

# BHAVNAGARMUNICIPALCORPORATION



**BidDocumentsFor**

**PROPOSED DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON  
PANCH SHAKTI AT VIJAYRAJNAGAR, BHAVNAGAR.**

## **NOTICE INVITING TENDER & QUALIFICATION CRITERIA**

EXECUTIVE ENGINEER  
Building Department  
Bhavnagar Municipal Corporation  
Mangalsinhji Road,  
Bhavnagar – 364 001

BHAVNAGARMUNICIPALCORPORATION	
NoticeInvitingOn-LineTender	
TenderNoticeNo. <b>BUILDING / E-7/ 2024-25</b>	
DepartmentName	: BuildingDepartment
IFBNo.	: <b>BUILDING / E-7/ 2024-25</b>
NameofProject	: SJMMSVY
NameofWork	: PROPOSED DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR, BHAVNAGAR
TenderType	Open – Percentage rate Tender
EstimatedContractValue(INR)	: <b>Rs.62,03,871/- (Excl. of GST)</b>
PeriodofCompletion(inmonth)	: <b>09 (NINE) Months including Monsoon period</b>
BidderNationality	LCB (LocalCompetitionBidding)
QualificationOfBidder	Duly registered with R&B in Class“D” Class & Above
BidCall(Nos)	: 1
TenderCurrencyType	: Single
TenderCurrencySettings	: IndianRupee(INR)
JointVenture/Consortium	: N.A.
Rebate	: N.A.
AmountDetails	
BidDocumentFee	: <b>Rs.2400 + 432 (18% gst) = 2832.00 in the Form of DD only/-(Rs. Two Thousand eight Hundred and thirty twoOnly)</b>
BidDocumentFeePayableTo	: Commissioner,MunicipalCorporation,Bhavnagar
BidSecurity /EMD(INR)	: <b>Rs.62,039.00/- (Rs. Sixty-Two Thousand Thirty-Nine Only.)(only D.D.)</b>
BidSecurity/EMDinfavour of	: Commissioner,MunicipalCorporation,Bhavnagar



<b>TenderDates</b>	
<b>Bid Document Downloading Start Date</b>	: Dt.24/10/2024
<b>BidDocumentDownloadin gEndDate</b>	: Dt.13/11/2024 18:00
<b>Pre-BidMeeting&amp;Time</b>	: Dt.28/10/2024 11:00Am (office of the City Engineer, MunicipalCorporation, Bhavnagar)
<b>LastDate&amp;TimeofOnlineBi dSubmission</b>	: Dt.13/11/2024 18:00
<b>PhysicalSubmissionofEMD Document Fee PQ Bid &amp;Supportingalldocuments</b>	: Dt. 13/11/2024 to Dt. 20/11/2024up to 06:10pm office of the Executive Engineer, Building Department, BMC-Bhavnagar
<b>OpeningOfPQBid(Online) &amp;TechnicalBid</b>	: Dt.21/11/2024, 17:00
<b>Penalty</b>	0.10 % of contractvalue per day to the maximum amount of 10% ofcontractvalue
<b>OpeningOfPriceBid(Onlin e)</b>	: Intimationthroughletter.
<b>BidValidity Period</b>	: 120Days
<b><u>QualificationofBidder:</u></b>	<p>Tenderer shall be required to submit the enlisted documents in hard copy along with theQualification Bid. If documents are insufficient or it does not match the required criteriamentionedbelow, then thePriceBidof the tenderer shallnotbeopened.</p> <p>MainlytenderershallfulfillfollowingTechnical&amp;Fina ncialpre-qualificationcriteriaasamain contractor. The tenderer shall fulfill the following all points A to Q requirements /experiencesforqualification.</p> <p>A. TheBiddermusthaveachievedaverageannualt urnoverduringlastthreefinancialyears,ending on31stMarch 2024 ofRs.20.6 LACS.</p> <p>B. TheBiddershallhavepositive</p> <p>C. Networthforlatestfinancialyear(2023-</p>

24) of Rs. 6.8 LACS as on 31st March 2024.

- D. The Bidder must have experience of successful completion of similar work on its own in India within last 7 years as on date of bid submission
- (a) One Project of minimum value Rs. 80% of the Project Value
- OR
- (b) Two Projects of minimum value Rs. 50% of the Project Value each
- OR
- (c) Three Projects of minimum value 40% of the Project Value of each

Note: Similar work shall mean Construction of Building Work as mentioned in tender documents in any of government organizations only. like R&B/Govt./Semi Govt./PSUs/Government Undertaking /Government Companies Department

- E. Available Bid Capacity (ABC) - must be more than the estimated tender cost. Note: Available Bid Capacity (ABC) will be derived by the following method. ABC is calculated as  $ABC = 2 * A * N - B$

Where,

A = Maximum value of works executed in any one year during the last five years (updated to present price level by applying enhancement factor) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the works for which tenders are invited i.e. 12/12 = 1.00

B = Value of existing commitments and on-going work to be completed during that next Year (period of completion of the works for the tenders are invited.)

Note: The statements/certificate showing the

value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works listed should be signed by the respective Employer or his authorized representative, not below the rank of an Executive Engineer or equivalent.

F. The cost of materials supplied by the Government / Clients shall not be taken into account for experience purpose.

G. An attested copy of registration with R&B etc. **Registration required: "D" Class & Above. Bank Solvency of Current Financial Year (2024-25) (20% of Tender amount.) of any Nationalized / Scheduled Bank except Co-operative Bank.**

H. Following enhancement factors will be used for the cost of works executed and financial figures to arrive at common base for the value of the works completed in India. Cut off month shall be considered from month of tender submission.

Year	Multiplying factor
Immediate last year of the assessment year*	1.1
Second	1.21
Third	1.33
Fourth	1.46
Fifth	1.61
Sixth	1.77
Seventh	1.95

\* Here assessment year shall be reckoned from year and month in which tender is submitted.

I. The experience of Joint Venture / Back-to-

	<p>backwork/NominatedSub- contractorsbyagenciesshallnot be considered.</p> <p><b>J.</b> TheBiddershouldsubmitSolvencyCertificate minimumvalueofRs.(20% of Tender amount.) issuedby schedule bank / Nationalized bank only and should be valid for at least up to sixmonthsfromthedataofsubmission. (Consideringvalidityas 1yearfromdateofissueofSolvencyCertificate)</p> <p><b>K.</b> TheBiddershouldsubmitthelistoftheworksalre adycompletedduringlast7yearin prescribed Performa and attested copies of certificates issued by head of the officeconcernedforcompletedwork.</p> <p><b>L.</b> TheBiddershallsubmitDeclarationregardingth eworkonhandwiththebidderin prescribed Performa. Attested copies of work orders, interim certificate if anyshallalsoattachassupportingdocument sfor above.</p> <p><b>M.</b> TheBiddershallsubmittheattestedcopyofpart nershipdeed,powerofattorney,etc.</p> <p><b>N.</b> JointVentureshallnotbeallowed.</p> <p><b>O.</b> EventhoughtheBiddermeetstheabovecriteria ,theyaresubjecttobedisqualifiediftheyhave</p> <ol style="list-style-type: none"> <li>Made misleading or false presentations in the forms, statementsandattachmentssubmittedin proofofthequalificationrequirements;an d/ or</li> <li>Duringverificationifitisfoundfromclientt hatofpoorperformance such as abandoning the works, for financial failureorabnormaldelayinworketc.</li> <li>Regarding Litigation, in case where Bidder or JV partner orMOU Partner is involved in illegal practice like any activities ofcorruption, coercive</li> </ol>
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	<p>practice ordebarred/blacklisted in last 2years by Any Govt / Organization in respect of performance ofBidder / MOU partner /JV partner, BMC authority requires thatbiddersunderthiscontract,observe thehigheststandardofethicsduringthepro curementandexecutionofsuchcontracts.</p> <p>(1) Will reject a proposal for award if it determines that thebidder has engaged in any corrupt or fraudulent practices incompeteforthiscontractorinpasthistoryand</p> <p>(2) Will reject aproposal if it found debarred/blacklistedbyany State Govt. /Govt. of India/ Semi Government/ PSU inlast10years.</p> <p>iv) The bidder or MOU partner shall not be under any InsolvencyBankruptcy code (IBC) resolution process at National CompanyLawTribunal(NCLT)orundergo neanyCorporateDebtRestructuring (CDR) mode in the past 10 years in India from thedateofthesubmissionofthebid.</p> <p>P. TheBiddershallnotethatincasetheBidder/MO Upartnerisblacklisted/statedas defaulter/ barred participating in tenders by any of government agencies / semigovernmentagencies/PSUinIndiadurin glast10yearstheninthatcase,theBidderwill be disqualified though the bidder satisfies all the pre-qualification conditionsmentioned above, and the bidder will be debarred for next 3 years from participatingintenderprocessfor BMC.</p> <p>Q. Bidderssshouldbeselectedbasedonqualitywor kdonebythemandifnecessarytendercommitte</p>
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	<p>ewillinspectbidders ongoingandcompletedwork.</p> <p>R. Thedecisionofthecommissionertoqualitythebi dderwillbethefinal.</p> <p>S. ConditionalTenderswillbeoutrightlyrejected.</p> <p>T. Theapplicantmustsubmitthisconfirmationlatt eronRs.300.00stamppaperwithnotary for Operating and Maintenance of proposed work shall include labour, allmaterials, plants, plants causalities, fertilizers, pesticides, tools, watering security ofpremises shall be responsibility of the Tenderer during the course of work and 2 yearsafterthetimeofcompletioncertificatefro mauthorityandallchargesforthesamebornby the Contractor (Tenderer). 1%from every running bill shall be deducted towardsSECURITY DEPOSITE of Operating and Maintenance of proposed work. <del>IT WILL BEREALEASEDAFETR COMPLETIONPERIODOF24 MONTHSOFO &amp;M-</del></p> <p>U. Ifworkisnotcompletedwithintimelimit,penalt yof0.10% perwillbedeductedfromrunningbilland it will beupto 10%.</p> <p>V. FDR For EMD and SD, or bank guarantee issued by state bank of India will not beaccepted.BiddershouldsubmitFDRorbankg uaranteeissuedbyanothernationalizedbank only.</p> <p>W. Biddershallquotetheratewithaltaxesexcluding GST.NoextrapaymentforGSTwillbedoneby BMC.</p> <p><b>VARIATIONINQUANTITIES</b></p> <p>Schedule of prices contain estimated quantities and actual quantities asexecutedbecomespayableatagreed rates.</p>
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	<p>However, accepted rates will be valid till variation in quantities up to any extent of the quantities so specified.</p> <p>X. Other terms and conditions of the tender shall be read and considered as a part of the tender documents. The rates/prices quoted by the bidders will be final and any sort of escalation will not be considered.</p> <p>Note: Star Rate, Price Escalation, price Variation in any items of Schedule-B / Extra item will Not be given by Bhavnagar Municipal Corporation. If Same will be stated in any Bid Documents will not be Considered.</p>
<b><u>Remarks</u></b>	<p>: Only Offer of those shall be opened whose EMD &amp; Tender Fee evidence is received electronically along with the bids. However, for the purpose of realization of Demand Draft, bidders shall send them in original through RPAD/Speed Post/Reg. A.D. so as they reach to the office of Executive Engineers</p> <p>- Building Dept., Bhavnagar Municipal Corporation, Bhavnagar during office hours between Dt. 13/11/2024 to Dt. 20/11/2024. Penetrative actions shall be imposed for not submitting the supporting documents in original to E.E. by bidder. All the successful bids, if possible, will be physical document opened on 21/11/2024, 17:00 in presence of tender committee at the City Engineer's Office, Commercial stage will be opened after approved tender document Bhavnagar Municipal Corporation, Bhavnagar. FDR FOR EMD OR SD, OR BANK GAURANTEEE issued by state bank of India will not be accepted</p>
<b>General Terms &amp; Conditions</b>	<p>: Bidders who wish to participate in this E-Tender will have to procure valid digital certificate as per information Technology Act 2000. Bidders can procure this certificate from any of the</p>

	<p>Government approved certifying agency i.e. (n) Code Solution.</p> <p><b>DOWNLOAD OF TENDER DOCUMENT:</b></p> <p>The tender document for this work is available only in digital format which can be download free of cost by the bidder.</p> <p><b>SUBMISSION OF TENDER:</b></p> <p>Tenderer shall submit their offer in electronic format on above mentioned website or before the scheduled date and time as mentioned, after Digitally Signing the same.</p> <p>Bidders shall upload the tender documents after submitting the DD details for tender fees and EMD in form of DD/Bank Guarantee detail online. The Demand Draft toward Tender Document fees can be submitted along with Earnest Money Deposit before the due date as specified above.</p> <p>This should be as per details given online and it should be drawn before last date of the uploading of the tender.</p> <p>The intending bidders shall have to submit the following documents in Physical form along with the EMD and tender fees.</p> <ul style="list-style-type: none"> <li>(a) Documents required for evaluation as sought in different annexure duly digitally signed.</li> <li>(b) Power of attorney.</li> <li>(c) Company's profile and certificate of Registration of company under the law.</li> </ul> <p>The Bidder should submit price Bid digitally only.  <b><u>Price bid in physical form shall Not be accepted</u></b> and any such offer if received by Bhavnagar Municipal Corporation same will</p>
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	<p>beoutrightlyrejected.</p> <p>Technical bid in physical form is not required to be submitted by all bidders.However, non-submission of technical bid does not absolve bidders from andliability of the tender. Only successful bidders have to submit the technical biddulysigned in physicalformuponintimationfromBMC.</p> <p><b>OPENINGOFTENDER:</b></p> <p>TheTechnicalBidwillbeopenedonthespecifieddateonlineonwebsite<a href="http://www.tender.nprocure.com">www.tender.nprocure.com</a>Bidders or their representative who wish to participate in onlinetender opening can log on to <a href="http://www.tender.nprocure.com">www.tender.nprocure.com</a>on the due date and time,</p> <p>marktheirpresenceandparticipateinonlinetendero pening.Bidderswhowishto remainpresent at Bhavnagar Municipal Corporation, only one representative of each firm will beallowedtoremainpresent.</p>
<b>Information foronlineparticipation</b>	<ol style="list-style-type: none"> <li>1. Internetsiteaddressfore- Tenderingactivitieswillbe<a href="http://www.tender.nprocure.com">www.tender.nprocure.com</a></li> <li>2. Interested bidders can view detailed tender notice and download tender documentsfromtheabove-mentionedwebsite.</li> <li>3. Bidders who wish to participate in online tender have to register with the websitethrough the "New User Registration" link provided on the home page. Bidder willcreateloginid&amp;password ontheirrowninregistration process.</li> <li>4. Bidders who wish to participate in this tender need to procure Digital Certificate asperInformationTechnologyAct-2000using that they can digitally sign their electronicbids.Bidderscanprocurethesamefro manyoftheCCAapprovedcertifyingagencies, or</li> </ol>

	<p>they may contact (n) code Solution at below mentioned address and they will assist them in procuring the same. Bidders who already have a valid Digital Certificate need not to procure the same. In case bidders need any clarification regarding online participation, they can contact M/S (n) code Solution</p> <p>301, G.N.F.C. Info Tower, Near Grant Bhagwati Hotel, Ahmedabad 380015, India. Tel: +917926857316 Tel: +917926857317 Tel: +917926857318 E-Mail: URL: <a href="http://www.tender.nprocure.com">www.tender.nprocure.com</a></p> <p>5. Bidders who wish to participate in e-Tender need to fill data in predefined forms of tender fee, EMD, PQ (Technical) or experienced details and Price bid only.</p> <p>6. Bidders should upload scan copies of referenced documents in support of their eligibility of the bid.</p> <p>7. After filling data in predefined forms bidders need to click on final submission link to submit their encrypted bid.</p> <p>Bidder can also submit Document Fees, EMD, Technical bid document &amp; Reference Documents in hard copy if such instructions are given by tendering authority.</p>
<b>Officer Inviting Bids</b>	<b>Executive Engineer, Building Department, Bhavnagar Municipal Corporation, Bhavnagar.</b>
<b>Bid Opening Authority Members in committee</b>	<b>(1) City Engineer (2) Executive Engineer (Building Department.) (3) Chief Accountant (4) Chief Auditor</b>
<b>Address</b>	<b>Building Department, Municipal Corporation, Sir Mangal Singhji Road, Bhavnagar</b>

<b>Contact Person</b>	<p>For further details of any query regarding the tender Contact to: Executive Engineer (Building Department), Bhavnagar Municipal Corporation., Sir Mangalsinhji Road, Bhavnagar-364001 Mobile no. 8128207404 E-mail: <a href="mailto:building.bmcgujarat@gmail.com">building.bmcgujarat@gmail.com</a></p>
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Date : 00/11/2024  
Place: Bhavnagar

**Executive Engineer  
Building Department  
Bhavnagar Municipal Corporation**

**BHAVNAGARMUNICIPALCORPORATION**  
**(BUILDINGDEPARTMENT)**

**TENDERDOCUMENT**

*Volume-1*  
*PART-AGeneralConditions*

**Client-**  
**MunicipalCommissioner**  
**BhavnagarMunicipalCorpora**  
**tion.**  
**Mangalsihji Road, Kalanala,**  
**Bhavnagar.**

**BHAVNAGARMUNICIPALCORPORATION**  
**(BUILDINGDEPARTMENT)**

**TENDERDOCUMENTSCONTENTS**

***Volume-1***

***PART-AGeneralConditions***

**DOWNLOADINGOFTENDERTHEWEBSITE :-**

**AsperNoticeInvitingTender.**<http://www.tender.nprocure.com>

**DATEOFPRE-BIDMEETING :-**

**AsperNoticeInvitingTenderLASTDATEOFONLINESUBMISSIONOF**

**:-**

**AsperNoticeInvitingTender.PRICEBIDOFTENDER**

**LASTDATEOPHYSICALSUBMISSION :-**

**AsperNoticeInvitingTender.OFTENDER(Enclosesasasked)**

**OPENINGOFTENDER :-AsperNoticeInvitingTender.**

## 1. **NOTICE INVITING TENDER (NIT)**

### **BHAVNAGAR MUNICIPAL CORPORATION**

**(BUILDING DEPARTMENT)**

#### **E-Tender Notice No.00/2024-2025**

On Line Tenders (E-Tendering) are invited by Bhavnagar Municipal Corporation from the eligible interested bidders who fulfill the qualifying criteria as specified by BMC for **DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR, BHAVNAGAR.**

The details may be downloaded from above notice will be available in [www.tender.nprocure.com](http://www.tender.nprocure.com) upto **Dt.13/11/2024**. In Prescribed e-form as well as Price bid should be submitted online so as to reach at address cited below on or before **Dt.13/11/2024**.

All relevant documents must be submitted by speed post or hand delivery along with processing fees as mentioned in the Tender document upto **Dt.20/11/2024** **Technical Bid Opening- Dt.21/11/2024**

**To**

**Executive Engineer** (Building Department), Bhavnagar Municipal Corporation,  
Mangalsihji Road, Kalanala,  
Bhavnagar, Gujarat.

**BHAVNAGAR MUNICIPAL CORPORATION  
(BUILDING DEPARTMENT)**

**2. MEMORANDUM OF WORK**

Municipal Commissioner invites online tenders from interested contractors for

1	Name of work	<b>DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR, BHAVNAGAR</b>
2	Time Limit	<b>09(NINE MONTHS INCLUDING MONSOON PERIOD)</b>
3	Tender Validity Period	<b>120 Days from Last Date of Tender Submission</b>
4	Eligibility Criteria	<p><b>Contractor registered in “D Class” and above will be required. Registration must be of R&amp;B/PWD/CPWD/GWSSB - &amp; who have Completed at least</b></p> <p><b>1) One Similar Work costing not Less than 80% of the Estimated Cost</b></p> <p><b>or</b></p> <p><b>2) Two Similar works costing not less than 50% of the Estimated Cost</b></p> <p><b>or</b></p> <p><b>3) Three similar works costing not less than 40% of the Estimated Cost</b></p> <p><b>With good Quality and Workmanship in the Last 7 Years and Who have an Average annual Turnover in the last Three Financial Years should be more than 30% of the Estimated Cost.</b></p> <p>(Escalation Factor shall be used to bring the value of such completed work to the level of current Financial Year as per page No.18)</p>
	Definition of Similar Work	<b>“Similar Work” Means Bidder should have completed Building Work with Garden development &amp; sculpture work.</b>
5	Estimated Cost put to Tender	<b>Rs.62,03,871.00</b>
6	Tender fees (Non-Refundable)	<b>Rs.2832/-</b> Demand Draft in favor of Municipal Commissioner, Bhavnagar
7	Earnest Money Deposit	<b>Rs.62,039/-</b> Demand Draft or Bank Guarantee in favor of (Municipal Commissioner, Bhavnagar Municipal Corporation) to be submitted as prescribed in 8.0 below. Demand Draft or Bank Guarantee shall be from Nationalized Bank / Scheduled Bank and valid for 210 days from Tender Submission Last Date. (As per attached ANNEXURE-1 of finance dept. circular No-03, Dt.28/04/2023)
8	Tender Floating Date and Time	ASPERN.I.T.
9	Last Date and Time for Online Submission of the Tender	ASPERN.I.T.
10	Pre-Bid Meeting	ASPERN.I.T.
11	Submission of EMD, Tender Fees and Tender Documents in Physical	In separate sealed cover Submission of EMD, Tender fee and other Documents in the Office of <b>Executive Engineer (Building Department), Bhavnagar Municipal Corporation, Mangalsihji Road, Kalanala, Bhavnagar, Gujarat.</b>

11b	Any queries, Clarifications regarding the Tender/Work submitted in writing to	Executive Engineer (Building Department), Bhavnagar Municipal Corporation
11c	Further Tender Information available with, Contact to (Name, Contact No.)	Executive Engineer (Building Department), Bhavnagar Municipal Corporation
12	Date of Opening of Technical bid	ASPERN.I.T.
13	Security Deposit	5% of the Sanctioned Tender Amount in form of Bank Guarantee/ Demand Draft (As per Annexure-I) or as per tender online
14	Mode of sending the Tender Documents	Price bid should be submitted by online tender only and technical bid should be submitted physically also in sealed envelope systems by RPAD/Speed Post in sealed covers in Two Set (One Original & One Duplicate) Each part shall be separately duly signed & sealed by Bidder.
15	Liquidated damages Penalty for Delay	
A	Percentage per Day (%) for Liquidated Damages	0.1% of the Cost of Remaining Work per day from the date of laying the said work up to the date of approved or extended time limit. (As per Circular no. 9, dated 18/05/2012 issued by M.C.)
B	Liquidated Damages for delay Maximum	10% of the cost of remaining work up to the date of approved or extended time limit. (As per Circular no. 9, dated 18/05/2012 issued by M.C.)
16	Deduction of Retention Money from each R.A. Bill	1. 2% of the value of work done will be deducted from each R.A. Bill. It will be released along with release of payment of Final Bill. 2. All other deduction made from each R.A. Bill as per BMC's Circular.
17	Place of Arbitration	Bhavnagar
18	Language of Arbitration	English
19	Labor welfare cess	As per construction works welfare cess Act – 1996 non-refundable 1% of tender amount shall be deducted against works welfare cess.
20	Solvency Certificate	Solvency certificate for an amount up to 20% of the Estimated Cost put to tender. A solvency certificate to this effect shall be submitted by him not Older than Last One Year from any Nationalized bank as per Annexure-I
21	Performance guarantee Bond for DLP, O & M Work	a) 5% of Amount of Completed Work in form of Bank Guarantee of Bank as per Annexure-1 (Ref. Circular No. 03, Dt. 28/04/2023) to be submitted on completion of work and to be retained till defect liability period is over. b) 5% of Contract Value of One Year's Comprehensive Maintenance Service Contract Covering Up to Completion of Maintenance Period of One Year After Defect Liability Period by the Way of Demand Draft / Bank Guarantee of Bank as per Annexure-1 Only in Favour of "Municipal Commissioner, Bhavnagar" After Completion of defect liability period.
22	Defect liability period	24 months after completion of the work



**23. Third Party Inspection/Project Management Consultant**

The Client at their Discretion may appoint Third Party Inspectors (TPI) and / Project Management Consultants (PMC) for Betterment of the Project. The Bidders/Bidders are Hereby Informed that they shall be Responsible for following the Instruction given by this Agency / Agencies throughout the Project. If any Discrepancy in the Testing Methodology arises, the Method/Practices Suggested by these Agencies shall be Abiding to the Bidders.

**24.** Conditional tenders will not be accepted. Municipal Commissioner reserves the rights to reject any or all the tenders in Part or Full without assigning any reasons whatsoever to Split the Tender & Award the Work to One or More than One Technically Qualified Tenderer at L1 Bidder's Rate in the Interest of Public. The Tenderers shall have no Cause of Action or Claim Against.

**25.** Tenders which do not fulfill all or any of condition or are submitted incomplete in any respect will be rejected. Municipal Commissioner reserves the right to reduce the scope of work and contract without assigning any reason thereof.

**26.** No advances such as machinery advance, mobilization advance or materials advance will be given.

**27.** In case of any dispute or clarification in technical specification or Item Unit of any tender item, the decision Taken by **Executive Engineer (Building Department)** shall be final.

**28. PRICE VARIATION:** **Shall Not be Applicable for Cement & T.M.T. Steel.**

**29.** As per Standing Committee's Resolution 0.5% testing charges shall be deducted from each R.A. Bill and the Amount of Actual Testing Charges shall be Adjusted in the Final Bill. Even if the Testing Expenses Exceed 0.5% of the Project Cost, the Excess Amount shall be borne by the Bidders, and no Payments shall be made in this Regards.

**30.** The rates to be quoted by the Bidder must be exclusive of GST but inclusive of all other taxes. GST shall be payable extra on the admissible payment as per the approved tender rates; GST shall be payable as per prevailing rates at the time of payment. (As per Circular No.38, Dt.21-11-2022)

**31. Joint venture and Sub Contracting shall not be allowed under this tender.**

**Seal and Signature of the Bidder**

**Executive Engineer (Building Department)**

### **Special Condition For Tenderers**

- Scope includes Complete Demolition of Existing Structure & Sub Structure upto Foundation Level of **Existing old traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar** & Then Disposal of Serviceable & Un Serviceable Material including Cleaning & Levelling of Entire Plot. The Total Project Includes Demolition of Existing Units and Site Clearance. The Total Responsibility and Liability of This Demolition Works Including Site Clearance Shall Be of The Contractor. This Demolition and Debris Removal Includes all Hidden Foundation also at Locations Where New Foundation or New Work is To Be Done.
- Contractor Has to Visit Site with representative of BMC before quoting amount in tender. The Contractor Shall Not Be Paid for Any Dismantling, Demolition, Carting the Debris And/or Any Expenses Incurred for Site Clearance.
- All Dismantling material is property of BMC.
- The Lowest Eligible Bidders shall have to Deposit Premium Amount for the Serviceable Goods at the Time of Submission of Security Deposit.

Signature of contractor

Executive Engineer (Building Department) Seal  
Bhavnagar Municipal Corporation

**ANNEXURE-1**

(A) Guarantees issued by the following banks will be accepted as SD/EMD on a permanent basis.

- (1) All Nationalized Banks (SBI not allowed)

(B) Guarantees issued by the following banks will be accepted as SD/EMD for the period up to March-2024. The validity cut-off date in the GR is with respect to the date of issue of Bank Guarantee irrespective of the date of termination of Bank Guarantee. Guarantees issued or authorized by Bhavnagar Branch Only.

- (1) Commercial Banks:

1	AU Small Finance Bank	12	Standard Chartered Bank
2	Axis Bank	13	Tamil Nadu Mercantile Bank
3	City Union Bank	14	Bandhan Bank
4	DBS Bank India Limited	15	BNP Paribas
5	DCB Bank	16	CSB Bank
6	Equitas Small Finance Bank	17	HSBC Bank
7	Federal Bank	18	Karnataka Bank
8	HDFC Bank	19	Karur Vysya Bank
9	ICICI Bank	20	South Indian Bank
10	Indus Ind Bank	21	Utkarsh Small Finance Bank
11	Kotak Mahindra Bank		

- (2) Co-Operative & Rural Banks of Gujarat

1. The Ahmedabad Mercantile Co-operative Bank Limited
2. Kalupur Commercial Co-operative Bank Limited
3. Nutanagrik Sahakari Bank Limited
4. Rajkot Nagarik Sahakari Bank Limited
5. Saraswat Co-operative Bank
6. Saurashtra Gramin Bank
7. The Gujarat State Co-Operative Bank
8. The Mehsana Urban Co-operative Bank Limited
9. The Surat District Co-operative Bank
10. The Surat Peoples Co-operative Bank
11. SVCCo-operative Bank LTD.

**Seal and Signature of the Bidder**

**Executive Engineer (Building Department)**

#### **4. Note for Contractors**

1. Tender once offered shall not be withdrawn except with the permission of Municipal Commissioner.
2. Tender once accepted shall be binding upon the Bidder even if the formal agreement is not signed.
3. Quantities of items in BOQ (Bill of Quantities) may vary in case of necessity arises.
4. Unless otherwise stated all measurements shall be taken in accordance with the "Bureau of Indian Standards" method of measurements of building and civil Engineering IS 1800.
5. The location of the proposed Site for this work may change or Cancelled Due to any Reason. No claim shall be entertained by BMC in this regard.
6. All duties chargeable by the Municipal Corporation/State Govt. will be payable by the Bidder.
7. The rates to be quoted by the Contractor must be exclusive of GST but inclusive of all other taxes. GST shall be payable extra on the admissible payment as per the approved tender rates; GST shall be payable as per prevailing rates at the time of payment. (As per Circular No.38, Dt.21-11-2022)
8. Financial Bid shall be submitted online only. If Rate Mentioned in Physical Copy than it will be Considered non-responsive and shall be rejected.
9. Bidder is requested to see the site physically before tendering. He is also requested to quote the rates, keeping in view the points mentioned in relevant pages of tender documents.
10. The Bidder shall have to submit the tenders in duplicate i.e. two sets - original and duplicate.
11. All information / details to be submitted in the given Performa supported by the valid certificated & attested duly signed. (Please refer Information's Details to be submitted by the tenderers in the Performa mentioned under *STATEMENT NO IT 09*)
12. Contractor shall have to maintain Quality and Workmanship as per Technical Specification for Entire Construction work. The contractor shall be held responsible for Non-Maintenance of Work Quality.

**Signature of Contractor**  
**Date:**

**Executive Engineer**  
**(Building Department)**

## **5.      *Conditions for the Water Supply & Electric Supply***

### **Water Supply:**

Bidder shall have to arrange at his own cost, a suitable Network with pipes for the construction of the works. Also, Completion of the work & Issue of Work Completion Certificate from Competent Authority, BMC shall Provide Water Connection for Operation and Maintenance Work. Water Connection charges shall be paid by Contractor.

### **Electricity:**

Electric supply shall be made available at the site by Bidder. Bidder must make his own arrangements with Electricity Supply Authorities and with other Bidders to connect to and take a supply from such services, paying all costs in Connection therewith. Necessary Documents for getting Electric supply/connection will be arranged by BMC Authority. The Bidders shall be entitled to use such supply. Electricity as may be available on the site for purpose of the work and shall pay such charges as is fixed by the appropriate supply Authorities up to Completion of construction Contract including Operation and Maintenance Period.

In case if there is any delay in supply of power or site of any interruption or fault in the power during the work. No compensation shall be paid for idle labor staff, machineries and for use of diesel operating sets etc. as the case may be.

**Signature/Stamp of Contractor**

**Executive  
Engineer (Building  
Department)**

## 6. Tender Declaration form

Date: \_\_\_\_\_

To  
Executive Engineer, Building  
Department, Bhavnagar  
Municipal Corporation, Bhavnagar.

**Project: Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar**

Dear Sir,

I/We the undersigned have carefully gone through and clearly understood the Tender documents of above mentioned project comprising of Notice Inviting tenders, Articles of Agreement, Scope of work, Definition of terms, notes Instructions/Information to Tenderer, Condition of Contract, special condition of contract, Appendices, Specifications, Schedule of quantities and tendered drawings furnished by BHAVNAGAR MUNICIPAL CORPORATION. I/We have satisfied myself/ourselves as to the location of site, examined drawings. I/We have visited site & fully acquainted with local situations regarding materials, labors & others factors pertaining to work before submitting tenders.

I/We do hereby offer to execute and complete the whole of the work within the time specified all in accordance with the specification, designs, drawing and instruction in writing referred to in the said document and with such materials as are provided for, at the respective rates which I/we have quoted in the schedule-  
Borata such other rates as may be fixed under the provision of these conditions.

In the event of this tender being accepted I/We agree to enter into an agreement and when required and execute the contract, according to your form of agreement as or in default where of I/we bind myself/ourselves to forfeit the "Earnest Money Deposit."

I/We understand that if I/WE shall not enter in agreement within ten days or decided by BMC from the date of receipt of letter of acceptance, you will forfeit the earnest money paid by me/us and taken necessary action as deemed fit.

I/We have enclosed a Demand Draft / Bank Guarantee as an "Earnest Money Deposit", for the sum as mentioned in NIT, the full value of which is to be absolutely forfeited to the Employer if I/We fail to commence the work specified. Otherwise the Employer shall retain the said sum, as an account of such Security Deposit as provided for in the aforesaid documents.

I/We agree not to employ Sub-contractors other than those that may be approved in accordance with Conditions in the aforesaid documents.

I/We understand that Muni. Commissioner shall have right to accept, reject the tender as well as the rate at which tender to be accepted and awarded.

I/We are bound to execute the job if the work order is issued within 120 days from the date of opening of the tender.

I/We agree to pay the Government Tax, GST, Labor Cess and other Prevailing taxes as applicable on such items on which the same are leviable and The rates to be quoted by the Contractor must be exclusive of GST but inclusive of all other taxes. GST shall be payable extra on the admissible payment as per the approved tender rates; GST shall be payable as per prevailing rates at the time of payment. (As per Circular No.38, Dt.21-11-2022)

Signature/Stamp of Contractor

Executive  
Engineer (Building  
Department)

## BHAVNAGARMUNICIPAL CORPORATION

### Invitation for Bid (IFB)

1. The BHAVNAGARMUNICIPAL CORPORATION, (hereinafter called "the Employer") in invite sealed Tender document from reputed and qualified bidders for the construction of Works detailed in the Table below:-

Sr . No.	Name of Works	Approximate value of works (Rs.)	Earnest Money Deposit (Rs.)	Completion Period
1	Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar	Rs. 62,03,871.00	Rs. 62,039.00	09 (NINE MONTHS INCLUDING MONTHS ON SOON PERIOD)

2. Interested bidders shall download the tender documents from website:

[www.tender.nprocure.com](http://www.tender.nprocure.com).

3. Tender (a complete set of bidding document) fee shall be **as per N.I.T** in the form of Demand Draft from any Nationalized Bank in favor of MUNICIPAL COMMISSIONER, Bhavnagar, payable at Bhavnagar, which shall be non-refundable. **The Details of Tender fees shall be submitted with scan copy at the time of Quoting price bid of the tender and physically to be submitted along with technical bid Vol.-1 with other enclosure.**

4. All bids must be accompanied by Earnest Money Deposit of the amount specified for the Works in the above Table payable at Bhavnagar and drawn in favor of **MUNICIPAL COMMISSIONER**, Bhavnagar, payable at Bhavnagar. Earnest Money Deposit will have to be specified in Clause 2 of Financial Condition.

5. Physical submission must be delivered to **Office of Executive Engineer (Building Department)**, Bhavnagar Municipal Corporation, Mangalsihji Road, Kalanala, Bhavnagar. As per N.I.T.

6. The Bids will be opened on **As per N.I.T** at the office of **Executive Engineer (Building Department)**, Bhavnagar Municipal Corporation, Mangalsihji Road, Kalanala, Bhavnagar, Gujarat, in the presence of bidders or their representatives who choose to attend. In the event of the specified date of bid submission/opening being declared a holiday for the Employer, the bids shall be received/opened on the next working day at the same place and the same time.

## **TERMS&CONDITIONS**

**( A ) INSTRUCTIONS TO BIDDERS**

**(ITB)(B)GENERALTERMS&CONDITIONS**

**( C)FINACIALTERMS&CONDITIONS**



## **BHAVNAGAR MUNICIPAL CORPORATION TERMS & CONDITION**

### **(A) INSTRUCTIONS TO BIDDERS (ITB)**

#### **1. Procedure for Submission of Tender**

- a) The Bidders should quote the price bidding tender form before last date of online submission as per N.I. and all other details as asked in the tender.
- b) The bidders shall submit the following Tender documents physically in hard copy in two separate envelopes (marked as "original" and other marked as "Duplicate") in scheduled time by RPAD/Speed Post/Hand Delivery in duplicate. This envelope shall be sealed in an outer envelope. The Bid envelope shall be marked as follows:-
- Tender Document Vol. 1
  - Tender fee
  - EMD
  - Registration certificate of class
  - Power of Attorney
  - Personal Details
  - Enclosures as asked in tender
  - Technical specifications duly signed by contractor.
- c) The envelope shall be addressed to the Employer at the following address:  
**Executive Engineer (Building Department), Bhavnagar Municipal Corporation, Mangalsihji Road, Kalanala, Bhavnagar, Gujarat.**
- d) Indicate the name and address of the bidder.  
If the outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the bid.
- e) All information has to be typed or handwritten legibly. All pages of the Bid have to be initialed by the bidder.
- f) ALL INFORMATION HAS TO BE SUBMITTED IN THE PRESCRIBED FORMAT ONLY. Projects for which incomplete information has been provided will not be considered for evaluation. The Bidder may attach separate sheets if so required. However, the final bound document submitted, has to be submitted in vertical A4 size (210mm X 297mm) except Form of Bids.

#### **2. Assessment of Submission**

- 2.1 The Employer will open the physically submitted document of all the bids received for the package (except those received late) containing the sealed Tender volume and other enclosures then announce the names of bidders in the presence of bidders or their representatives who choose to attend on the date and time mentioned in the IFB. In the event of specified date of bid opening being declared as a holiday for the Employer, the Tender will be opened at the appointed time and location on the next working day.
- 2.2 In Physical submission, Bidders detailed and tender fee, E.M.D. shall be opened first. The Employer at the opening will announce bidder's names, the presence or absence of EMD, the amount and validity of EMD furnished with each bid, is valid registration and such other details, as the Employer may consider appropriate.

- 2.3 The Employer will determine whether the bid is accompanied by the required EMD.
- 2.4 If the EMD furnished does not conform to the amount and validity period as specified in the Invitation for Bid and has not been furnished in the form, the bid shall be rejected by the Employer as non-responsive and the Tender volume will be returned to the bidder.
- 2.5 Subject to confirmation of the EMD by the issuing bank, the Tender volume accompanied with valid EMD will be taken up for further evaluation. In case, the Bank does not confirm the EMD, the bid shall be rejected as non-responsive and no further evaluation carried out.
- 2.6 The tender volume will further be examined to determine whether the bid has been properly signed, meets the eligibility and qualification criteria, has the required available bid capacity, is accompanied by the requisite certificates, undertaking and other relevant information specified in the bid documents and is substantially responsive to the requirement of the bidding documents and provides any clarification for ascertaining the correctness of the information/details.
- 2.7 The Employer shall prepare besides the record of bid opening, minutes of the Bid opening, including the information disclosed to those present in accordance with Sub Clause 3.2 thereof.
- 2.8 The bidders or their representatives who are present shall sign attendance sheet evidencing their attendance.
- 2.9 If the Tender volume is not substantially responsive, it will be rejected by the Employer and will not subsequently be made responsive by correction or modification or withdrawal of the nonconforming deviation or reservation.

### **3. Evaluation and Comparison of Tender volume**

The Employer will evaluate and compare only those Tender volumes which are determined to be substantially responsive in accordance with Clause 2 as above and qualified for award of Contract in accordance with Clause 5 as below.

### **4. Procedure for Tender Opening**

Received copies of tender in physical form within scheduled time, will be open on scheduled date and time. In the event of specified date of bid opening being declared bidders who qualify the criteria then bidder bid will be considered for opening of price bid. (Following clause no. 5 of ITB).

### **5. Award**

- 5.1 B.M.C. will open the Price Bid of the Bidders who are Qualified in Technical Evaluation. B.M.C. may reserve the right to award the Contract to One or More Technically Qualified bidders at the Same Rate as Quoted by L1 Bidder.

### **6. Notification of Award**

- 6.1 Prior to expiration of the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder by cable/fax and confirmed by registered letter that this bid has been accepted. This letter shall name the sum which the Employer

will pay the Contractor in consideration of the execution, completion and maintenance of the Works by the Contractor as prescribed by the Contract.

6.2 The notification of award will constitute the formation of the Contract.

**7. As per Finance Department Circular no. 03, Dt. 28/04/2023 A successful Bidder has to deposit security deposit/Bank Guarantee within 15 days after receiving letter of Intent. If Agency fails to Submit Security Deposit within Time, Penalty Should be charged 4% P.A. for Late Submission of Security Deposit. Time limit of work will commence from the date of issue of work order.**

#### **8. Clarification of Bids**

- 8.1 To assist in the examination, evaluation and comparison of bids, the Employer may, at his discretion, ask any bidder for authentication of the correctness of the information/details furnished by him in his bid. Such request by the Employer and the response by bidders shall be in writing or by cable/fax.
- 8.2 Subject to above clause, no bidders shall contact the Employer on any matter relating to his bid from the time of bid opening to the time contract is awarded.
- 8.3 Any effort by the bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of his bid.

#### **9. Process to be Confidential**

- 9.1 Information relating to the examination, clarification, evaluation and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful bidder has been announced. Any effort by a bidder to influence the Employer's processing of bids or award decisions may result in the rejection of his bid.

#### **10. Site Visit**

- 10.1 The bidder is advised to visit and examine the Site of Works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the bidder's own expense.
- 10.2 The bidder and any of its personnel or agents will be granted permission by the Employer to enter its premises and lands for the purpose of such inspection, but only upon the express condition that the bidder, its personnel and agents, will release and indemnify the Employer and its personnel and agents from and against all liability in respect thereof and will be responsible for death or personal injury, loss of or damage to property and any other loss, damage, costs and expenses incurred as a result of the inspection.

**Seal and Signature of the Bidder**  
**Date:**

**Executive Engineer**  
**(Building Department)**

## **BHAVNAGAR MUNICIPAL CORPORATION TERMS & CONDITION**

### **(B) GENERAL TERMS & CONDITIONS**

#### **1. Scope of Bid**

1.1 The Bhavnagar Municipal Corporation hereinafter called "the Employer" invites Tender document for the construction of works (as defined in these documents, hereinafter referred to as "the Works") detailed in the table given in the IFB.

1.2 The Works consist of:

**Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar.**

#### **2. Source of Funds**

2.1 The expenditure on these Works will be met by BHAVNAGAR MUNICIPAL CORPORATION.

#### **3. Eligible Bidders**

3.1 This invitation for bids is open to bidders who have necessary bid capacity and who meet the following requirements:

- A bidder shall not be under a declaration of financial eligibility for corrupt or fraudulent practice.

**Contractor registered in "D Class" and above will be required. Registration must be of R&B/PWD/CPWD/GWSSB - & who have Completed at least**

- 1) **One Similar Work costing not less than 80% of the Estimated Cost**  
**or**
- 2) **Two Similar Work costing not less than 50% of the Estimated Cost**  
**or**
- 3) **Three Similar Work costing not less than 40% of the Estimated Cost With good Quality and Workmanship in the Last 7 Years and Who have an Average annual Turnover in the last Three Financial Years should be more than 30% of the Estimated Cost.**

**Definition of Similar Work:-** "Similar Work" Means Bidder should have completed Building Work with Garden development & architecture work.

(Escalation Factor shall be used to bring the value of such completed work to the level of current Financial Year)

**Escalation factor:** Following enhancement factor will be applied for annual turnover and completion cost of project to bring them to the base year. The current financial year in which bid is invited shall be considered as the base year. This shall be applicable for last Seven years only.

Year	Financial Year	Enhancement Factor
Base (year of inviting tender)	2023-2024	1.0
-1	2022-2023	1.1
-2	2021-2022	1.21
-3	2020-2021	1.33
-4	2019-2020	1.46
-5	2018-2019	1.61
-6	2017-2018	1.77

Enhancement factor is a multiplication factor utilized for enhancing the value of the work of work done, turnover Amount.

#### **Work Completion:**

- ~~1. For work completion, the bidder has to submit Certificate 3 (A) from their~~

- respective employers. Those works which are not supported by the Certificate 3(A) shall not be considered as completed work.
- ~~2. Work completed by the bidder with Government / Semi Government under the name of the bidder themselves shall be considered for evaluation.~~
  - ~~3. Work completed by the bidder from Private works (Not Sublet), but shall be under the direct name of the bidder, shall be considered of 50% value of the work done. The amount to be derived for this, shall consist only building construction works and no other amount. Bidder has to Submit TDS Certificate for Such Private Work.~~
  - ~~4. In case of Earlier Partnership firm (Dissolved Now), any of the partner with the new firm (New name) bids for the tender, the work completion credentials shall be considered as per the Partnership deed and percentage of profit shared by the partners of the dissolved firm.~~
  - ~~5. Work Completion means completed works only. If the work is in progress and some percentage of the work is completed, the bidder cannot consider that amount into the work completed. For example, for the project Rs. 10.00 Crore if the work is completed 1.50 Cr., then the bidder can not submit the work completion of Rs. 1.50 Cr. for eligibility of this tender.~~
  - ~~6. Works done under Sublet and/or Joint Ventures shall not be considered for evaluation purposes anyhow.~~
- ~~Bidders shall provide such evidence of their continued eligibility satisfactory to the Employer, as the Employer shall reasonably request.~~

#### **4. Eligible Material, Equipment and Services**

4.1 At the Employer's request, the bidder having offered the evaluated lowest financial bid may be required to provide evidence of the origin of materials, equipment, and services to the satisfaction of the Employer.

4.2 For purposes of Sub Clause 4.1, "origin" means the place where the materials are mined, grown, produced or manufactured; similarly, for equipments and from where the services are provided.

#### **5. Qualification of the Bidder**

To be qualified for award of Contract, bidders shall:

- a) Submit a written power of attorney authorizing the signatory of the bid to commit the bidder.

##### **5.1 Organisation & Management**

- a. Memorandum of association/articles of association/partnership agreement etc.
- b. Bids from the joint ventures are not acceptable.
- c. Certificate of class of registration

**5.2 Financial Status**

- 5.2.1** Achieved an Average Annual financial turnover during the last 3 years, ending 31st March of the previous financial year should be at least **30%** of the estimated cost put to Tender. It should be duly certified by Chartered Accountant.
- 5.2.2** (Escalation factor as mentioned above shall be used to bring the value of such completed work to the level of current financial year i.e. **2023-24**)
- 5.2.3** If company did not exist for the last 5 years, corresponding figure for the year is to be taken as zero.
- 5.2.4** The agency should Submit Solvency certificate for an amount up to 20% of the tender amount. A solvency certificate to this effect shall be submitted by him not older than Last One Year from any Nationalized bank as per Annexure-I.
- 5.3** Sub-Contractors' experience and resources shall not be taken into account in determining the bidder's compliance with the qualifying criteria.

# FORM1

## General information

All individual firms must complete the information in this form. Nationality information shall be provided for all owner(s) or applicant(s) that are partnership or individually owned firms.

1 Name of firm:

2 Head office address:

.....  
.....

3 Local office address (if any):

.....  
.....

4 Telephone/Contact:

5 E-mail address:

6 Place of incorporation/registration:

7 Year of incorporation/registration:

- Additional information regarding litigation, debarment, arbitration, etc.
- Affidavit.

### 5.4 Disqualification

Even though the Bidders may meet the above criteria, they are subject to be disqualified for any of the following reasons:

- a) Misleading or false representation in the forms, statements and attachments submitted and included in document.
- b) Record of poor performances such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor, consistent history of litigation awarded against the applicant or financial failure due to bankruptcy.
- c) Has been identified by the Employer as poor performer in implementation of ongoing BMC works.

### 5.5 Debarment/Blacklisting

Notwithstanding the above, the Employer may debar or blacklist any of the bidder(s) for their misleading or false representations in the forms statements etc. for the period to be decided by the Employer

## 6. One Bid per Bidder

6.1 Each bidder shall submit only one bid per contract package either by himself. A bidder who submits or participates in more than one bid for a contract package will be disqualified.

## **7. Bidding Documents**

The bidder is expected to examine carefully the contents of all the above bid documents. Failures to comply with the requirements of bid documents will be at the bidder's own risk. Bids which are not substantially responsive to the requirements of the bidding documents will be rejected.

## **8. Language of Bid**

The bid, and all correspondence and documents related to the bid exchanged between the bidder and the Employer shall be written in the English language. Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in the English language, in which case, for purposes of interpretation of the bid, the English translation shall prevail.

## **9. Bid Prices**

9.1. Unless stated otherwise in the bidding documents, the Contract shall be for the whole works as described in bidding documents, based on the percentage rate amount in the Bill of Quantities submitted online by the bidder.

9.2. The bidder shall fill (in e-tender) in percentage rate above or below and total amount (**both in figures and words**) for overall items of the Works provided in the Bill of Quantities

## **10. Bid Validity**

10.1 Bid shall remain invalid as per Instruction to Bidders (ITB) after that deadline date for bid submission specified in Clause. The Employer as non-responsive shall reject a bid valid for a shorter period.

10.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request the bidder to extend the period of validity for a specified additional period. The request and the responses thereto shall be made in writing or by fax. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid but will be required to extend the validity of his Bid Security for the period of the extension, and in compliance with Clause 2 (Financial Terms & Conditions) in all respects.

## **11. Format and Signing of Bid**

11.1 The bidder shall prepare two copies of the documents comprising the bid as described in Instruction to Bidders.

11.2 The bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the bidder.

11.3 The bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case the person or persons signing the bid shall initial all such corrections.

11.4 All witnesses and sureties shall be persons of status and probity and their full names, Occupations and addresses shall be printed below their signatures.



**12. Deadline for Submission of Bids**

Bids must be received by the Employer at the address specified above not later than the time and date specified in the IFB.

**13. Late Bids**

Any bid received by the Employer after the deadline for submission of bids will be returned unopened to the bidder.

**14. Signing of Agreement**

At the same time that the Employer notifies the successful bidder that his bid has been accepted, the Employer will direct him to submit the Performance Security and attend the Employer's office on a date determined by the Employer for signing the Form of Agreement.

**15.** The selection process will lay high emphasis on the ability and competency of contractors to do high quality work within the given time schedule.

**16.** The onus of providing all necessary company/project related information, in appropriate manner and medium, so as to demonstrate the competency of the bidder and to allow proper evaluation, will rest entirely on the Bidder.

**17.** All clause shall be operative from the date of issue of work order and up to the expiry of original and extended time limit.

**18. Legal Condition:-****• Corrupt or Fraudulent Practices**

The Employer will reject a proposal for award if he determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question. The Employer will declare the firm ineligible, either indefinitely or for a stated period of time, to be awarded a contract by BHAVNAGAR MUNICIPAL CORPORATION if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for the contract, or during execution.

❖ “corrupt practice” means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

❖ “fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Borrower, and includes collusive practice among bidders (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.

- Municipal Commissioner reserves the rights to reduce/increase the scope of work and contract without assigning any reason thereof.
- If Bhavnagar Municipal Corporation is convinced that the Bidder has resorted to material misrepresentation or provided fraudulent information/statement, the said Bidder will be liable for disqualification/rejection at any stage.

- Proof for fulfillment of eligibility criteria should be submitted along with Tender volume. If the Tender volume is submitted without valid documents and without proof of eligibility criteria it will be rejected.
- Those who do not meet with the eligibility criteria need not submit the Tender document.
- Tenders, which do not fulfill all or any of condition or are submitted incomplete in any respect or are conditional tenders, will be rejected.
- Contractor shall be responsible to obey all Labour Laws, Environmental and Safety Laws. (the existing laws as well as framed from time to time). Any penalties laid due to violation of such laws shall be directly deducted from the contractor's outstanding.

## **19. Administrative Conditions:-**

### **• Safety and Signage**

- Contractor has to arrange for the complete safety of the persons working for project, users of the surrounding area i.e. public and vehicles also. All the arrangements of safety equipment, first-aid treatment, mandatory signage regarding work & traffic as per requirement to be arranged at site.
- Necessary dropping, shoring and underpinnings shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing it and the work shall be carried out in such a way that no damage is caused to the adjoining property.

### **• Liaison with local authority for electrical connections for the BMC**

The contractor is responsible for liaison with local authority for change in supply connection or new connection on behalf of BMC. It includes filling the necessary application to power supply company, follow up and getting the supply, filling the necessary test reports to the power supply company. All official fees including security deposits and other expenses shall be initially paid by the contractor.

### **• Contractor shall not sublet the work without permission of the authority.**

## **20. Insurance**

Insurance in respect of damage to persons and property:

The contractor shall be liable for and shall indemnify the Employer against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out the works, unless due to any act or neglect of the Employer or of any person for whom the Employer is responsible.

The contractor shall be responsible for all injury to persons, animals or things, and for all structural and decorative damage to property which may arise from the operation or neglect of himself or of any nominated sub-contractor's employees, whether such injury or damage arises from carelessness, accident or any other cause whatever in any way connected with the carrying out of this contract. This clause shall be held to include, inter alia, any damage to buildings, whether immediately adjacent or otherwise and damage to roads, streets, good paths, bridges or way as well as all damage caused to the buildings and works forming the subject of this contract by frost or other inclemency of weather. The contractor shall indemnify the employer and hold him harmless in respect of all and any expenses arising from any such

injury or damage to persons or property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of government or otherwise and also in respect of any award of compensation or damages consequent upon such claim.

The contractor shall reinstate all damages of every sort mentioned in this clause, so as to deliver up the whole of the contractor works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damage to the property of third parties.

The contractor shall indemnify the employer against all claims which may be made against the employer by any member of the public or other third party in respect of anything which may arise in respect of the work or in consequence thereof and shall at his own expense arrange to effect and maintain until the virtual completion of the contract, with an approved office and policy of insurance in the joint

names of the employer and the contractor against all claims which

may be made upon the employer whether under the workmen's compensation act or any other statute in force during the currency of this contract or at common law in respect of any employee of the contractor or any sub-

contractor and shall at his own expense effect and maintain, until the virtual completion of the contract, with an approved office and policy of insurance in the joint names of the employer and contractor against such risks and deposit such policy or policies with the Architect from time to time during the currency of the contract.

The contractor shall be responsible for anything which may be excluded from the insurance policies above referred to and also for all other damages to any property arising out of and incidental to the negligent or defective carrying out of this contract. He shall also indemnify the employer in respect of any costs, charges or expenses arising out of any claim or proceeding and also in respect of any award of or compensation of damage arising therefrom.

The employer with the concurrence of the Architect shall be at liberty and is hereby empowered to deduct the amount of any damage, compensation, costs, charges and expenses arising or accruing from or in respect of any such claim or damage from any sum or sums due or to become due to the contractor.

### **Insurance: (CAR)**

The contractor shall in joint names of the Employer and contractor insure against loss or damage by fire, storm, tempest, lightning, flood, earthquake, aircraft or anything dropped therefrom, serial objects, riot and civil commotion for the full value thereof all work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work, but excluding temporary building plant, tools and equipment owned or hired by the contractor or any subcontractor and shall if such work material and goods so insured until virtual completion of the works such insurance shall be with insurers approved by the Architect and contractor shall deposit with the Architect the policy or policies and there receipts in respect of premium paid and should the contractor make default in insuring or continuing to insure as aforesaid the Employer may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium from any monies due to or to become due to the contractor.

Provided always that if the contractor shall independently of his obligations under this contract maintain a policy of insurance which covers (inter alia) the said work, materials and goods against the aforesaid contingencies to the full value thereof then the

maintenance by the contractor of such policy shall if the Employer interest is endorsed thereon, be a discharge of the contractor's obligation to insure in the joint names of the Employer and contractor and the production by the contractor as and when may reasonably be required by the Architect of a current certificate of insurance from the company or firm which shall have issued the said policy shall be a discharge of the contractor's obligation to deposit with the Architect policy or policies and the receipts in respect of premium paid.

Upon survey of any claim under the insurances aforesaid the contractor with due diligence shall restore work damaged, replace or repair unfixed materials or goods which have been destroyed or injured, remove all and dispose of any debris and proceed with the carrying out and completion of the work. All monies received from such insurances shall be paid to the contractor by installments under certificates of the Architect issued at the period of interim Certificates named in the appendix to these conditions. The contractor shall not be entitled to pay money in respect of the restoration of work damaged, the replacement and repair of any unfixed material or goods and the removal and disposal of debris other than the monies received under the said insurances.

### **Workmen's Compensation**

Responsibilities and liabilities, of the Contractor under Workmen's Compensation Act following shall also apply in addition to following:

a) On the occurrence of an accident, which results in death of workmen employed by the contractor or which is so serious as is likely to result in death of any such workmen, the Contractor, shall within 24 hours of happening of such accident(s) intimate, in writing to the Engineer in charge the fact of such accident(s). The contractor shall indemnify Bhavnagar Municipal Corporation (BMC) against, all loss or damages sustained by the BMC resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines, if any, payable by the BMC as a consequence of BMC failure to give notice under the Workmen's Compensation Act or otherwise to conform to the provisions of the said act in regard to such accident(s).

b) In the case of an accident, in respect of which compensation may become payable under Workmen's Compensation Act, whether by the contractor or by the Government as principal Employer, it shall be lawful for the Engineer in charge to retain cut of money due and payable to the contractor, such sum or sum of money as, may, in the opinion of the Engineer in charge, be sufficient to meet such liability. The opinion of the Engineer in charge shall be final in regard to all matters arising under this clause.

## **21. OFFICE ACCOMMODATION FOR THE SITE ENGINEERING**

The contractor shall provide, erect and maintain at his cost a separate simple watertight office accommodation for the Site Engineer. These accommodations shall be well lighted and ventilated and provided with Air Condition, windows, door, with a lock.

The office of Site Engineer shall be with minimum of 500 Sq. Ft. containing with meeting room, toilet and pantry facilities and the contractor shall provide minimum 1 desk with minimum 6 chairs, drawers for keeping drawings, 1 steel cupboard having proper lock and data board for displaying drawings. The accommodations shall be demolished when directed.

The contractor shall have to provide One number of computer systems as per configuration asked by the department and One Number of 3 in 1, i.e. printer, scanner and Xerox. The contractor shall Take photograph and record all significant site progress in terms of civil work (reinforcement, Masonry, plastering work etc.), electric work, plumbing work (including concealed open electric, plumbing, horticulture & landscaping etc.), finishing work etc. once every week (irrespective of no work progress on site or prolonged holidays) using professional camera with flash (and shot at maximum resolution) and stored and submitted with weekly computer folders labeled clearly with date of week and serial number of week as per week of progress.

**Sanitary Arrangement:**

The Contractor shall provide and erect all necessary sanitary convenience for the Site staff and the workmen maintain in a clean orderly condition and clean and deodorize the ground after removal.

**Seal and Signature of the Bidder**  
**Date:**

**Executive Engineer**  
**(Building Department)**

## **BHAVNAGAR MUNICIPAL CORPORATION TERMS & CONDITION**

### **(C) FINANCIAL CONDITION**

#### **1. Cost and Currencies of Bidding**

The bidders shall bear all costs associated with the preparation and submission of his bid and the Employer will in no case be responsible or liable for those costs.

#### **Currencies of Bid and Payment**

- The rates and the prices shall be quoted by the bidder entirely in Indian Rupees
- All payments including advances, if any, shall be made in Indian Rupees.

#### **2. Earnest Money Deposit :-**

2.1 Bank guarantees (and other instruments having fixed validity) issued as surety for the bid shall be valid for 28 days beyond the validity of the bid.

2.2 The EMD of the unsuccessful bidders, except for L1, L2 and L3 bidders, will be returned as promptly as possible but not later than 28 days after the expiration of the period of bid validity.

2.3 The EMD of the successful bidder, along with second and third lowest tenders, will be returned when the bidder has furnished the required performance security and signed the agreement.

#### **2.4 Earnest Money Deposit may be forfeited**

- a) if the bidder withdraws his bid during the period of bid validity;
- b) in the case of a successful bidder, if the bidder fails within the specified time limit to
  - i) furnish the required Performance Security or
  - ii) sign the Agreement.

#### **3. (A) Security Deposit:-**

Within 15 (Fifteen) days of the date of receipt of the Letter of Acceptance, the successful bidders shall deliver to the Employer, an Initial Security Deposit in the form of a Bank Guarantee for an amount equivalent to 5% of the Contract Price. (Ref. Circular No. 03, Dt. 28/04/2023)

The Security Deposit to be provided by the successful bidder in the form of a bank guarantee as per format shall be issued from any Nationalized or RBI approved foreign bank.

- (B) **Performance Bond 5%** of Amount of Completed Work in form of Bank Guarantee at the time of final bill. THE CONTRACTOR SHALL SUBMIT THE PERFORMANCE BOND IN THE REQUIRED FORMAT AS DIRECTED BY B.M.C. (Ref. Circular No. 03, Dt. 28/04/2023)

5% OF CONTRACT VALUE OF ONE YEAR'S COMPREHENSIVE MAINTENANCE SERVICE CONTRACT COVERING UP TO COMPLETION OF MAINTENANCE PERIOD OF TWO YEARS AFTER DEFECT LIABILITY PERIOD BY THE WAY OF DEMAND DRAFT / BANK GUARANTEE OF BANK AS PER ANNEXURE-1 ONLY IN FAVOUR OF "MUNICIPAL COMMISSIONER, BHAVNAGAR" AFTER COMPLETION OF DEFECT LIABILITY PERIOD.

- (C) **Defect liability period: 24 month** for all work to be carried out by the contractor excluding any breakage or other repairing/extension work which is not caused due to bad workmanship

or basic civil work done by agency. The period will commence from the date of virtual completion of the site or as recorded in measurement book for a particular running / Final Bill which is later. In any case BMC authority has right to en-cash the performance bank guarantee without any intimation to contractor, which was submitted against service to be provided by contractor during the defect liability period for unsatisfying response from contractor whenever asked during this period.

**(D) Retention:-**

a) Retention @ 2% of the value of work done will be deducted from each RA bill. It will be released along with release of payment of Final Bill.

**4. Approved Bank:-** As per attached ANNEXURE-I financed dept. circular No-03, Dt. 28/04/2023.

5. Mobilization advance will not be given.

6. Quantities in B.O.Q. may vary up to any extent and contractor shall not claim any extra rate for the same.

**7. Liquidated Damages/Penalty:**

A	Percentage per Day (%) for Liquidated Damages	0.1% of the Cost of Remaining Work per day from the date delaying the said work up to the date of approved or extended time limit. (As per Circular no. 9, dated 18/05/2012 issued by M.C.)
B	Liquidated Damages for delay Maximum	10% of the cost of remaining work up to the date of approved or extended time limit. (As per Circular no. 9, dated 18/05/2012 issued by M.C.)

**8. G.S.T. on Materials**

All charge on account of G.S.T. etc. on material procurement or any other component for the works from any source shall be borne by the contractors.

G.S.T. payable by the Contractor under the Contract, or for any other cause as of the date 28 days prior to the deadline for submission of the bids, shall be included in the rates and prices and the total bid price submitted by the bidder and the evaluation and comparison of bids by the Employer shall be made accordingly.

**9 Price Escalation:- PRICE VARIATION SHALL NOT BE APPLICABLE FOR ANY ITEM.**

**10. If the Bidder fails to execute the said works within prescribed time limit, the said work will be carried out at the risk and cost by other Bidders with 15% supervision charges as may be decided by the Executive Engineer (Building Department).**

**11 .As per Standing Committee's Resolution 0.5% testing charges shall be deducted from each R.A. Bill and the Amount of Actual Testing Charges shall be Adjusted in the Final Bill. Even if the Testing Expenses Exceed 0.5% of the Project Cost, the Excess Amount shall be borne by the Contractors, and no Payments shall be made in this Regards.**

Seal and Signature of the Bidder      Executive Engineer  
Date: (Building Department)

## **SpecialConditionsofContract**

### **1. SpecialConditionsofContract**

- I.** No claim for, time extension shall be entertained for the part possession of the site forexecution.
- II.** Biddershouldcarryouttheworkinstipulatedtimelimitaspertenderspecification.Biddershould planned to use ready mix concrete of approved design for speedy work. No claimfor any extra rate for use of ready mix concrete or any other latest technology for any itematanydayornighttimewillbeeligible.Biddershouldquotetherateaccordingly.
- III.** No claim shall be entertained if the items stipulated in the tender shall not be executed aspersitecondition/requirements.
- IV.** Noidlechargesshallbepaidtocontractorifanymachineryandmanpowerremainidleandnoclaim shallbeentertainedforthesame.
- V.** Municipal Commissioner reserves the rights to reduce / increase the scope of work up toany extent without assigning reason thereof and the contractor has to execute the BOQitemsathistender rate.
- VI.** If any underground utilities (Water pipeline, drainage, electric, telephone, communication,etc.),Gaslinefoulduringexecutioncontractorshallstartworkatotheravailable workfrontuntilsuchutilities/Gaslineareshifted.Ifneededsuchserviceshastoshiftedbycontract or, BMC will pay the rates as per prevailing SOR/ approved rates or other non-schedulesitemswillbepaidaspermarketratanalysisapprovedbyconsultants/competentauthor ity.Noclaimfortimeextensionshallbeentertainedforthesame.

**SealandSignatureoftheBidder**  
**Date:**

**ExecutiveEngineer**  
**(Building Department)**



## **Instruction to Tenderers**

### **IT.1 GENERAL**

The General scope of work **Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar** will remain as per the architectural/Structural working drawings prepared by the consultant/BMC.

### **IT.2 INVITATION TO TENDER**

The Municipal Commissioner for and on behalf of Bhavnagar Municipal Corporation here in after referred as BMC will receive tenders for the work as per the specifications and schedule of prices in the tender document. The tenders shall be opened in the office of the Executive Engineer (Building Department) in the presence of tenderers or their representatives who remain present. The Municipal Commissioner reserves the right to reject the lowest or any other or all tenders or part of it which in the opinion of the Municipal Commissioner does not appear to be in its best interest and the tenderer shall have no cause of action or claim against the authority or its officers, employees, successors or assignees for rejection of his tender.

### **IT.3 LANGUAGE OF TENDER**

Tenders shall be submitted in English and all information in the tender shall also be in English. Information in any other language shall be accompanied by its translation in English. Failure to comply with this may make the tender liable to rejection.

### **IT.4 Deleted**

### **IT.5 TENDER DOCUMENTS**

Tender documents and set of drawings shall comprehensively be referred before tendering. These several sections form in the document are the essential parts of the contract and a requirement occurring in one shall be as binding as though occurring in all, they are to be taken as naturally, explanatory and describe and provide for complete works. The tender documents shall be submitted in two sets.

### **IT.6 EXAMINATIONS BY TENDERERS**

At his own expense and prior to submitting his tender, each tenderer shall (a) examine the contract documents. (b) visit the site and determine local condition which may affect the work including the prevailing wages and other pertinent cost factors. (c) familiarize himself with all central, state and local license required for the work and (d) correlate his observation, investigation and determinations with the requirements of the tender documents, site & subsoil investigation.

The tender quantity is fixed as per drawings enclosed herewith. During execution any increase or decrease in quantity - same will be paid as per the Tender clause.

## TENDER DOCUMENTS

### VOLUME-I(TECHNICAL BID)VOLUME-II(PRICE BID)

Copy of the tender Document should be completed, legible in ink, checked in a responsible manner. Signed stamped and returned together with the tender security Bond by the stipulated date, this shall form the tender. The tenderer is required to complete.

The form of tender, including the Appendices enclosed thereto, Tender security bond and the Tender summary shall be submitted duly signed and stamped.

All the pages in which entries are required to be made by the tenderer are contained in the tender documents and the tenderer shall not take out or add to or amend the text of any of the documents except insofar as may be necessary to comply with any issue pursuant to Clause IT.19 hereof

#### IT.7 EARNEST MONEY DEPOSIT.

Each tender must be accompanied by a receipt of deposit as tender guarantee in the form of Earnest money mentioned on relevant page. Any tender not accompanied by a tender guarantee in the form of earnest money deposited for the sum stipulated in the tender's document will be summarily rejected. The earnest money deposit shall be paid with the tender by B.G./D.D. payable at Bha vnagar without which the tender shall not be considered as valid. EMD in the form of Bank Guarantee of the banks approved by BMC shall also be acceptable. (As per Annexure-1)

Sr.No.	Tender No	Estimated Cost	Amount of E.M.D.

The Earnest Money Deposit will be returned to the unsuccessful tenderers after an award has been finalized.

The Earnest Money Deposit (Tender Guarantee) will be forfeited in the event, the successful tenderer fails to accept the contract and fails to submit the "Performance Guarantee Bonds to the Owner as stipulated in this tender documents within **Fifteen days (15 days)** after receipt of notice of award of contract.

The Earnest Money Deposit of the successful tenders shall be converted in to security Deposit amount after acceptance of the tender. Bank Guarantee shall also be acceptable for S.D.

No interest shall be paid by the owner on any tender guarantee.

IT.8 --DELETED--

#### IT.9 PREPARATION OF TENDER DOCUMENTS

Tenderers are required to note the following while preparing the tender documents.

Tender shall be submitted on the Tender form bound here in English. All appendices and statements shall be properly filled in. Numbers shall be stated both in words and in figure wherever so indicated and the signature of all persons signing shall be in long hand.

**Percentage, Prices, wordings and notations must be in ink or type written. No erasers will be permitted. Mistakes may be crossed out and corrections typed or written in ink adjacent thereof, and shall be checked before submission of the tenders. If there is discrepancy between the rates quoted in figures and in words, the rates expressed in words shall be considered as binding.**

Tender shall be accompanied by the prescribed tender fee, security deposit and other required documents and drawing. All witnesses and sureties shall be persons of status and probity and their full names, occupation and address shall be stated below their signature.

Variation to the contract Documents requested by the tenderer may be affixed and duly signed and stamped. Such variation may be refused by the authority is not obliged to give reason for his decisions.

Submission of tenders shall comply with the notice inviting tenders as to place, date and time. Tenders and tender security (E.M.D.) shall be enclosed with the tender documents and shall be put in a sealed envelope.

#### IT.10 SUBMISSION OF TENDER DOCUMENTS

Tenderers are requested to submit the Tender Documents on following lines. Following documents to be submitted online as well as in physical.

- i. Tender security bond (Earnest Money)
- ii. Certificate as registered contractor with Government of Gujarat or appropriate authority. (Not applicable for private sector)
- iii. Tender's financial capability and standing over at least past Seven years.
- iv. Current Income Tax Clearance Certificate.
- v. Tenderer's experience in the field relevant to this contract.
- vi. Tenderer's present commitments.
- vii. The technical ability and qualification of the tenderer. Details of technical personnel with their qualification & experience.
- viii. A list of the equipment the tenderer possessed and that which he proposed to acquire and use for the purpose related to the work
- ix. Tenderers should submit all the drawing which they have received along with tenders If Any (Architectural + Structural).
- x. Bank Solvency Certificate.
- xi. Labour license to be submitted
- xii. Details to be submitted as per the Statement No 1 to 9

Price bid should be submitted by e-tender only and Technical bid should be submitted physically also in sealed envelopes systems By RPAD/Speed post in sealed covers in Duplicate (One Original & One Duplicate) duly sign & seal by contractor as per schedule given on page no. 3. The time limit for receipt of tender shall strictly apply in all cases. The tenderers shall have to ensure that their tender is received by the competent authority (BMC) at the required place before expiry of the time limit. No delay on account of any cause of receipt of tender shall be entertained. Tender received after the time limit is over will not be accepted and inadvertently accepted will not be opened and will be returned unopened. Tenders which may get opened before

the due date with no indication having been given on the envelopes containing a tender there is liable to be rejected.

Mailed tender must be sent in a covering envelope by registered post, Acknowledge Due. The return receipt will be endorsed to show the date and time of receipt. Mailed Tenders not received at the required place before the date and time set for the receipt will not be accepted from post.

The tender must contain name, address of residence and place of business of the person or persons submitting the tender and must be signed and sealed by the tenderer with his usual signature.

Tenders by partnership firm must be furnished with the full names and address of all partners and be signed by one of the members of the partnership or by a legally authorized representative holding power of attorney followed by signature and designation of the person or persons signing.

Tenders by corporations/company must be signed with the legal name of the corporation/companies by the president or by the secretary or other person or person legally authorized to bind the corporation/company in the matter.

#### IT.11 TENDER VALIDITY PERIOD

The validity period of the tender submitted for this work shall be of **120 Days from Last Date of Tender Submission** and that the tenderer shall not be allowed to withdraw or modify the tender offer on his own during the validity period. The tenderer will not be allowed to withdraw the tender or make any modification or addition in the terms and conditions on his own tender. If this is done then the owner shall, without prejudice to any other right or remedy, be at liberty to reject the tender and forfeit the earnest money deposit in full.

#### IT.12 GENERAL PERFORMANCE DATA

Tenderers shall present all information which is sought for in the tender document in form of various schedules. Tenders may not be considered if every Blank and the Schedule are not properly filled in before submission of the tender.

#### IT.13 SIGNING OF TENDER DOCUMENTS

If the tender is made by an individual, it shall be signed with his full name above his current address. If the tender is made by a proprietary firm, it shall be signed by the proprietor above his name and name of his firm with his current address.

If the tender is made by a firm in partnership, it shall be signed by all the partners of the firm above their full names and current address, or by a partner holding the power of attorney for the firm, in which case a certified copy of the power of attorney shall accompany the tender. A certified copy of the partnership deed, current address of all partners of the firm shall also accompany the tender.

If the tender is made by a limited company or a limited corporation, it shall be submitted duly signed by an authorized person holding the power of attorney, & shall accompany the tender. Such limited company or corporation may be required to furnish satisfactory evidence of its existence before the contract is awarded.

If the tender is made by a group of firms, the sponsoring firm shall submit complete information pertaining to each firm in the group and state along with the bid as to which of the firms shall have the responsibility for tendering and for completion of the contract documents and furnish evidence and responsibilities for completion of contract documents.

**The full information and satisfactory evidence pertaining to the participation of each member of the group of firm in the tender shall be furnished along with the tender.**

All witness and sureties shall be persons of status and probity and their full names, occupations and address shall be stated below their signature. All signatures in the tender document shall be dated.

#### IT.14 WITHDRAWAL OF TENDERS

If during the tender validity period, the tenderer withdraws his tender, the tender security (Earnest Money Deposit) shall be forfeited.

#### IT.15 INTERPRETATION OF TENDER DOCUMENTS

Tenderers shall carefully examine the Tender Document and fully inform themselves as to all the conditions and matters which may in any way affect the work or the cost thereof. Should a tenderer find errors, omissions or discrepancies from the specifications or other documents or should be in doubt as to their meaning, he should at once address query to the Executive Engineer (Building Department), BMC. The correct interpretation of the same will be issued to all tenderers as an addendum.

#### IT.16 ERRORS AND DISCREPANCIES IN TENDERS

**IN CASE OF CONFLICT BETWEEN THE FIGURES AND WORDS IN THE RATE SHEET EXPRESSED IN WORDS SHALL BE CONSIDERED.**

#### IT.17 MODIFICATION OF DOCUMENTS

Modification of specifications and extension of the closing date of the tender, if required, will be made by an addendum. Copies of each addendum will be sent to all tenderers. These shall be signed and shall form a part of tender. The tenderer shall not add to or amend the text of any of the document except in so far as may be necessary to comply with any addendum.

#### IT.18 ADDENDUM

**Addendum shall form part of the contract documents. The full consideration shall be given to all Addenda in the preparation of tender. Tenderers shall verify the number of Addendum issued, if any and acknowledge the receipt of all addenda (i.e. before 48 hrs. of last date for tender on web-site) in the tender. Failure to so acknowledge may cause the tender to be rejected.**

The Owner or the in-charge may issue Addenda to advise tenderers of changed requirements. Such an addendum may modify previously issued addendum.

#### IT.19 G.S.T./TAX AND DUTIES ON MATERIALS

All charges on account of Octroi, Terminal Entry Tax, Excise Duty, etc and other duties on indigenous material obtained for the works from any source shall be borne by the contractor (Subject to provisions made in the tender). As per the amendment of Sales Tax Act which came into force from Aug. 1985, Sales Tax on works Contract shall be paid by the Contractor and no reimbursement will be made by the Municipal Corporation for the same. All charges on account of GSTs shall be payable extra while any other taxes/duties on materials from the work on any source shall be borne by contractor.

#### IT.20 EVALUATION OF TENDERS

In comparing tenders, the BMC shall consider factors such as the time of completion, efficiency and reliability of construction method proposed, compliance with the specification, relative quality, the operation, maintenance and replacement cost of structure and plant and all so the

qualifying criteria for the evaluation of tenders. The price bids of only those tenderers who are pre/post qualified will be opened in the presence of the contractors.

#### IT.21 TIME REQUIRED FOR COMPLETION

The completion period/time limit mentioned in this schedule is to be reckoned from the date of issue of work order to the date by which physical completion of the work takes place. The completion period/time shall be in accordance with the calendar months.

#### IT.22 POLICY FOR TENDER UNDER CONSIDERATION

Tender shall be termed to be under consideration from the opening of the tender until such time as any official announcement is made or award is made. While tenders are under consideration, tenderers and their representative or other interested parties are advised to refrain from contracting by any corporation personnel or representative on matters related to the tenders under study. The BMC representative if necessary will obtain clarification on tenders by requesting such information from any or all the tenderers, either in writing or through personal contacts may be necessary. The tender will not be permitted to change the substance of his tender after tenders have been opened. This includes any post tender price revision. Non compliance with this provision shall make the tender liable for rejection.

#### IT.23 PRICES AND PAYMENTS

The rates to be quoted by the Contractor must be **Exclusive** of GST but inclusive of all other taxes. However, any subsequent changes in the tax structure by Government after due date of bid submission will be compensated on availability of submission of actual documentation. Contractor has to intimate Engineer in charge regarding changes occurred in the tax structure after bid submission. If contractor fails to provide such information and if any financial obligation may arise due to change in tax structure, same will be recovered from the contractor.

#### IT.24 PAYMENT TERM

The terms of payment are defined in the General Condition of Contract. The BMC shall not under any circumstances relax these terms of payment and will not consider any alternative payment terms. Tenderer should therefore in their own interest note this provision to avoid rejection of their tenders.

#### IT.25 AWARD

Award of the contract or the rejection of tenders will be made within the tender validity period stated in the notice inviting tenders.

A successful Bidder has to deposit security deposit / Bank Guarantee **within 15 days** after receiving letter of Acceptance. Time limit of work will commence from the date of issue of work order.

If tenderer receiving the notice of award fails or refuses to execute the contract Agreement within the stated time limit or refuse to furnish the Bond as required herein, the owner may annul his award and declare the tender security forfeited and will take action as deemed fit.

A corporation, partnership firm or other consortium acting as the Tenderer and receiving the award shall furnish evidence of its existence and evidence that the officer signing the contract agreement and Bonds for BMC, partnership firm or other consortium acting as the Tenderer is duly authorized to do so.

#### IT.26 SIGNING OF CONTRACT

The successful tenderers shall be required to execute the contract agreement within **15 days** of receipt of intimation to execute the contract, failing which the BMC will be entitled to annul the award and forfeit the Earnest Money Deposit. The person to sign the contract document shall be as per BMC's policy.

#### IT.27DISQUALIFICATION

Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have,

- a. Made misleading or false representations in the forms, statements, affidavits and attachmentssubmittedinproofofthequalificationrequirements;and/or
- b. Recordofpoorperformancesuchasabandoningtheworks,notproperlycompletingthecontract,inordinate delays in completion, litigation history, or financial failures etc. or debarring fromBMCworketc.
- c. Tamperedthebiddocumentinany manner.
- d. Colludedwithotherprospectiv ebiddersforthisworktoarriveatquotedpricesforthepurposeof restrictingcompetition.
- e. IndulgedininducementofanyofficialofBMCand/ortheirconsultingengineerandotheradvisorsinany mannerwhatsoever.
- f. NotsubmittedantiblacklistingaffidavitstatingthatbidderisnotblacklistedbyanyState,Central,andLocalGovernmentAuthorityalsoanyotherlitigationhistorywithalldetails.
- g. Proposalnotsubmittedinaccordancewiththistender.
- h. Duringvalidityoftheproposal,oritsexendedperiod,ifany,thebidderchangeshiscommercialterms.
- i. Thebidderqualifiestheproposalwithhisownconditions.
- j. Proposalisreceivedinincompleteformorwithoutsignature.
- k. Proposalisreceivedafterduedateandtime.
- l. Proposalisnotaccompaniedbyallrequisitesdocuments
- m. Commercialproposalisenclosedwiththesameenvelopeastechnicalproposal
- n. Theenvelope doesnotshowon the outside thereferenceofbid andthusgetsopenedbefore theduedateof opening.
- o. TheE.M.D.isnotdepositedinfullandinthemannerasspecifiedintheclassofEarnestMoneyDeposit.
- p. ThetenderisinlanguageotherthanEnglishordoesnotcontainsitsEnglishTranslationincaseofother languageadoptedfortenderpreparation.
- q. Thetenderdocumentsreceivedarenotdulysignedbyauthorizedperson.
- r. Thevalidityoftenderislessthanwhatisstatedinthetender.
- s. Anyofthepageorpagesoftenderis/areremovedorreplaced.
- t. Anyconditionwhichaffectthecost.
- u. Ifitisjointventure.
- v. Eachbiddershallsubmitonlyonebidpercontractpackageeitherbyhimself.Abidderwhosubmitsorparticipatesinmorethanonebidforacontractpackagewillbedisqualified.

#### IT.28PERFORMANCEGUARANTEE&SECURITYDEPOSIT

As a contract security the tenderer to whom the award is made shall furnish a securitydeposit & performance guarantee each (Security Deposit) for the amount of 5% of the contractprice to guarantee the faithful performance, completion and maintenance of the works of thecontract in accordance with all condition and terms specified herein and to the satisfaction of theEngineers-in charge and ensuring the discharge of all obligations arising from the execution ofcontractin oneoftheformsmentionedbelow.

- a) Inform ofDemanddraftofapprovednationalizedBank asperAnnexure –  
InfavoroftheMunicipalCommissionerBMCamountof5%ofthe Contractvalue asperE-Iform  
format.

OR

- b) Inform ofB.G.ofanynationalized bankasperAnnexure –Iofamountof5%ofcontractvalue

The performance guarantee shall be delivered to the BMC before **Fifteen (15) days** of the completion of work under contractor as instructed by the Engineer-in-charge.

On satisfactory completion of the **defect liability period** in all respect, the performance guarantee will be returned to the contractor without any interest after the defect liability period.

#### IT.29 STAMP DUTY

The successful tenderer shall have to enter into an agreement on a non-judicial stamp paper as per the form of the agreement approved by the BMC. The cost of stamp paper and adhesive stamp shall be borne by the contractor.

#### IT.30 BRAND NAMES

Specific reference in the specification to any material by manufacturer's name, or catalogue shall be constructed as establishing a standard or quality and performance and not as limiting competition and the tenderer in such cases, may at his option freely use only other product, provided that it ensures an equal or higher quality than standard mentioned and meets BMC approval.

#### IT. 31 NON TRANSFERABLE

Tender documents are not Transferable.

#### IT.32 COST OF TENDERING

The owner will not defray expense incurred by tenderers in tendering.

#### IT.33 EFFECT OF TENDER

The tender shall remain Valid for a period **of 120 Days from Last Date of Tender Submission** for this work and that the tenderer shall not be allowed to withdraw or modify the offer in his own during the period. If any tenderer withdraw or make any modifications or additions in the terms and conditions of his own tender, then the BMC shall without prejudice to any other right or remedy, be at liberty to reject the tender and forfeit the earnest money in full.

#### IT.34 CHANGES IN QUANTITY OR QUALIFYING CRITERIA:

BMC reserves the right to waive any qualifying criteria or information in any tender as special case and to reject one or all tenders without assigning any reasons for such rejection and also to vary the quantities of items or group or quantum of work as specified in the schedule of prices as may be necessary in the interest of Public work of large for which no any claim shall be entertained.

#### IT.35 NEW EQUIPMENT AND MATERIAL

All materials, equipment and spare parts thereof shall be new, unused and originally coming from manufacturer's plant to the BMC. The rebuilt or overhauled equipment/materials will not be allowed to be used on works.

#### IT.36 RIGHTS RESERVED

The owner reserves the right to reject any or all tenders, to waive any informality or irregularity in any tender without assigning any reason. The owner further reserves the right to withhold issue of work order even after agreement and no payment will be made to the successful tenderer on account of such withholding. The owner is not obliged to give reasons for any such action.

#### IT.37

Municipal Commissioner reserves right to increase/decrease the scope of work & also split the tender into two or more contracts without assigning any reason even after the work is awarded.



#### IT.38 MOBILIZATION ADVANCE

**No Mobilization Advance or advance on Machinery will be given.**

#### IT.39

The scope of work is clearly mentioned in the tender documents. The contractor shall have to carry out the work in accordance with the detail specifications. No condition will be accepted. The condition on a tender will be liable to be rejected.

#### IT40

The contractor will have to construct shelter for storing valuable materials like cement etc. The contractor shall arrange for construct, maintain and afterwards remove and reinstate any temporary access required for and in connection with the execution at the work at his own cost. Reinstatement shall include restoring the area of the access route to at least the degree of safety, stability, drainage & appearance that existed before the contractor entered the site.

#### IT41

**In the event of any discrepancy the following order of precedence should apply**

**(a) Dimension & quantity**

**(1) Tender form**

**(2) Drawing**

**(3) Specification**

On drawing, figures dimension unless previously incorrect will be followed in preference to select dimension.

**(b) Description**

**(1) Tender form**

**(2) Drawing**

**(3) Specification**

In case of defective description or ambiguities, due Engineer in-charges should issue further instruction and direction in what manner the work is to be carried out. The contractor should further within comply with such instruction.

Irrelevant mistakes, discrepancies or errors made through oversight leading to misunderstanding may be got corrected properly by the Executive Engineer (Building Department).

The contractor shall take no advantage of any apparent error or omission in drawing as description or specification. The Engineer-in-charges shall make such correction as may be necessary to fulfill intent of specification plan.

#### IT-42

Proper procedure shall have to be taken by contractor at all the time during the progress of the work, failing which the contractors shall be held responsible for all damages to the work under execution or to any property or to lives of persons during the work in progress and also during the defect liability period.

#### IT-43

All work shall be measured by standard method according to rules & customs of BMC. The engineer-in-charge decision to what is usual method in use will be final.

IT-44

Tender once accepted shall be binding on the contractor even if the formal agreement is not signed/executed.

IT-45

The contractor shall have to give in writing the date of completion of work within a fortnight from date of work completed by him otherwise the date noted on record by departments shall be reckoned as final & no excuse as representation in that behalf shall be granted at a later date.

IT-46 Specimen signature of contractor will be cross checked whenever contractor receives payment in account section of BMC OR in case of representative of contractor receives payment along with letter of authority of contractor who signs an agreement.

**IT47**

**The details/contents/ information mentioned in the tender document may be read as final binding on the contractors. Any difference found in Form B-1 in regards to these related items may be treated as cancelled**

**IT48**

**Contractors should make arrangement to cordon the construction site by way of proper supports and barricades at his own cost and risk as per the direction of EIC.**

**IT49**

**Contractors should provide safety barricading and should take sufficient precaution for the safety of their staff & labour, BMC's staff, BMC-MET's staff, student, TPI/PMC staff and Consultant's staff at his own cost and risk.**

**IT50 Valuation of Variations**

- a.) The basis for the evaluation of variations for addition to the Contract Prices shall be as follows in the same order of priority.
- b.) Contract unit rates for individual items shall apply to varied quantities where there is a quantity variation.
- c.) In case of other non-tender items following procedures shall apply.

If any extra item crops up during the progress of work the same shall be carried out by the Contractor and he shall be paid at the rate fixed by Executive Engineer (Building Department) which shall be fixed as of the rates derived by rate analysis based on the following three methods.

- (i) based on approved BOQ item rates or Govt. **SOR 2023-24** plus or minus contractor's tender premium or rebate as the case may be.
  - (ii) based on prevailing Govt. of Gujarat's SOR Rates.
  - (iii) Rate analysis based on current market rates. This shall be based on
- The material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works, the overheads and the Contractor's profit.

- For Market rate analysis, the overheads shall be taken at 5% of the sum of material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works.
  - For Market rate analysis, the Contractors profit shall be taken at 10 % of the sum of material costs, the labour costs, the cost of use of all plant, machinery and equipment, the cost of all temporary and incidental works, the overheads.
- e.) The Engineer shall determine provisional rates and prices to enable on account payments to be included in the Interim Payment Certificates, until rates and prices are agreed as final by the Employer, the Contractor and the Engineer.
- f.) The Contractor shall not be entitled to additional payment for costs, which could have been avoided by giving early warning.

**Signature/Stamp of Contractor**

**Executive Engineer  
(Building Department)**

**BHAVNAGAR MUNICIPAL CORPORATION**  
***Tender form B-1***

**FORM B-1 OF GUJARAT STATE ROADS AND BUILDING DEPARTMENT/  
WATER RESOURCES DEPARTMENT may be referred. (only English version)**

***Note binding on the contractors***

- 01. The terms and conditions of contract mentioned in the Clause no 1 to 77 of Form B-1 of Gujarat State Road and Building Department / Water Resources Department shall be applicable. Binding on the contractors unless specifically mentioned about it thereunder in clause no. 15 to 20***
- 02. Please read “Bhavnagar Municipal Corporation” instead of “Government/Government of Gujarat” wherever written.***
- 03. Please read “Bhavnagar Municipal Corporation” instead of “Government of Gujarat State Public Works Department/Public Works Department/Government” wherever written.***
- 04. Please read “Executive Engineer (Building Department)” instead of “Superintending Engineer” or “Executive Engineer” wherever written.***
- 05. “Bhavnagar Municipal Corporation” here in called as “BMC”***
- 06. “Governor for the state of Gujarat” shall be read as “Municipal Commissioner/Bhavnagar Municipal Corporation”***
- 07. The contents/details/information mentioned in the relevant point under the heading***
- 08. The contents/details/information mentioned in the relevant point under the heading “NOTICE INVITING TENDERS” may be read as under-***  
***Point No 1 may be read as: Tenders are invited by Municipal Commissioner, BMC for the work of **Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar.** Point No. 3: The class of contractor shall be as per Memorandum of Works in Brief.***
  - The Cl. No. 14, 2, 21, 38, 60, 69, 73, 74, 75 shall be read as deleted.***
- 09. The contents/details/information mentioned in the relevant point under the heading “ADDITIONAL INSTRUCTIONS TO PERSONS TENDERING” shall be read as under-***
  - Point No. 2.1 may be read as per the details mentioned in the tender notice***
- 10. DECLARATION FORM & DECLARATION CERTIFICATE are given separately in Tender Document and it shall be applicable.***
- 11. TENDER FOR WORKS to be read as given in tender documents/Tender Form.***

12. *MEMORANDUM to be read as per the details given in tender notice*

13. The contents/details/information mentioned in the following **CLAUSE** under the heading **“TERMS AND CONDITION OF CONTRACT”** shall be read as under-

- Point no.1 may be read as “All works proposed to be executed by the contractor shall be notified in tender documents placed on BMC’s website–

<http://www.tender.nprocure.com>”

- Point no. 4 & 8 may be read as deleted and to be read as per details in tender documents.

**13. TENDER FOR WORKS to be read as given in tender documents/Summary of Price Schedule Cost**

*MEMORANDUM to be read as per the details given in tender notice*

The contents/details/information mentioned in the following **CLAUSE**

under the heading **“TERMS AND CONDITION OF CONTRACT”** may be read as under-

- **Clause 1: Security Deposit:** to be read as per the details given separately in the tender documents.

- *Clause 2: Liquidated Damages for delay:*

*Clause No. 12, 12A, 12B, 14.5, 15A, 24, 25, 31, 45, 47, 51, 55 (B-1)/54(B2), 72, 73, 74,*

*75, & 77 may be read as deleted in the form B-*

*1. CLAUSE 30 and CLAUSE 60 may be read as under:*

**CLAUSE 30: DISPUTE TO BE REFERRED TO TRIBUNAL:**

**DISPUTE TO BE REFERRED TO ARBITRATOR.**

- (1) The disputes relating to this contract, so far as they relate to any of the following matters, whether such disputes arise during the progress of the work or after the completion or abandonment thereof, shall be referred to an independent Arbitrator appointed by BMC as far as possible in consultation with the agency if it is necessary and such disputes shall be settled in accordance with the arbitration and conciliation Act, 1996.
  - (i) The rates of payment under clause 5 for any tools, materials and stores, in or upon the work of the site thereof belonging to the contractor or procured by him and intended to be used for execution of the work or any part thereof possession of which may have been taken by the Engineer-in-charge under the said clause-5.
  - (ii) The reduction in rates made by the Engineer-in-charge under clause 9 from the items of work not accepted as completed fully in accordance with the sanctioned specifications.
  - (iii) The rate of part of payment for any class of work which is included in the additional or altered work carried out by the contractor in accordance with the instructions of the Engineer-in-charge under clause 14 and the rates for which it is to be determined under the said clause 14.
  - (iv) The rates of payment for materials already purchased or agreed to be purchased by the contractor before receipt of notice given by the Engineer-in-charge under clause 15 and/or amount of compensation payable to the contractor under the said clause for loss in respect of such materials.

- (v) The amount of compensation which the contractor shall be liable to pay under clause 17 in the event of this failure to rectify, remove or reconstruct the work within the periods specified in the written intimation or the amount of expenses incurred by the Engineer-in-charge under the said clause 17 in rectifying, removing or re-executing the work or in removing and replacing the materials or articles complained of.
  - (vi) The reduction of rates as may be fixed by the Engineer-in-charge under clause 17 for the inferior work or materials as accepted or made use of.
  - (vii) The amount of compensation payable by the contractor for damages as estimated and assessed under clause 23.
  - (viii) The amount payable to the contractor for the work carried out under clause 33 in accordance with the instructions and the requirement of the Engineer-in-charge in case where there are no specifications.
2. The award declared by the arbitrator shall be speaking award giving reasons and calculation to every item of claims. The decision will have to be implemented by all the concerned.
  3. In case of dispute leading to the contractor or Bhavnagar Municipal Corporation approaching on Court of Law. It shall be within the jurisdiction where the site of work is situated.

Thereference to arbitration proceeding under this clause shall not:

- i) Entitle the contractor to stop the Affect the right of the Engineer-in-charge under clause 5 to take possession of all or any tools, plants, materials and stores in or upon the works of site thereof belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof.
- ii) Preclude the Engineer-in-charge from utilizing the materials purchased by the contractor in any work or from removing such materials to other places, during the period the work is stopped or suspended in pursuance, of notice given to the contractor under clause 15.
- iii) Progress of the work or the carrying out the additional or altered work in accordance with the provisions of clause 14 or as the case may be, of clause 33.

**Seal and Signature of the Bidder**  
**Date:**

**Executive Engineer**  
**(Building Department)**

**BHAVNAGAR MUNICIPAL CORPORATION  
FORM OF BID AND APPENDIX TO BID  
FORM 1-BID SECURITY (BANK GUARANTEE)**

Whereas M/s.....  
(Hereinafter called the Tenderer) is desirous and preferred to tender for works in accordance with the terms and conditions of tender for the work of.....

1. Therefore, We hereby affirm that -we are guarantors on behalf of the Tenderer up to total rupees.....(in words.....)Rs.(in figures) and we undertake to pay to Municipal Commissioner, BHAVNAGAR MUNICIPAL CORPORATION, Bhavnagar. Specified tip to his first written demand, without demur without delay and without the necessity of a previous of judicial or administrative procedures and without the necessity of a previous of judicial or administrative procedures and without the necessity to prove to the Bank the defects or shortcomings or debts of the contractor any sum within the limit of Rs.....
2. We further agree that the Guarantee herein contended shall remain in full force and effect during the period that would be taken for the acceptance of tender. However unless a demand of claim under this guarantee is made on its in writing on or before the (Date to be specified will not be less than **120 days** from the stipulated date of receiving the tender) we shall be discharged from all liabilities under the guarantee thereafter
3. We undertake not to revoke the guarantee during its currency except with the previous consent of the Municipal Commissioner, BHAVNAGAR MUNICIPAL CORPORATION, Bhavnagar in writing.
4. We lastly undertake not to revoke the guarantee for any charge in constitution of the Tenderer or of the Bank.

Date:

Signature & Seal of Guarantor.....

Bank Address.....

5. The contractor shall have to furnish income tax clearance certificate before his tender is accepted and intimate assessment number and ward under which he is assessed.

6. Copies of certificate as regards previous experience, if any, must accompany the tender.

7. List of approved banks - As per Annexure-1.

**Seal and Signature of the Bidder**  
**Date:**

**Executive Engineer**  
**(Building Department)**

**FORM-**

**2 PERFORMANCE GUARANTEE BOND (BANK GUARANTEE)**

**(Clause 37 of Section IV Volume 1)**

Whereas M/s \_\_\_\_\_ have been Awarded a contract dated \_\_\_\_\_ for the **Development of traffic island circle based on panch shakti theme at Vijayrajnagar, Bhavnagar** as specified in the tender by the BHAVNAGAR MUNICIPAL CORPORATION.

Whereas the said M/s \_\_\_\_\_ has approached Us \_\_\_\_\_ Bank to provide a PERFORMANCE GUARANTEE BOND to the BMC for the work undertaken by M/s. \_\_\_\_\_ and Whereas. We, the \_\_\_\_\_ Bank have agreed to provide such a PERFORMANCE GUARANTEE BOND. Now therefore, we the \_\_\_\_\_ Bank provided the following Performance Bank, Guarantee by way of this Bond to the BMC.

1. The contract value of the contract provided to M/s. \_\_\_\_\_ by the BMC \_\_\_\_\_ in \_\_\_\_\_ Rs. \_\_\_\_\_. This guarantee in the nature of PERFORMANCE GUARANTEE is provided so as to ensure and indemnify the BMC for full and proper performance of the contract by M/s. \_\_\_\_\_ the \_\_\_\_\_ Bank hereby indemnify the BMC for all losses and / or damages to the New Construction which would be Rectify by M/s. \_\_\_\_\_ and such PERFORMANCE GUARANTEE would include any damage to the New Construction because of defective products, poor workmanship, or at all, by way of this bond, we the \_\_\_\_\_ Bank agree and promise that in the eventuality of the contractor M/s. \_\_\_\_\_ not repairing or remedying the Problem, loss or damage to the New Construction we shall indemnify and pay the BMC such expenses, losses and damages that may be incurred by the BMC, as a result of the BMC getting the work done itself or from the other source.

2. We \_\_\_\_\_ Bank agree and understand that the decision as to whether any losses or damage to the project have taken place or not and / or whether the work suffers from poor workmanship or not will be taken by the Commissioner of BMC and on the Commissioner's decision regarding such losses or damages or defect whatsoever being notified by the BMC to us, We shall immediately take steps and ensure that M/s. \_\_\_\_\_ faithfully and diligently carry out the necessary remedial steps to the full satisfaction of the Commissioner of the BMC. The opinion of the Commissioner as to whether full and complete remedial steps, to the full satisfaction the Commissioner of the BMC has been taken or not, \_\_\_\_\_ will \_\_\_\_\_ be that \_\_\_\_\_ of the BMC. For the purpose, of arriving at such decision as aforesaid it will be open to the Commissioner of the BMC in case he so desires, to delegate this power to subordinate like the Executive Engineer (Building Department) to take appropriate decision and the decisions referred to above will be deemed to be properly taken and as if taken by the Commissioner of the BMC. In the eventuality of M/s. \_\_\_\_\_

\_\_\_\_\_ not taking remedial action to the almost satisfaction of the Commissioner of BMC. The BMC will be entitled to get the work done itself or from sources. On the Commissioner of the BMC notifying to us the total expenses incurred for this purpose. We hereby expressly have undertaken to pay the BMC the said amount forth with and in any case not less than 7 days from taken to pay the BMC the said binding the amount indicted by the Commissioner of the BMC and our \_\_\_\_\_ obligation \_\_\_\_\_ to



paysuchamountwillbecontinuingoftheBMCandourobligationirrespectiveofanydispute

of difference that may arise between us and M/s. \_\_\_\_\_  
\_\_\_\_\_ of between the BMC  
and M/s. \_\_\_\_\_.

**3. The contract value is Rs.**

\_\_\_\_\_. This PERFORMANCE GUARANTEE is limited to 5% of the said contract value and accordingly it comes to Rs.

\_\_\_\_\_ our liability will be in all cases be limited to Rs.  
\_\_\_\_\_.

**4. We agree and**

undertake that this PERFORMANCE GUARANTEE will be valid for a period of Twelve months from the date when the contract work is completed by the M/s. \_\_\_\_\_. The Commissioner of the BMC notifies such completion to us. In case, no such completion is notified, this performance guarantee will be a valid for **month** from the date of execution of this agreement. The Performance Guarantee will come into effect from such completion date. In case however, the contract of several parts it will be opened to the Commissioner to indicate separate completion dates for separate part and to simultaneously indicate a break up of the contract value equivalent to these separate parts. In which case the PERFORMANCE GUARANTEE to the extent of the different completion dates. It is expressly understood that the considering this period of **month**, the date by which the Corporation, intimate the Bank about the losses, damages or problems as the case may be, shall be considered as long as such intimation is within a period of Twelve months from the completion date. We the

\_\_\_\_\_ Bank will be liable, irrespective of whether the remedial actions or lack thereof has taken place after the period of the **month**.

**5. We**

\_\_\_\_\_ Bank agree that the PERFORMANCE GUARANTEE which is continuing guarantee will be binding, \_\_\_\_\_ and \_\_\_\_\_ enforceable \_\_\_\_\_ against us irrespective of any difference/disputes between the BMC and M/s.

\_\_\_\_\_ of between us and M/s. \_\_\_\_\_

and irrespective of any change or variation or execution time or any forbearance or waiver made or granted by the BMC to M/s. \_\_\_\_\_.

**6. In case any disputes arise as to the interpretation or implementation or implementation of this PERFORMANCE GUARANTEE, the matters shall be referred to the sole arbitration of the Commissioner of BMC whose decision in the matter will be final. In case any resource to any court of law is necessitated, the appropriate Civil Court in the BHAVNAGAR along will have Jurisdiction.**

**Date:**

**Signature of Contractor**

### FORM3-FORM OF AGREEMENT

THIS AGREEMENT made the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ between BHAVNAGAR Municipal Corporation  
.....(herein after called “the Employer”) of the one part and M/s.  
.....(hereinafter called “the Contractor”) of the other part.

WHEREAS the Employer is desirous that certain works should be executed by the Contractor, viz.  
\_\_\_\_\_ and has accepted the bid by the  
contractor for the execution and completion of such works and the remedying of any defects  
therein at a contract price of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_).

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

- a) the Letter of Acceptance;
- b) the General Conditions
- c) The Financial Condition
- d) the Technical Specifications;
- e) the Priced Bill of Quantities; and
- f) other documents forming part of the contract.

3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract. IN WITNESS whereof the parties hereto have caused this Agreement to be executed the day and year first before written.

Signed, sealed, and delivered by the said Employer and the Contractor in the presence of:

#### WITNESSES:

On behalf of BHAVNAGAR MUNICIPAL CORPORATION	On behalf of M/s.
1	1
2	2

Binding Signature of the Employer:

Binding Signature of the Contractor:

**Sample Form for updating-qualification information**

**BHAVNAGAR MUNICIPAL CORPORATION**  
**BUILDING DEPARTMENT**

**GENERAL CONDITION**

1. Contractor shall produce the relevant registration certificate of BMC/State Govt/Central Govt.
2. Contractor shall register the work to labour commissioner as per labour act.
3. Contractor shall not sub-let the work without permission of the authority.
4. Contractor should have sufficient skilled and unskilled laborers so that he shall start work at different sites simultaneously. Contractor's having labour force available during festival shall only apply. Contractor cannot stop the work due to unavailability of labor force.
5. **Price escalation shall not be applicable for any item.**
6. No advance payment/machinery advance will be paid.
7. Payment of running bill will be made as per recent B.M.C. policy in force.
8. Deleted.
9. If the work is not completed within time limit the penalty will be recovered from immediate bills of contractors.
10. If the material, i.e. M.H cover, C.C block etc. supplied from Municipal Corporation store then contractor shall not claim for any extra rate for non-execution of such item, partly/fully.
11. In the specifications, "as directed"/"Approved" shall be taken to mean, "as directed"/approved" by the Engineer-in-charge.
12. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
13. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points, or aspects in the relevant Indian Standard shall be referred to.
14. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:
  - (i) Length, width and depth (height) ----- 0.01 Meter.
  - (ii) Areas ---- 0.01 Sq. Mt.
  - (iii) Cubic Contents ---- 0.01 Cu. Mt.
15. The distance, which constitutes lead, shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.
16. Where no lead is specified, it shall mean "all leads".
17. Lift shall be measured from plinth level.
18. Definite particulars covered in the items of work, though not mentioned or elucidated in it, specifications shall be deemed to be included therein.
19. Reference to specifications of materials as made in the detailed specification of the items of work is in the form of a designation containing the number of the specification of the material and prefix 'M' e.g. 'M-5'.
20. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date.
21. The contract rate of the item of work shall be for the work completed in all respects.
22. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
23. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
24. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work within 24 hours.
25. No materials shall be stored prior to, during and after execution shall be kept in sufficient numbers and in good working condition on the site of the work.

26. All works shall be carried out in workmanlike manners per the best techniques for the particular item.
27. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
28. The mode, procedure and manner of execution shall be such that it does not cause damage or overloading of the various components of the structure during execution or after completion of the structure.
29. All necessary safety measures and precaution (including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.
30. Contractor will have all types of report register which given below,
  - a) Progress register
  - b) Cement & steel register
  - c) Daily work register
31. Contractor has to put on site Notice board showing Information of Work as per City Engg. Circular No. 7 (4-2-2013)
32. If any Discrepancy Found in Unit in the BOQ Tender Item then Unit Will be Considered as per Prevailing SOR or DSR.
33. Contractor has to follow Planning Department Circular No 10 Dt. 07/09/2018 strictly.
34. As per BMC's Finance department circular no. 38/ Dt. 21/11/022 and approval of competent authority, rate of all the items are taken without GST and prevailing GST will be payable If Applicable.
35. All the relevant prevailing BMC circulars/ its time to time revisions are applicable for this work and all the bidders are bound to follow the same, so the bidder must check before applying for the tender.

**Seal and Signature of the Bidder**  
**Date:**

**Executive Engineer**  
**(Building Department)**

***10. Information/Details to be submitted by the Tenderers  
In the Performance mentioned under Statement no 1 to 9***

**STATEMENT NO-1 (NOT APPLICABLE)**

**DECLARATION**

I/We hereby declare that I/We am/are not partner(s) blacklisted or connected with firm blacklisted in any states, CPWD / MES / Railways or any Government, Semi-Government or Private body. **In case of Non Register With BMC, The Bidder has to get register within 3 (Three) month after receiving work order.**

At present I/We am/are registered as approved contractor(s), firm(s) in any state, CPWD/MES/Railways.

We, the partners/owners of this firm, hereby give an undertaking that we are jointly and severally responsible to meet all the liabilities ever and above the business of this firm and make good the above financial loss sustained by the Bhavnagar Urban Development Authority as a result of our abandoning the work entrusted to us.

I/We further declare that my/our near relatives are not working in BMC as an E.E., C.E., Dy. C.E., A.C.E., A.E., T.S. as on today.

**Signature/Stamp of Contractor**

**STATEMENT NO-2**

**APPLICABILITY OF PROVIDENT FUND AND MISCELLANEOUS PROVISIONS ACT 1952**

Successful bidder i.e. the agency whose tender is accepted by the BMC shall have to comply the necessary formalities under the employees provident fund and Miscellaneous Provisions Act, 1952 as Contributory Provident Fund Scheme is applicable to labourers engaged in construction activity and shall have to submit proofs regarding deduction of provident fund and other dues and depositing the same with government department under the act and the scheme regularly on monthly basis failing which no running / final bill payment will be made by the BMC to the contractor in any circumstances.

**A certificate to the above effect has to be given by the contractor as under.**

***Declaration  
Of  
Depositing Provident Fund contribution***

This to certify that we have deducted the employees' P.F. and deposited the same along with employer's contribution towards provident fund on labour charges/wages paid by us to the labourers engaged for the work of \_\_\_\_\_ with

\_\_\_\_\_  
Provident Fund Authority under our Provident Fund Code No.

We produce herewith the copies of the challans for the provident fund deduction and contribution deposited as mentioned above.

**Signature/Stamp of Contractor**

**STATEMENT NO.-3**

**CURRICULAM VITAE**

Sr.No.	Detailsofperson		
1.	Name		
2.	Age		
3.	Qualifications		
4.	Experience inProjectRelatedfield		
5.	Otherexperiences		
6.	EmploymentRecord.		
Sr.No.	Period From - To	Organizationu nder which	Status /position intheorganization

**Note:-**

- 1) Separatesheetforeachpersontobefurnishedasabove.
- 2) Thecontractor'sProjectTeamshouldconsistofpersons inthe followingdisciplines.a)SeniorEngineerwithexperienceofBuildingwork  
b) SeniormaterialEngineer.  
c)SeniorQuantitySurveyor.  
d)Projectmanagementexpert.Siteincharge

**Signature/StampofContractor**



**STATEMENT-4**

**INFORMATION REGARDING FINANCIAL CAPACITY OF THE CONTRACTORS.**

Sr.No.	Details	Amount(Rs.inLacs)	Remarks
1.	Solvency	.	A Banker's Certificate May please be attached.
2.	Annual Turnover for the last three years.		
3.	Price of biggest (Construction) job carried out		

**Signature/Stamp of Contractor**

**STATEMENT NO. – 4/A (C.A CERTIFICATE REQUIRED)**

**BIDDER'S FINANCIAL CAPACITY**

<b>Sr.No.</b>	<b>Financial Year Annual</b>	<b>Turnover in Rs.</b>	<b>Net worth Rs.</b>	<b>Net Cash Rs.</b>
<b>1</b>	<b>2022-2023</b>			
<b>2</b>	<b>2021-2022</b>			
<b>3</b>	<b>2020-2021</b>			
<b>4</b>	<b>2019-2020</b>			
<b>5</b>	<b>2018-2019</b>			

- 1) Figures to be taken from audited balance sheets.
- 2) Copies of the balance sheet to be attached.
- 3) Separate sheets should be provided for each member of the consortium.
- 4) The bidders shall have to provide that for a period of at least 4 months the bidder has ability to sustain negative cash balance and how he proposes to meet with the same.
- 5) Cash Plan/Cash flow Statement.

**Signature/Stamp of Contractor**

**STATEMENT NO.-4/B (NOT APPLICABLE)**

**AVAILABLE BID-CAPACITY**

<b>Financial Year Annual</b>	<b>2018-19</b>	<b>2019 -2020</b>	<b>2020-2021</b>	<b>2021-2022</b>	<b>2022-2023</b>
Value of Construction work executed in Rs. Crores.					

The bidder must have available bid capacity more than the amount put to tender. The available bid capacity will be worked out as follows.

**Available bid capacity =  $(A \times N \times 2) - B$ , where**

**A =**

Maximum value of construction work executed in any one year during the last five years taking into account the completed as well as works in progress.

**B =**

Value of existing commitments and ongoing work to be completed during the period of completion of work for which bids have been invited.

**N =** Number of years prescribed for completion of work for which bid has been invited.

The statement showing the value of existing contracts and commitments and ongoing works as well as stipulated period of completion remaining for each of the works listed should be countersigned by the engineer-in-charge.

**Signature/Stamp of Contractor**

**STATEMENT NO.-5**

**LIST OF SIMILAR TYPE OF WORKS COMPLETE  
DURING THE LAST SEVEN YEARS.**

<b>Sr. No.</b>	<b>Year of Constr uction work</b>	<b>Name of Project</b>	<b>Name of ow ner &amp; contac t person of th e project, ad dress, phone no. fax no.</b>	<b>Total cost of the work</b>	<b>Total value of work do ne Rs.</b>	<b>Date of s tarting work</b>	<b>Date of Actu al completio n of work</b>
<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
1)							
2)							
3)							
4)							
5)							
6)							
7)							
8)							
9)							
10)							

*Note: Certificate from the owners in support of above works may be enclosed with this statement.*

**Signature/Stamp of Contractor**

**STATEMENT NO. -5/A**

**DETAILS OF ONGOING PROJECT**

<b>Sr. No</b>	<b>Name of project</b>	<b>Value of remaining work Rs. in lakhs.</b>	<b>Start date</b>	<b>Likely date of completion</b>	<b>Name, address, telephone, fax no. of project authority and contact person.</b>

**Signature/Stamp of Contractor**

**STATEMENT NO. - 6**

**CONTRACT LOST BY PARTY EVEN WHEN CONTRACTOR'S PRICE IS LOW  
WEST (IN INDIA)**

<b>Sr. No.</b>	<b>Details of Project</b>	<b>Actual contract Period (start date – end date)</b>	<b>Reasons for rejection Remarks known to the bidder</b>	<b>by the owner's rejection</b>	<b>Name, address, phone and fax no. of the owner's representative</b>

**Signature/Stamp of Contractor**

**STATEMENT NO.-7**

**DETAILS OF PROJECTS UNDER LITIGATION/ ARBITRATION**

<b>Sr. No.</b>	<b>Name of Project</b>	<b>Location</b>	<b>Value of the Project Rs.</b>	<b>Reasons for litigation/arbitration</b>
<b>1.</b>				
<b>2.</b>				
<b>3.</b>				
<b>4.</b>				
<b>5.</b>				
<b>6.</b>				
<b>7.</b>				
<b>8.</b>				
<b>9.</b>				
<b>10.</b>				

**Note:** The bidders shall furnish separate table for individual project.

**Signature/Stamp of Contractor**

**STATEMENT NO.-8**

**DETAILS OF PLANT & MACHINERY TO BE DEPLOYED ON THIS WORK**

Name of the contractor/company \_\_\_\_\_

Sr. No	Name of plants/ machinery	Nos. available (with make & year)	Nos. proposed to be deployed for this project	Present location	Present value of plant/ machineries
1	2	3	4	5	6

**Note:**

*Plant/ machineries which are proposed to be procured shall have to be procured at the earliest after award of the work and before the start of the work*

**Signature/Stamp of Contractor**



**STATEMENT NO. 9**

**METHOD STATEMENT AND WORK PLAN**

The Bidder shall have to provide a brief write up to be enclosed with the “Technical Bids” covering his approach and methodology to handle the project construction activities including his detailed work plan. The brief shall include the following aspects.

<b>Sr.No.</b>	<b>Components</b>	
1.	Methodology	
2.	Construction equipment availability and plan of deployment.	
3.	PERT/Construction chart/Barchart.	
4	Manpower Resource	

**Signature/Stamp of Contractor**

## Material & Technical Specifications

### Standard norms for quality control

Sr No.	Test	Frequency of tests	Acceptance Criteria
<b>1</b>	<b>Cement</b>		
a)	Setting time initial	50-100T-2 sample	Not less than 30 minutes
	final	100-200T-3 sample	Not more than 600 minutes
		200-300T-4 sample	
		300 - 500 T-5 sample	
		500-800T-6 sample	
		810- 1300 T-7 sample	
b)	Fineness by Sieve	1 in 5 samples	90% passed from 90 microns sieve
c)	Consistency	One sample (Each as sample above)	Above 30 percent
d)	Compressive strength	One sample (Each as sample above)	160 kg/cm <sup>2</sup> for OPC & PPC on third day
			220 kg/cm <sup>2</sup> for OPC & PPC on seventh day
			310 kg/cm <sup>2</sup> for OPC & PPC on twenty eight day
e)	Fineness test through Specific surface	1 in 5 samples	2250 kg/Cm <sup>2</sup> and above for OPC FOR PPC 3000 kg/Cm <sup>2</sup>
f)	Chemical Analysis IS 4032-986	1 in 5 samples	Mgo less than 6 percent SO <sub>3</sub> less than 2.75 percent less on ignition upto 5 percent
<b>2</b>	<b>Sand</b>		
a)	Silt Content	1 sample of 10 kg / 150 cu. mt.	Upto 3 percent
b)	Fineness modulus	-Do-	Specification as per specified standard. No sand of fourth zone shall be used.
<b>3</b>	<b>Kapachi-Grit for Bituminous work</b>		
a)	Gradation	1/200 m <sup>3</sup>	
b)	Flakiness index	1/200 m <sup>3</sup>	Max 30%
c)	Impact	1/100 m <sup>3</sup>	Max 30%
d)	Abrasion	1/100 m <sup>3</sup>	Max 35%
e)	Bit. Extraction	100 MT-1	0.80 to 4 %
f)	Bitumin (penetration test)	100 MT-1	
g)	Stripping value	50-100 m <sup>3</sup> on test	Max. 25%
<b>3</b>	<b>Kapachi-Grit for Building work</b>		As per IS 183-1970 standards
a)	Gradation	2 test/Season	As per relevant specifications provision
b)	Impact	2 test/Season	wearings surface 30% overlaid surface (IS 18.5-1972) 45%
c)	Abrasion	2 test/Season	30% 5%
d)	Soundness	2 test/Season	Loss with Loss with
<b>4</b>	<b>Bricks</b>		
a)	Efflorescence	20 bricks out of 2000	Moderate
		32 bricks out of 3500	

		50 bricks out of 50000	
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Sr No.	Test	Frequency of tests		Acceptance Criteria	
b)	Water absorption	-DO-		Less than 20 Percent	
c)	Compressive strength	-DO-		Minimum average 35 Kg/cm <sup>2</sup> & individual result may fall below up to 20 percent	
<b>5</b>	<b>Cement Concrete flooring/Mosaic tiles</b>				
a)	Water absorption	6 tiles/2000 tiles		Maximum 10 percent	
b)	Transverse strength	12 tiles/2000 tiles		Wet Dry 80 Kg/cm <sup>2</sup> 180 Kg/cm <sup>2</sup>	
c)	Abrasion	6 tiles/2000 tiles		Average wear shall not exceed 3.5 mm	
<b>6</b>	<b>Water Chemical Analysis</b>	Once for approval source			
a)	PH	"		6 to 8	
b)	Chlorides	"		2000 mg/L (PCC) & 500 mg/L for RCC	
c)	Organic (matter)	"		200 mg/L Max.	
d)	Inorganic (matter)	"		3000 mg/L Max.	
e)	Sulphate (mg/L)	"		500 mg/L Max.	
f)	TDS	"		2000 mg/L Max.	
<b>7</b>	<b>Cement Concrete cubes ordinary and controlled concrete</b>	As per IS 456-2000		Graded designation	Specified characteristic compressive strength. At 28 days N/mm <sup>2</sup>
		work m <sup>3</sup>	No. of sample	M10	10
		1-5 m <sup>3</sup>	1	M15	15
		6-15 m <sup>3</sup>	2	M20	20
		16-30 m <sup>3</sup>	3	M25	25
		31-50 m <sup>3</sup>	4	M30	30
		51 m <sup>3</sup> & above	4+one	M35	35
		add sample for each 50 m <sup>3</sup> part thereof		M40	40
	ordinary and controlled concrete for road bridge	successes/60 m <sup>3</sup> each for 7 and 28 days further then at every day for first six days and once in three days thereafter.		Average compressive strength of each day should not be less than specified strength subject to that 20% cubes per day (i.e.) 1 per 5 may fall below specified strength up to 85 percent.	
<b>8</b>	<b>Steel</b>				
a)	TMT bars	1 test/40 MT		Fe-500 Quenched and Tempered (TMT) bars of different diameters satisfying IS : 1786, with Yield stress > 500 N/mm <sup>2</sup> , Tensile strength > 545 N/mm <sup>2</sup> and elongation more than 12%	
b)	steel for general structural purposes specification IS 2062-1992			Gr. A Fe 410 WS 410 N/mm <sup>2</sup> (All size) Gr. B Fe 410 WB 410 N/mm <sup>2</sup> (All size) Gr. C Fe 410 WC 410 N/mm <sup>2</sup> (All size)	
c)	steel wires for prestressed concrete IS 1785 part-119 lab			8.0 140 Kg/mm <sup>2</sup> 7.0 150 Kg/mm <sup>2</sup> 5.0 160 Kg/mm <sup>2</sup> 4.0 175 Kg./mm <sup>2</sup> 3.0 190 Kg./mm <sup>2</sup>	
				85% the minimum specified tensile strength	
<b>9</b>	<b>Teakwood</b>	As per LOT			
a)	Colour				
b)	Hardness				

Sr No.	Test	Frequency of tests	Acceptance Criteria
c)	Density		
d)	Weight		
e)	Moisture cement		
f)	Porosity		
g)	Rasin		
h)	I.D. Mark		
10	All Other Material	As suggested by Consultant/EIC/TPI as per relevant IS code	

**NOTE :**

- 1) Tests as may be directed by Engineer in charge as shown above shall have to be conducted.
- 2) Above mentioned all the tests of the materials and others shall be carried out for construction of each and every different lot in Government Approved laboratory.
- 3) BMC/PMC/TPI may ask Contractor to Carry Out Additional Laboratory Tests for any of the Above Items if Required. The Cost of such testings shall be borne by the Contractor.

**Signature/Stamp of Contractor**



**AFFIDAVIT**  
**Affidavit / Confirmation Regarding**  
**Non Banned – Non Debarred – Non Black Listed – No Litigation & Other Details**  
**(On Non-Judicial Stamp Paper Of Rs 300/- Duly Attested By First Class Magistrate/ Notary Public)**

I/we, \_\_\_\_\_ age \_\_\_\_\_ year residing at \_\_\_\_\_ in capacity of \_\_\_\_\_ M/s \_\_\_\_\_ hereby solemnly affirm that

1. All general instructions, general terms and conditions, as well as special terms & conditions laid down on all the pages of the tender form, have been read carefully and understood properly by me which are completely acceptable to me and I agree to abide by the same.
2. I/We have submitted following certificates /document for T.E as required as per general terms& conditions as well as special terms & conditions of the tender.

Sr. No	Name of the Document
1	
2	
Onwards	

3. All the certificates /permissions /Document / Permits /Affidavits are valid and current as on date and have not been withdrawn/ cancelled by the issuing authority.
4. It is clearly and distinctly understood by me that the tender is liable to be rejected if on scrutiny at any time, any of the required certificates / permissions /Document/ permits/ affidavits is /are found to be invalid/wrong /incorrect/ misleading /fabricated/expired or having any defect.
5. I/We further undertake to produce on demand the original certificate/permission/Document/permits for verification at any stage during the processing of the tender as well as at any time asked to produce.
6. I/We also understand that failure to produce the Documents in “prescribed Performa” (wherever applicable) as well as failure to give requisite information in the prescribed Performa may result in to rejection of the tender.
7. My /our firm has not been banned/ debarred/ black listed at least for three years (excluding the current financial year) by any government department / state government/ government of India / Board / corporation/ municipal corporation / metro city / government financial institution within India in context to purchase procedure or work through tender.
8. I/We conform that I/We have meticulously filled in, checked and verified the enclosed Documents/certificates/ permission/permits/ affidavits /information etc. from every aspect and the same are enclosed on order(i.e. in chronology) in which they are supposed to be enclosed. Page numbers are given each submitted Document. Important information in each Document is “highlighted” with the help of “marker pen” as required.
9. The above certificates/documents are enclosed separately and not on the Performa printed from tender document.
10. I /We say and submit that the permanent account Number (PAN) given by the income tax Department is \_\_\_\_\_ Which is issued on the name of \_\_\_\_\_ [Kindly mention here either name of the proprietor (in case of proprietor Firm) or name of the tendering firm, Whichever is applicable].
11. I / We understand that giving Wrong information on oath amounts to forgery and perjury, and I/We am/are aware of the consequences thereof, in case any information provided by us are found to be false or incorrect, you have right to reject our bid at any stage including forfeiture of our EMD/PBG/cancel the award of contract, in this event, this office reserves the right to take legal action on me/us.
12. I/We have physically signed & stamped all the above Documents along with copy of tender Documents (page no.\_\_\_\_ to \_\_\_\_).
13. I/We hereby confirm that all our quoted items meet or exceed the requirement and are absolutely compliment with specification mentioned in the bid Document .
14. My /our company has not filed any writ petition, court matter and there is no court matter filed by state government and its Board corporation, is pending against our company.
15. I/We hereby commit that we have paid all outstanding amounts of dues/taxes/ cess /charges/fees with interest and penalty.
16. In case of breach of any tender terms and conditions or deviation from bid specification other than already specified as mentioned above, the decision of tender committee for disqualification will be accepted by us.

Whatever stated above is true and correct to the best of my knowledge and belief.

**Date:**

**stamp & sign of the Tenderer**

**Place:**

**(signature and seal of the notary)**

**(Upload Scan Copy And To Be Submitted Physically in Original)**

NAME OF WORK: DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR, BHAVNAGAR					
NAME OF DOCUMENT: SCHEDULE-B					
Item No.	Item Description	Quantity	Unit	Rate (In Rs.)	Total Amount (In Rs.)
1	Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (i) R.C.C. work	7.00	Cmt	1030.81	7,215.67
2	Demolition of Brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.	18.00	Cmt	536.09	9,649.62
3	Dismantling steel work including distempering and stacking the materials with all lead and lift.	2112.00	Kg	3.67	7,751.04
4	Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle	255.00	Smt	2.84	724.20
5	Excavation for foundation in any kind of soil incl. sand, soft or hard marum, soft rock not requiring Blasting incl. dewatering if required at cost and risk of agency incl. shoring, strutting, making the bottom level and sides in plumb incl. watering, raming and consolidating the bottom etc. incl. removing the surplus stuff and black cotton soil if any within all lead and lift using the selected stuff for back filling to foundation, in side trenches and plinth in layers of 20 cms. th. with watering, consolidating etc. comp. as directed. (A) up to 1.50mt.	167.00	Cmt	196.49	32,813.83



6	Excavation for foundation in any kind of soil incl. sand, soft or hard marum, soft rock not requiring Blasting incl. dewatering if required at cost and risk of agency incl. shoring, struting, making the bottom level and sides in plumb incl. watering, raming and consolidating the bottom etc. incl. removing the surplus stuff and black cotton soil if any within all lead and lift using the selected stuff for back filling to foundation, in side trencehs and plinth in layers of 20 cms. th. with watering, consolidating etc. comp. as directed. (A) from 1.50mt. to 3.00mt.	6.00	Cmt	212.52	1,275.12
7	Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each disposed layer by ramming and watering.	133.00	Cmt	130.40	17,343.20
8	Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.	200.00	Cmt	289.07	57,814.00
9	Providing and laying cement concrete 1:3:6 (1-Cement : 3- coarse sand : 6- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	24.00	Cmt	3005.76	72,138.24
10	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (A) Foundation and bottom of slab (linear or curvilinear shape)	2.00	Cmt	4597.52	9,195.04
11	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (B) Walls (linear or curvilinear shape) from top of foundation level upto floor two level	4.00	Cmt	8633.91	34,535.64
12	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (C) Slabs, landing, shelves and Cantilever upto floor two level.	5.00	Cmt	4721.32	23,606.60

13	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (C) Coping and Beams (linear or curvilinear shape) upto floor two level.	34.00	Cmt	5867.23	1,99,485.82
14	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (D) Columns upto floor two level	3.00	Cmt	9966.46	29,899.38
15	Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level	5656.00	Kg	76.22	4,31,100.32
16	Uncoursed Rubble Masonry with hard stone of approved quality in foundations and plinth in Cement Mortar 1:5 (1-cement : 5-coarse sand including levelling up etc. complete	113.00	Cmt	2542.31	2,87,281.03
17	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in superstructure above plinth level upto floor two level in Cement Mortar 1:5 (1- Cement : 5 -fine sand) (B) Conventional	70.00	Cmt	4320.09	3,02,406.30
18	Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i)Cement mortar 1:3 (1-cement:3-sand)	4.00	Smt	138.72	554.88
19	Providing 15mm thick cement plaster in single coat on Rough (Similar)side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in (ii) Cement mortar 1:4 (1-cement : 4-sand)	126.00	Smt	163.86	20,646.36
20	20mm thick mala / sand faced cement plaster on walls upto height 10 metres above ground level consisting of 12mm thick backing coat of C.M. 1:3 (1-cement : 3-sand) and 8mm thick finishing coat of C.M. 1:1 (1-cement : 1-sand) etc. complete.	419.00	Smt	326.11	1,36,640.09

21	Providing, fabricating, assembling, hoisting/ erecting and fixing in position at all heights/ all shapes & sizes with all leads & lifts using MS Rolled Steel Sections, Hollow sections, MS Plates/ sheet, Flats, Bright Bars, Anchor bar, deep threaded MS bolts, threaded J bolts, insert plate, support plate etc as per drawing and all confirming to latest relevant IS codes for steel structures like staircases, railings, handrail, platforms, brackets, monkey ladder or similar etc. including straightening, cutting, bending, bolting and welding the members, scaffolding/ staging etc. complete and comprising of : i) Profile Cutting of components to required length/ width and shape/ profile;ii) Smooth grinding/ machining of edges/ faces/ all welding joints; iii) Necessary welding (electric arc welding) in required weld length and size;iv) Machine drilling of holes for joining/ anchoringStandard measurements will be paid for as actual cut length used at site. The rate shall include dry sanding, degreasing (wet cleaning) & preparation of rust free surface manually or mechanically, metal putty to make the surface even and smooth, 2 coat zinc chromate yellow oxide primer and 2 coat	3168.00	Kg	64.33	2,03,797.44
22	Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials. etc complete	419.00	Smt	114.54	47,992.26
23	Rolling and consolidation of soling including filling in depression which occur during the process, with power roler 8 tonne to 12 tonne.	35.00	Smt	22.37	782.95
24	Supplying and spreading of graded stone aggregate of following sizes for rolling and W.B.M. including filling the interstices to required camber and gradient (2) Hand broken stone aggregate 40 mm to 63 mm size.	6.00	Cmt	541.93	3,251.58
25	Painting lines, deashes, arrows, letters etc. on roads, Air fields and like in two coats with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter. (i) Over 10cm in width	12.00	Smt	123.13	1,477.56

26	Supplying and fixing cat eye (Stim Sonite) made out from Acrilo beautille sterine injuction high compressed molding with reflector made of MMC (prismatic type of size 12cm x 6cm x 2.5cm) provided with bituminous adhesive 100g. with each unit for fixing. (High Intensity grade)	64.00	No.	375.72	24,046.08
27	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidlines of IRC : SP 63-2018 etc. Complete.	35.00	Smt	686.91	24,041.85
28	Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concret as per approved design and including excavation for fixing in proper line and level, filling the joint with C:M 1:3 (1cement : 3fine sand) etc complete.	57.00	Rmt	361.65	20,614.05
29	Providing cement vata (10cm. x 10 cm. size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete.	57.00	Rmt	23.69	1,350.33
30	Providing and fixing Rajula stone work of thickness 100 mm for wall lining (veneer work) in linear as well as curvilinear portions, backing filled with a grout of average 12 mm thick in cement morar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the stone shade etc. all complete as specified and as directed by the Engineer-in-Charge.	49.00	Smt	3407.21	1,66,953.29

31	Providing and laying Polished Rajula slat stone work on wall top / flooring in required colour, design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 20 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.	37.00	Smt	2604.16	96,353.92
32	Providing and fixing Rajula slat stone work (polished and machine cut) of thickness 20 mm for wall lining (veneer work) in linear as well as curvilinear portions, backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the stone shade etc. all complete as specified and as directed by the Engineer-in-Charge.	53.00	Smt	4392.63	2,32,809.39
33	Providing and laying broken chine mosaic flooring for terrace using 12 mm to 20 mm broken pieces of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar creme out upto surface using white cement including rounding off junctions and extending them upto 15 cm along the wall,clearing with water and oxalic acid etc. as directed.	17.00	Smt	747.29	12,703.93
34	Providing, transporting and fixing in position yellow khatu sand stone fountain with required all tools and tackles as metioned. The rate shall be includes fountain ring 1 nos SS 302 10 Ft, 100 nos brass nozzle 1/4, 10 nos RGB lights, SMPS & controller for lights, UPVC plumbing material with labour for installation, Internal cabling for lighting & fountain, Sand Stone (Yellow Khatu Stone Fountain) with polishing, 5 HP submersible pump etc. complet in all manner as approved and directed by the Engineer-in-charge.	1.00	Job	464832.30	4,64,832.30

35	Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow sand stone (Jal Shakti - Two pots with water drop) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge.Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.	1.00	No.	521547.80	5,21,547.80
36	Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Urja Shakti - Human figure) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.	1.00	No.	468665.25	4,68,665.25

37	Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Gyan Shakti - Stone with Book effect) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.	1.00	No.	486087.75	4,86,087.75
38	Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow sand stone (Jan Shakti - Humans with symbols) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge.Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.	1.00	No.	493637.50	4,93,637.50

39	Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Raksha Shakti - Soldgers) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.	1.00	No.	573200.25	5,73,200.25
40	Anti termite treatment of lawn / plant area through premise 30.50% I P. one liter premise diluted in 499 liters water and applying solution @ 1.00 litre solution per sqm lawn or bed area. (two application) i/c cost of chemical)and as per direction of officer-in-charge.	198.00	Sqm	7.63	1,510.74
41	Supplying and stacking of good earth at site including royalty and carriage upto 5 km lead complete.	15.00	Cum	520.76	7,811.40
42	Supplying and stacking sludge at site including royalty and carriage upto 5 km lead complete.	6.00	Cum	296.94	1,781.64
43	Supplying and stacking at site dump manure, compost or other specified fertilizer (as specified in specification) from approved source, and stack wherever required and as directed by Engineer-in-charge.Screened through sieve of I.S. designation 16 mm	9.00	Cum	293.61	2,642.49
44	Mixing earth and sludge or manure in the required proportion specified or directed by the Officer-in-charge.	30.00	Cum	36.92	1,107.60
45	Spreading/ filling of sludge, dump manure, good earth/ available excavated and/ or top layer of plot (as per surface excavation) for all lead (within plot/ side area) in required thickness as per direction of Engineer-in-charge (Cost of sludge, dump manure and / or good earth to be paid in relevant tender item).	30.00	Cum	52.88	1,586.40



46	Tecoma (Orange) Draft - 1 Feet height (As per proposed planting palette in technical specification)	70.00	No	170.87	11,960.90
47	Tecoma (Yellow) Draft - 1 Feet height (As per proposed planting palette in technical specification)	70.00	No	170.87	11,960.90
48	Tecoma (Red) Draft - 1 Feet height (As per proposed planting palette in technical specification)	70.00	No	170.87	11,960.90
49	Fountain Grass (Silver) - 1.50 Feet height (As per proposed planting palette in technical specification)	20.00	No	227.18	4,543.60
50	Fountain Grass (Purple) - 1.50 Feet height (As per proposed planting palette in technical specification)	20.00	No	227.18	4,543.60
51	Golden Mayurpankh - 2 Feet height (As per proposed planting palette in technical specification)	10.00	No	367.95	3,679.50
52	Exora (Pink) - 1 Feet height (As per proposed planting palette in technical specification)	100.00	No	58.25	5,825.00
53	Exora (Red) - 1 Feet height (As per proposed planting palette in technical specification)	100.00	No	58.25	5,825.00
54	Exora (White) - 1 Feet height (As per proposed planting palette in technical specification)	100.00	No	58.25	5,825.00
55	Curtain vine - 2 Feet height (As per proposed planting palette in technical specification)	80.00	No	86.40	6,912.00
56	Greem Vichia Palm - 6 Feet height (As per proposed planting palette in technical specification)	10.00	No	4239.23	42,392.30
57	Malpinghia (lady) - 6 Feet height (As per proposed planting palette in technical specification)	3.00	No	16908.87	50,726.61
58	Providing Perating and Maintenance of proposed work shall include labour, material, plants, plants causalities, fertilizers, pesticides, tools, watering, electrical, mechanical and all day to day cleaning of premieses shall be responsibility of the Tenderer during the course of work and 2 year after the time of completion certificate from authority.	24.00	Month	8080.00	1,93,920.00
59	Providing and fixing C.I. UGWT cover 0.60 M. x 0.45M. size having weight not less than 35Kg.	1.00	Each	958.17	958.17
60	Providing and fixing screw down bib taps of following size.(A) Brass screw down bib tap polished bright. (ii) 20mm dia.	2.00	Each	214.81	429.62
61	Providing and fixing Gun metal check or non-return fullway wheel valve. (B) 20mm dia.	1.00	Each	203.82	203.82

62	Providing and fixing Gun metal check or non-return fullway wheel valve. (C) 25mm dia.	1.00	Each	420.64	420.64
63	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [B] 20 mm.	5.00	Rmt	205.00	1,025.00
64	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [C] 25 mm.	15.00	Rmt	249.73	3,745.95
65	Providing and fixing polypropylene steps of required size and finishing as per drawing and approved by Engineer-in-charge.	8.00	Each	116.15	929.20
66	Point wiring for Light / Bell with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length , in below type of pipe erected with 6A Modular type switch / bell push & accessories and earth continuity of following type, erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D.Connector as directed.(a) with medium class Rigid PVC pipe and accessories erected flushed on wall/ceiling completeCat. III	20.00	Pt	493.89	9,877.80
67	Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories.[II] For 16A Plug and 16 amp switch with 2-2.5 sq.mm Cu. Wire from mcb db board.(a) with medium class Rigid PVC pipe and accessories erected flushed on wall/ceiling completeCat. III	1.00	Pt	788.81	788.81

68	Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for(B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI)(b) sheet steel double door(iii) 8 way	1.00	Ea	4025.86	4,025.86
69	Providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on 3 phase and neutral 415V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component for following Max. rating erected as directed.(iii) 63 Amps. FP Cat. III	1.00	Ea	3585.50	3,585.50
70	Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (a) 6 to 32 Amp. Cat. III	1.00	Ea	701.95	701.95
71	providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark Cat.III	20.00	Ea	131.30	2,626.00

72	Supplying & erecting in earthpit of minimum bore dia. 225mm size approved make Safe Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 80 mm having 80-200 Micron galvanising, Inner pipe dia of 40 mm having 200-250 Micron galvanising, connection terminal dia of 14 mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover (A)(approved make OEM has to submit test certificate including value of earth resistance of installation duly stamped and signed by agency and officer Incharge has to ensure the value of earthing resistane mentioned in test Certificate) & having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 ohm / meter testing as per IEC 62561-2017, Voltage drop:- < 1 volt at no load & dry form, Sulphar content:- <2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted by Agency.[B] For Electrical installation up to 11 KV, located in other than normal soil i.e. Soft Rock	1.00	Ea	8370.88	8,370.88
73	Providing and erecting Annealed bare Copper wire 8 to 16 SWG.	1.00	Kg	937.28	937.28
74	Supplying KITKAT pattern porcelain cut-out fuse with base of following current capacity erected on existing block board.(v) 100 A. 500 V.	4.00	Ea	328.25	1,313.00
75	Supplying and erecting 36W Poll Light as per material palette and approved by Architect including materil, labour, transportation, tools etc. complete as directed by Engineer in Charge.	5.00	Ea	21487.75	1,07,438.75
76	Supplying and erecting Spike lights with LED lamp as per material palette and approved by Architect including materil, labour, transportation, tools etc. complete as directed by Engineer in Charge.	35.00	Ea	1602.87	56,100.45

77	Supplying and erecting Direct - On - Line Starter with 18 A. rating contactor and with 3.5 Amp. 18A range directly operated in totally insulated elegant enclosure for single phase operation up to 3 HP as per IS 13947 complete erected on P.W. Block with necessary connection. Cat-III	1.00	Ea	2477.53	2,477.53
78	Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size (A) With medium class Rigid PVC pipe and accessories(b) 2 wire 2.5 sq. mm	110.00	Mtr	90.90	9,999.00
79	Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed.(e) 1.50 Sq.mm 3 core round PVC sheathed	200.00	Mtr	51.51	10,302.00
80	Providing and erecting ISI mark Medium class RIGID PVC PIPES of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed (b) 25 mm	200.00	Mtr	36.36	7,272.00
81	Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed.(i) 2.50 Sq.mm 4 core round PVC sheathed	20.00	Mtr	119.18	2,383.60

82	Providing & erecting weather proof, dust & vermin proof, floor mounted front operated outdoor type double door cubical panel board necessary IP-54 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accesories , supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating. (The rates excludes the cost of switchgears, bus bars, inter connecting mains & Copper Aluminium strips, motors, Fuses etc. The dimension shall be measured	1.00	Sq.Mtr	13528.95	13,528.95
83	Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground / road surface for enclosing cable (A) 50 mm outer dia	30.00	Mtr	72.72	2,181.60
84	Providing & laying approved make ISI marked Rigid PVC pipe having 6Kg / cm <sup>2</sup> (Class-3) to be erected at road crossing on or floor as directed for laying of cable. The pipes as following size of dia & weight per 6 mtr.(B) 50 mm inner Dia. (2.5Kg/6RMT)	10.00	Mtr	80.80	808.00
85	S.I.T.C. of single phase submersible pump set suitable for 100 mm size or more dia bore well having motor capacity and discharge as under with necessary panel box. Lifting and Lowering taken extra.(a) Motor rating 1 HP (12 stage) pump having capacity of 50 LPM at 43 to 45 mtr head suitable for 32 mm dia. delivery pipe Cat.II	1.00	Ea	18402.20	18,402.20

86	PGVCL lisening work for getting 3 phase power connection including payment of fq and all other charges on behalf of commissioner BMC.	1.00	No	30300.00	30,300.00
<b>Total Rs. :-</b>					<b>62,03,871.00</b>
<b>Say Rs. :-</b>					<b>62,03,871.00</b>

**NAME OF WORK: DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR,****NAME OF DOCUMENT: SPECIFICATION INDEX**

Item No.	Item Description	Applicable Specification Reference
1	Demolition including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (i) R.C.C. work	As per Building work specification booklet Item No. 20.3 & Page No. 147.
2	Demolition of Brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.	As per Building work specification booklet Item No. 20.11(iii) & Page No. 148.
3	Dismantling steel work including distempering and stacking the materials with all lead and lift.	As per Building work specification booklet Item No. 20.43 & Page No. 150.
4	Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle	As per Road and bridges work specification booklet attached herewith.
5	Excavation for foundation in any kind of soil incl. sand, soft or hard marum, soft rock not requiring Blasting incl. dewatering if required at cost and risk of agency incl. shoring, struting, making the bottom level and sides in plumb incl. watering, raming and consolidating the bottom etc. incl. removing the surplus stuff and black cotton soil if any within all lead and lift using the selected stuff for back filling to foundation, in side trencehs and plinth in layers of 20 cms. th. with watering, consolidating etc. comp. as directed. (A) up to 1.50mt.	As per Building work specification booklet Item No. 4.0.0. (A) + 4.0.0. (B) + 4.0.0. (C) + 4.0.0. (D) & Page No. 29.



6	Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each disposed layer by ramming and watering.	As per Building work specification booklet Item No. 4.12 & Page No. 35.
7	Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.	As per Building work specification booklet Item No. 4.0.0.4 & Page No. 35.
8	Providing and laying cement concrete 1:3:6 (1-Cement : 3- coarse sand : 6- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	As per Building work specification booklet Item No. 5.3.2. (A) & Page No. 38.
9	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (A) Foundation and bottom of slab (linear or curvilinear shape)	As per Building work specification booklet Item No. 5.8.3 + 9.1 (A) & Page No. 47 + 63.
10	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (B) Walls (linear or curvilinear shape) from top of foundation level upto floor two level	As per Building work specification booklet Item No. 5.8.3 + 9.1 (C) & Page No. 47 + 65.
11	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (C) Slabs, landing, shelves and Cantilever upto floor two level.	As per Building work specification booklet Item No. 5.8.3 + 9.1 (B) (I) & Page No. 47 + 64.

12	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (C) Coping and Beams (linear or curvilinear shape) upto floor two level.	As per Building work specification booklet Item No. 5.8.3 + 9.1 (H) (I) & Page No. 47 + 65.
13	Providing and laying controlled cement concrete M.250 and curing complete including cost of formwork but excluding the cost of reinforcement for reinforced concrete work in (D) Columns upto floor two level	As per Building work specification booklet Item No. 5.8.3 + 9.1 (G) (I) & Page No. 47 + 65.
14	Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level	As per Building work specification booklet Item No. 5.4.11 & Page No. 45.
15	Uncoursed Rubble Masonry with hard stone of approved quality in foundations and plinth in Cement Mortar 1:5 (1-cement : 5-coarse sand including levelling up etc. complete	As per Building work specification booklet Item No. 7.6. (II) & Page No. 58.
16	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in superstructure above plinth level upto floor two level in Cement Mortar 1:5 (1- Cement : 5 -fine sand) (B) Conventional	As per Building work specification booklet Item No. 6.12. (B) + 6.19 (B) & Page No. 51 + 53.
17	Providing 10mm thick cement plaster in single coat on brick/concrete walls for interior plastering upto floor two level and finished even and smooth in (i)Cement mortar 1:3 (1-cement:3-sand)	As per Building work specification booklet Item No. 17.58 (I) & Page No. 119.

18	Providing 15mm thick cement plaster in single coat on Rough (Similar)side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in (ii) Cement mortar 1:4 (1-cement : 4-sand)	As per Building work specification booklet Item No. 17.6 & Page No. 119.
19	20mm thick mala / sand faced cement plaster on walls upto height 10 metres above ground level consisting of 12mm thick backing coat of C.M. 1:3 (1-cement : 3-sand) and 8mm thick finishing coat of C.M. 1:1 (1-cement : 1-sand) etc. complete.	As per Building work specification booklet Item No. 17.95 & Page No. 122.

20	<p>Providing, fabricating, assembling, hoisting/ erecting and fixing in position at all heights/ all shapes &amp; sizes with all leads &amp; lifts using MS Rolled Steel Sections, Hollow sections, MS Plates/ sheet, Flats, Bright Bars, Anchor bar, deep threaded MS bolts, threaded J bolts, insert plate, support plate etc as per drawing and all confirming to latest relevant IS codes for steel structures like staircases, railings, handrail, platforms, brackets, monkey ladder or similar etc. including straightening, cutting, bending, bolting and welding the members, scaffolding/ staging etc. complete and comprising of :</p> <p>i) Profile Cutting of components to required length/ width and shape/ profile;</p> <p>ii) Smooth grinding/ machining of edges/ faces/ all welding joints;</p> <p>iii) Necessary welding (electric arc welding) in required weld length and size;</p> <p>iv) Machine drilling of holes for joining/ anchoring</p> <p>Standard measurements will be paid for as actual cut length used at site. The rate shall include dry sanding, degreasing (wet cleaning) &amp; preparation of rust free surface manually or mechanically, metal putty to make the surface even and smooth, 2 coat zinc chromate yellow oxide primer and 2 coat of enamel paint of approved make, shade and finish over all the surfaces of the steel sections.</p> <p>Note: The contractor shall be submit shop/ fabrication drawings based on construction drawings for approval from the Architect and Engineer in charge. The fabrication work shall start only after approval of the fabrication drawings submitted by contractor. Fabrication shall be in a perfect architectural workmanship manner and as provided in section V &amp; VI of IS 800 &amp; IS 7215.</p>	As per Building work specification booklet Item No. 11.2. (A) + 19.7 & Page No. 78 + 138.
21	Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials. etc complete	As per Building work specification booklet Item No. 18.57 & Page No. 136.
22	Rolling and consolidation of soling including filling in depression which occur during the process, with power roler 8 tonne to 12 tonne.	As per Building work specification booklet Item No. 26.76.

23	Supplying and spreading of graded stone aggregate of following sizes for rolling and W.B.M. including filling the interstices to required camber and gradient (2) Hand broken stone aggregate 40 mm to 63 mm size.	As per Building work specification booklet Item No. 26.5 + 26.2.
24	Painting lines, deashes, arrows, letters etc. on roads, Air fields and like in two coats with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter. (i) Over 10cm in width	As per Building work specification booklet Item No. 19.126 & Page No. 146.
25	Supplying and fixing cat eye (Stim Sonite) made out from Acrilo beaultile sterine injunction high compressed molding with reflector made of MMC (prismatic type of size 12cm x 6cm x 2.5cm) provided with bituminous adhesive 100g. with each unit for fixing. (High Intensity grade)	As per Road and bridges work specification booklet attached herewith.
26	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidlines of IRC : SP 63-2018 etc. Complete.	As per separate sheet attached herewith.
27	Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concret as per approved design and including excavation for fixing in proper line and level, filling the joint with C:M 1:3 (1cement : 3fine sand) etc complete.	As per separate sheet attached herewith.

28	Providing cement vata (10cm. x 10 cm. size) quarter round in cement mortar 1:1 including neat cement finishing, watering etc. complete.	As per Building work specification booklet Item No. 17.0.0.1 & Page No. 124.
29	Providing and fixing Rajula stone work of thickness 100 mm for wall lining (veneer work) in linear as well as curvilinear portions, backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the stone shade etc. all complete as specified and as directed by the Engineer-in-Charge.	As per Building work specification booklet Item No. 14.44. & Page No. 99 but except for Rajula stone work of thickness 100 mm for wall lining.
30	Providing and laying Polished Rajula slat stone work on wall top / flooring in required colour, design and patterns, in linear as well as curvilinear portions all complete as per the architectural drawings with 20 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.	As per Building work specification booklet Item No. 14.43. (A) & Page No. 98 but except for Polished Rajula slat stone work on wall top / flooring.

31	Providing and fixing Rajula slat stone work (polished and machine cut) of thickness 20 mm for wall lining (veneer work) in linear as well as curvilinear portions, backing filled with a grout of average 12 mm thick in cement morar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment to match the stone shade etc. all complete as specified and as directed by the Engineer-in-Charge.	As per Building work specification booklet Item No. 14.44. & Page No. 99 but except for Rajula slat stone work (polished or machine cut) of thickness 20 mm for wall lining.
32	Providing and laying broken chine mosaic flooring for terrace using 12 mm to 20 mm broken pieces of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar creme out upto surface using white cement including rounding off junctions and extending them upto 15 cm along the wall,clearing with water and oxalic acid etc. as directed.	As per Building work specification booklet Item No. 14.19. (A) & Page No. 92 but except for broken chine mosaic flooring for terrace.
33	Providing, transporting and fixing in position yellow khatu sand stone fountain with required all tools and tackles as metioned. The rate shall be includes fountain ring 1 nos SS 302 10 Ft, 100 nos brass nozzle 1/4, 10 nos RGB lights, SMPS & controller for lights, UPVC plumbing material with labour for installation, Internal cabling for lighting & fountain, Sand Stone (Yellow Khatu Stone Fountain) with polishing, 5 HP submersible pump etc. complet in all manner as approved and directed by the Engineer-in-charge.	As per separate sheet attached herewith.

34	<p>Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow sand stone (Jal Shakti - Two pots with water drop) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge.</p> <p>Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.</p>	As per separate sheet attached herewith.
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35	<p>Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Urja Shakti Human figure) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.</p> <p>Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.</p>	As per separate sheet attached herewith.
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36	<p>Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Gyan Shakti - Stone with Book effect) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.</p> <p>Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.</p>	As per separate sheet attached herewith.
37	<p>Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow sand stone (Jan Shakti - Humans with symbols) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge.</p> <p>Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.</p>	As per separate sheet attached herewith.

38	<p>Providing, making, cutting, polishing, transporting and fixing in position good quality sculpture made out from Jaiselmer Yellow / Black Selvada sand stone (Raksha Shakti - Soldgers) of any shade, Matt finish with Nano coating for weather saftey in any shape. Sculpture shall be free from cracks, lines, stains, white spots of efflorescence and even in shade for each elements. The work shall be carried out as per drawings and got approval by Architect. The sculpture to be fixed in line, level and plumb in all respect with the use of required tools, cement mortar, and cement slurry with matching pigment as approved by the Engineer-in-charge. The rate shall be inclusive of double polishing for black selvada sand stone.</p> <p>Note :- Sculpture size will be 4'.6" with 6" base as per proposed in technical specification.</p>	As per separate sheet attached herewith.
39	<p>Anti termite treatment of lawn / plant area through premise 30.50% I P. one liter premise diluted in 499 liters water and applying solution @ 1.00 litre solution per sqm lawn or bed area. (two application) i/c cost of chemical)and as per direction of officer-in-charge.</p>	As per Horticulture & landsape work specification booklet attached herewith.
40	<p>Supplying and stacking of good earth at site including royalty and carriage upto 5 km lead complete.</p>	As per Horticulture & landsape work specification booklet attached herewith.
41	<p>Supplying and stacking sludge at site including royalty and carriage upto 5 km lead complete.</p>	As per Horticulture & landsape work specification booklet attached herewith.

42	Supplying and stacking at site dump manure, compost or other specified fertilizer (as specified in specification) from approved source, and stack wherever required and as directed by Engineer-in-charge. Screened through sieve of I.S. designation 16 mm	As per Horticulture & landscape work specification booklet attached herewith.
43	Mixing earth and sludge or manure in the required proportion specified or directed by the Officer-in-charge.	As per Horticulture & landscape work specification booklet attached herewith.
44	Spreading/ filling of sludge, dump manure, good earth/ available excavated and/ or top layer of plot (as per surface excavation) for all lead (within plot/ side area) in required thickness as per direction of Engineer-in-charge (Cost of sludge, dump manure and / or good earth to be paid in relevant tender item).	As per Horticulture & landscape work specification booklet attached herewith.
45	Tecoma (Orange) Draft - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landscape work specification booklet attached herewith.
46	Tecoma (Yellow) Draft - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landscape work specification booklet attached herewith.
47	Tecoma (Red) Draft - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landscape work specification booklet attached herewith.
48	Fountain Grass (Silver) - 1.50 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landscape work specification booklet attached herewith.
49	Fountain Grass (Purple) - 1.50 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landscape work specification booklet attached herewith.

50	Golden Mayurpankh - 2 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
51	Exora (Pink) - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
52	Exora (Red) - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
53	Exora (White) - 1 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
54	Curtain vine - 2 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
55	Greem Vichia Palm - 6 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
56	Malpinghia (lady) - 6 Feet height (As per proposed planting palette in technical specification)	As per Horticulture & landsape work specification booklet attached herewith.
57	Providing Perating and Maintenance of proposed work shall include labour, material, plants, plants causalities, fertilizers, pesticides, tools, watering, electrical, mechanical and all day to day cleaning of premieses shall be responsibility of the Tenderer during the course of work and 2 year after the time of completion certificate from authority.	As per Separate Sheet attached herewith.
58	Providing and fixing C.I. UGWT cover 0.60 M. x 0.45M. size having weight not less than 35Kg.	As per Building work specification booklet Item No. 23.00.6. (II) & Page No. 173.

59	Providing and fixing screw down bib taps of following size.(A) Brass screw down bib tap polished bright. (ii) 20mm dia.	As per Building work specification booklet Item No. 23.92 (A) (II) & Page No. 170.
60	Providing and fixing Gun metal check or non-return fullway wheel valve. (B) 20mm dia.	As per Building work specification booklet Item No. 23.99 & Page No. 171.
61	Providing and fixing Gun metal check or non-return fullway wheel valve. (C) 25mm dia.	As per Building work specification booklet Item No. 23.99 & Page No. 171.
62	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [B] 20 mm.	As per Building work specification booklet Item No. 23.20 & Page No. 160 but except for CPVC (SDR 13.5) PIPE.
63	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [C] 25 mm.	As per Building work specification booklet Item No. 23.20 & Page No. 160 but except for CPVC (SDR 13.5) PIPE.
64	Providing and fixing polypropylene steps of required size and finishing as per drawing and approved by Engineer-in-charge.	As per Building work specification booklet Item No. 24.33 & Page No. 180 but except for polypropylene steps.

65	<p>Point wiring for Light / Bell with 2-1.5 sq.mm &amp; earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length , in below type of pipe erected with 6A Modular type switch / bell push &amp; accessories and earth continuity of following type, erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D.Connector as directed.</p> <p>(a) with medium class Rigid PVC pipe and accessories erected flushed on wall/ceiling complete</p> <p>Cat. III</p>	As per Electrical work specification booklet attached herewith.
66	<p>Point wiring for Individual Plug with &amp; earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch &amp; 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories.</p> <p>[II] For 16A Plug and 16 amp switch with 2-2.5 sq.mm Cu. Wire from mcb db board.</p> <p>(a) with medium class Rigid PVC pipe and accessories erected flushed on wall/ceiling complete</p> <p>Cat. III</p>	As per Electrical work specification booklet attached herewith.

67	<p>Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 &amp; 3, IEC 61439-1 &amp; 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for</p> <p>(B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI)</p> <p>(b) sheet steel double door</p> <p>(iii) 8 way</p>	As per Electrical work specification booklet attached herewith.
68	<p>Providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on 3 phase and neutral 415V,50Hz. having characteristic of quick action &amp; tripping with all advance feature &amp; do not incorporate any electronic component for following Max. rating erected as directed.</p> <p>(iii) 63 Amps. FP</p> <p>Cat. III</p>	As per Electrical work specification booklet attached herewith.
69	<p>Providing &amp; erecting 415 V MCB Four Pole for Motor &amp; Inductive Load (C Curve) having 10KA breaking capacity &amp; confirms to IS :8828 in existing box having following capacity</p> <p>(a) 6 to 32 Amp.</p> <p>Cat. III</p>	As per Electrical work specification booklet attached herewith.



70	providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark Cat.III	As per Electrical work specification booklet attached herewith.
71	<p>Supplying &amp; erecting in earthpit of minimum bore dia. 225mm size approved make Safe Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 80 mm having 80-200 Micron galvanising, Inner pipe dia of 40 mm having 200-250 Micron galvanising, connection terminal dia of 14 mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover (A)(approved make OEM has to submit test certificate including value of earth resistance of installation duly stamped and signed by agency and officer Incharge has to ensure the value of earthing resistance mentioned in test Certificate) &amp; having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 ohm / meter testing as per IEC 62561-2017, Voltage drop:- &lt; 1 volt at no load &amp; dry form, Sulphur content:- &lt;2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted by Agency.</p> <p>[B] For Electrical installation up to 11 KV located in other than normal soil i.e. Soft Rock, Marshy Soil etc.</p> <p>-Length of Pipe : 2 mtr</p> <p>-Back filling Compound :1 no. Bag of 25 Kg.</p>	As per Electrical work specification booklet attached herewith.
72	Providing and erecting Annealed bare Copper wire 8 to 16 SWG.	As per Electrical work specification booklet attached herewith.

73	Supplying KITKAT pattern porcelain cut-out fuse with base of following current capacity erected on existing block board. (v) 100 A. 500 V.	As per Electrical work specification booklet attached herewith.
74	Supplying and erecting 36W Poll Light as per material palette and approved by Architect including materil, labour, transportation, tools etc. complete as directed by Engineer in Charge.	As per Electrical work specification booklet attached herewith.
75	Supplying and erecting Spike lights with LED lamp as per material palette and approved by Architect including materil, labour, transportation, tools etc. complete as directed by Engineer in Charge.	As per Electrical work specification booklet attached herewith.
76	Supplying and erecting Direct - On - Line Starter with 18 A. rating contactor and with 3.5 Amp. 18A range directly operated in totally insulated elegant enclosure for single phase operation up to 3 HP as per IS 13947 complete erected on P.W. Block with necessary connection. Cat-III	As per Electrical work specification booklet attached herewith.
77	Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size (A) With medium class Rigid PVC pipe and accessories (b) 2 wire 2.5 sq. mm	As per Electrical work specification booklet attached herewith.

78	Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed. (e) 1.50 Sq.mm 3 core round PVC sheathed	As per Electrical work specification booklet attached herewith.
79	Providing and erecting ISI mark Medium class RIGID PVC PIPES of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed (b) 25 mm	As per Electrical work specification booklet attached herewith.
80	Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed. (i) 2.50 Sq.mm 4 core round PVC sheathed	As per Electrical work specification booklet attached herewith.

81	<p>Providing &amp; erecting weather proof, dust &amp; vermin proof, floor mounted front operated outdoor type double door cubical panel board necessary IP-54 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body &amp; doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accesories , supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions &amp; cable alley as per requirements &amp; instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus &amp; earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating. (The rates excludes the cost of switchgears, bus bars, inter connecting mains &amp; Copper Aluminium strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall be supplied with following approved manufacturers with following size.</p> <p>(A) locally fabricated panel board</p> <p>(i) with 350 mm depth</p>	As per Electrical work specification booklet attached herewith.
82	<p>Providing &amp; laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground / road surface for enclosing cable</p> <p>(A) 50 mm outer dia</p>	As per Electrical work specification booklet attached herewith.

83	<p>Providing &amp; laying approved make ISI marked Rigid PVC pipe having 6Kg / cm<sup>2</sup> (Class-3) to be erected at road crossing on or floor as directed for laying of cable.</p> <p>The pipes as following size of dia &amp; weight per 6 mtr. (B) 50 mm inner Dia. (2.5Kg/6RMT)</p>	As per Electrical work specification booklet attached herewith.
84	<p>S.I.T.C. of single phase submersible pump set suitable for 100 mm size or more dia bore well having motor capacity and discharge as under with necessary panel box. Lifting and Lowering taken extra.</p> <p>(a) Motor rating 1 HP (12 stage) pump having capacity of 50 LPM at 43 to 45 mtr head suitable for 32 mm dia. delivery pipe Cat.II</p>	As per Electrical work specification booklet attached herewith.
85	<p>PGVCL lisening work for getting 3 phase power connection including payment of fq and all other charges on behalf of commissioner BMC.</p>	As per Electrical work specification booklet attached herewith.

***GENERAL TECHNICAL  
SPECIFICATIONS  
FOR  
BUILDING WORKS***



## SPECIFICATIONS OF MATERIALS INDEX

Particulars		Page No.
General Technical Specifications-General		5
Standard Technical Specifications		7
M. 1.	Water	9
M. 2.	Lime	9
M. 3.	Cement	9
M. 4.	White Cement	9
M. 5.	Coloured Cement	9
M. 6.	Sand	9
M. 7.	Stone Dust	10
M. 8.	Stone Grit	10
M. 9.	Cinder	11
M. 10.	Lime Mortar	11
M. 11.	Cement Mortar	11
M. 12.	Stone coarse aggregates For Nominal Mix Concrete	11
M. 13.	Black trap or equivalent Hard Stone Coarse aggregate For design Mix Concrete	12
M. 14.	Brick bats aggregates	12
M. 15.	Brick	13
M. 16.	Stone	13
M. 17.	Laterite stone	13
M. 18.	Mild Steel Bars	13
M. 19.	High yield strength steel deformed bars	13
M. 20.	High tensile steel wires	13
M. 21.	Mild Steel binding Wires	14
M. 22.	Structural Steels	14
M. 23.	Galvanised iron sheets	14
M. 23. A	G.I. Valleys gutters ridges	14
M. 24.	Asbestos cement sheets	14
M. 25.	Mangalore pattern roof tiles	14
M. 26.	Shuttering	14
M. 27.	Expansion Joints, premodulded Filler	15
M. 28.	Expansion Joints, copper strips & hold Fast	15
M. 29.	Teak wood	15
M. 29. A	Non Teak wood	16
M. 30.	Wooden Flush door shutters (Solid Core)	16
M. 31.	Aluminium Doors, Windows, Ventilators	17
M. 32.	Rolling steel gate	17
M. 33.	Collapsible steel gate	17
M. 34.	Welded steel Wire Fabric	17
M. 35.	Expanded metal sheets	18
M. 36.	Mild Steel Wires (Wire gauze Jali)	18
M. 37.	Plywood	18
M. 38.	Glass	18
M. 39.	Acrylic sheets	19
M. 40.	Particle board	19
M. 41.	Expanded polystyrene or Framed sty roper slabs	19
M. 42.	Resign boded Fiber glass	19
M. 43.	Fixtures and Fastening	19
M. 44.	Paints	21
M. 45.	French Polish	21
M. 46.	Marble pipes For marble mosaic terrazzo	21
M. 47.	Flooring tiles	22
M. 48.	Rough Kota stone	23
M. 49.	Polished Kota stone	23



	Particulars	Page No.
M. 50.	Dholpur Stone slab	23
M. 51.	Marble slab	23
M. 52.	Granite stone slab	23
M. 53.	P.V.C. Flooring	24
M. 54.	Facing tiles	24
M. 55.	White glazed tiles	24
M. 56.	Galvanized iron pipes and fitting	25
M. 57.	Bib cooks and stop cock	25
M. 58.	Gun metal Wheel valve	25
M. 59.	while glazed porcelain wash basin	25
M. 60.	European type water closed	25
M. 61.	Orrissa type water closet	25
M. 62.	Indian type water closet	25
M. 62.	A Foot Rests	26
M. 63.	Glazed earthenware sink	26
M. 64.	Glazed earthenware lipped type flat back urinal/Corner type urinal	26
M. 65.	Low level enamel Hushing tank	26
M. 66.	Cast Iron flushing cistern	26
M. 67.	Flush cock	26
M. 68.	Cash iron pipes and fitting	26
M. 69.	Nahni Trap	27
M. 70.	Gulley Trap	27
M. 71.	Glazed stoneware pipes and filling	27
M. 72.	Wall peg rail	27
M. 73.	G. 1. Water spout	27
M. 74.	Asbestos cement pipe ( A.C. pipe )	28
M. 75.	Crydon ball valve	28
M. 76.	Bitumen fell for water proofing and damp proofing	28
M. 77.	Selected Earth	28
M. 78.	barbed-Wire	28

## DETAILED SPECIFICATIONS

Section – 4	Excavation	29
Section – 5	Plain & R.C.C. Work	37
Section – 6	Masonry work	50
Section – 7	Rubble masonry work	57
Section – 9	Centering and form work	63
Section – 10	Wood Work, Doors, windows	68
Section – 11	Steel shutters, Windows, Ventilators	78
Section – 12	Labour for fixing fixtures and fastenings	82
Section – 13	Glazing	85
Section – 14	Paving & Floor Finishes	88
Section – 15	Roof Covering	104
Section – 16	Ceiling & Lining	116
Section - 17	Plastering and Painting	119
Section – 18	White washing and Distempering	125
Section – 19	Painting and Polishing	138
Section – 20	Demolition and Disentangling	147
Section – 21	Repairs to Buildings	152
Section – 22	Miscellaneous Buildings items	153
Section – 23	Water Supply, Plumbing and Sanitary fittings	160
Section – 24	Drainage & Sewerage	175
Annexure	Equivalent plain area for uneven surface for painting	186
Annexure	Schedule of Fixtures & Fastenings for doors, windows, ventilators, Wardrobes and cupboards	188

## GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORKS

### GENERAL:

1. In the specifications "as directed" / "approved" shall be taken to mean "as directed" / "approved by the Engineer-in-Charge".
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
3. In "Mode of Measurement" in the specifications wherever a dispute arises in the absence of specific mention of a particular point of aspect the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:
 

(i) Length, width and depth (height)	0.01	meter
(ii) Areas	0.01	Sq.Mt.
(iii) Cubic Contents	0.01	Cu.Mt.

In recording dimensions of work the sequence of length, width and height (depth) or thickness shall be followed.
5. The distance which constitutes lead shall be determined along the shortest practical route and note necessarily the route actually taken The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specific, it shall mean "all leads"
7. Lift shall be measured from plinth level.
8. Up to "floor two level" means actual height of floor (Maxi 4 M) up to 3 Mt. above plinth level.
9. Definite particulars covered in the items of work, though not mentioned or elucidated in its specifications shall be deemed to be included therein.
10. Reference to specifications of materials as made in the detailed specification of the items of works is in the form of a designation containing them under the specification of the material and prefix 'M' e.g. 'M-5',
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all aspects.
13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
14. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work
15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
16. No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.
17. All works shall be carried out in a workmanlike manner as per the best techniques for the particular item.
18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
19. The mode, procedure and manner of execution shall be such that it does not cause damage or over-loading of the various components of the structure during execution or after completion of the structure.
20. Special modes of construction not adopted in general Engineering practice if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode

Of construction is safe, sound and helps in speedy construction and Completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-Charge shall not, however absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.

21. All installations pertaining to water supply and fixtures there of as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the contractor.
22. The contractor shall be responsible for observing the rules and regulations imposed under the "Minor Minerals Act", and such of the laws and rules prescribed by Government from to time.
23. All necessary safety measures and precautions (including those laid down in the various relevant Indian Standards) shall be taken to ensure to ensure the safety of men. Materials and machinery on the works as also of the work itself.
24. The testing charges of all materials shall be borne by the Contractor.
25. Approval to any of the executed items for the work does not in any relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications

## GENERAL

### STANDARD TECHNICAL SPECIFICATIONS

Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable specification
1		25		49	
2		26		50	
3		27		51	
4		28		52	
5		29		53	
6		30		54	
7		31		55	
8		32		56	
9		33		57	
10		34		58	
11		35		59	
12		36		60	
13		37		61	
14		38		62	
15		39		63	
16		40		64	
17		41		65	
18		42		66	
19		43		67	
20		44		68	
21		45		69	
22		46		70	
23		47		71	
24		48		72	

Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable Specification	Sr. No. of the item in the Schedule 'B' of tender	Sr. No. of applicable specification
73		99		125	
74		100		126	
75		101		127	
76		102		128	
77		103		129	
78		104		130	
79		105		131	
80		106		132	
81		107		133	
82		108		134	
83		109		135	
84		110		136	
85		111		137	
86		112		138	
87		113		139	
88		114		140	
89		115		141	
90		116		142	
91		117		143	
92		118		144	
93		119		145	
94		120		146	
95		121		147	
96		122		148	
97		123		149	
98		124		150	

## SPECIFICATIONS OF MATERIALS

### M-1. Water

1.1. Water shall not be salty brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standard specified in I.S. 456-1978.

1.2. If required by the Engineer-in-Charge it shall be tested by comparison with distilled water Comparison shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I.S. 269-1976. Any indication of unsoundness change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength, of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3. Water for curing mortar, concrete or masonry should not be too acidic or too alkaline .

It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces

1.4. Hard and bitter water shall not be used for curing

1.5. Potable water will generally found suitable for curing mortar or concrete.

### M-2. Lime

2.1. Lime shall be hydraulic lime as per I.S. 712-1973 Necessary tests shall be carried out as per I.S. 6932 (Parts I to X) 1973

2.2. The following field tests for limes are to be earned out:

(1) A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty white colour indicates quick lime, and solid lumps are the un burnt lime stone.

(2) Acid tests for determining the carbonate content in lime Excessive amount of impurities and rough determination of class of lime.

2.3. Storage shall comply with J.S. 712-1973 The slaked lime, if stored, shall be kept in a weather proof and damp-proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged" in any way shall be rejected and all rejected materials shall be removed from site of work.

2.4. Field testing shall be done according to I.S 1624-1974 to show the acceptability of materials.

### M-3. Cement

3.1. Cement shall be ordinary Portland slag cement as per I.S.269-1976 or Portland slag cement as per I.S. 455-1976

### M-4. White Cement

4.1. The white cement shall conform to I S. 8042-E-1978.,

### M-5. Coloured Cement

5.1. Coloured cement shall be with white of grey Portland cement as specified in the item of the work.

5.2. The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment add cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties to provide for durability underexposure to sunlight and weather.

5.3. The pigment shall have the property such that it is neither affected by the cement nor detrimental to it

### M-6 Sand

6.1. Sand shall be natural sand, clean, well graded hard strong, durable and gritty particles free from injurious amounts of dust, clay kankar nodules, soft or flaky particles shale, alkali salts organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer-in-Charge. The sand shall not contain more than 8 percent of silt as determined by field test, if necessary the sand shall

be washed to make it clean.

**6.2. Coarse Sand :** The fineness modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand shall be as under.

I.S. Designation	Sieve passing sieve	Percentage by weight Designation	I.S. Sieve Percentage by weight passing Sieve
4.75 mm	100	600 micron	30 - 100
2.36 mm	90 to 100	300 micron	50 - 70
1.18 mm	70 to 100	150 micron	0 - 50

**6.3. Fine Sand :**

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under.

I.S. Designation	Percentage by weight Sieve passing	I.S. Designation	Percentage by weight Sieve passing
4.75 mm	100	600 micron	40 - 85
2.36 mm	100	300 micron	5 - 50
1.18 mm	75 to 100	150 micron	0 - 10

**M-7. Stone Dust**

**7.1.** This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of silt as determined by field test using measuring cylinder. The method of determining silt contents by field test is given as under :

**7.2.** A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder up to 100 mm. mark. The clean water shall be added up to 150 mm. mark. The mixture shall be stirred vigorously and the content allowed to settle for 3 hours.

**7.3.** The height of silt, visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the content within the allowable limit.

**7.4.** The fineness modulus of stone dust shall not be less than 1.80

**M-8. Stone Grit**

**8.1.** Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flakey elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious with cement.

**8.2.** The grit shall conform to the following gradation as per sieve analysis :

I.S. sieve designation	Percentage by weight	I.S. Sieve designation	Percentage by weight
12.5 mm	100 %	4.75 mm	0-20%
1000 mm	85 - 100%	2.36 mm	0-25%

**8.3.** The crushing strength of grit will be such as to allow the concrete in which it is used to build-up the specified strength of concrete.

**8.4.** The necessary tests for grit shall be carried out as per the requirements of I.S. 2386- ( parts-I to VIII) 1963, as per instructions of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

**M-9. Cinder**

**9.1.** Cinder is will burnt furnace residue which has been fused or sintered into lumps of varying sizes

**9.2.** Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only It shall be sound clean and free from clay dirt, ash or other deleterious matter

**9.3.** The average grading for cinder aggregates shall be as mentioned below .

I.S. Designation	Percentage by weight Sieve passing	I.S. Designation	Percentage by weight Sieve passing
20 mm	100	4.75 mm	70
10 mm	86	2.36 mm	52

**M-10. Lime Mortar**

**10.1.** Lime : Lime shall conform to specification M-2, Water : Water shall conform to specification M-1 and Sand: Sand shall conform to specification M-6

**10.2. Proportion of Mix:**

**10.2.1.** mortar shall consist of such proportions of slaked lime and sand as may be specified in item The slaked lime and sand shall be measured by volume

**10.3. Preparation of mortar;**

**10.3.1.** Lime mortar shall be prepared by wet process as per I S 1625-1971 .Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in an even layer and ground for 180 revolutions with a sufficient water. Water shall be added as required during grinding ( care being taken not to add more water) that will bring the mixed material to a consistency of stiff paste. Thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

**10.4. Storage:**

**10.4.1.** Mortar shall always be kept damp, protected from sun and rain till used up, covering it by tarpaulin or open sheds.

**10.5. Use:**

**10.5.1.** All mortar shall be used as soon as possible after grinding. It should be used on the day on which it prepared, But in no case mortar made earlier than 36 hours shall be permitted for use.

**M-11. Cement Mortar**

**11.1.** Water shall conform to specification M-1, Cement : Cement shall conform to specifications M-3 and Sand : Sand shall conform to M-6

**11.2. Proportion of Mix**

**11.2.1.** Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes, the proportion of cement will be by volume on the basis of 50 Kg/Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed or machine mixed as directed.

**11.3. Proportion of Mortar :**

**11.3.1.** In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed

**11.3.2.** The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes

**M-12. Stone Coarse Aggregate For Nominal Mix Concrete**

**12.1.** coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar

**12.2.** The aggregate shall generally be cubical in shape Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement and ordinary reinforced cement concrete shall generally be as per the table given below.



However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6- mm. less than the cover whichever is smaller.

I S. Sieve Designation	Percentage passing for single Sized aggregates of Nominal size			I S. Sieve Designation	Percentage passing for single Sized aggregates of Nominal size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16 mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10 mm	05	0.20	0.30
40 mm	85-100	100	-	4.75 mm	-	0.5	0.5
20 mm	0.20	85-100	100	2.35 mm	-	-	-
16 mm	85-100						

**Note :** This percentage may be varied some what by the Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

**12.3.** The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests, indicated in I.S. 383-1970 and 456-197f shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean. .

#### **M-13. Black Trap or Equivalent Hard Stone Coarse**

**13.1.** Aggregate For Design Mix Concrete . Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

**13.2.** The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed, from the best, black trap or equivalent hard stones as approved, Aggregate shall have no deleterious with cement

**13.3.** The necessary tests indicated in I S. 383-1970 and I.S.456-1978 shall have to be carried out to ensure the acceptability of the material.

**13.4.** If aggregate is covered with dust it shall be washed with water to make it clean.

#### **M-14. Brick Bats Aggregate**

**14.1.** Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm - 50 mm. size unless otherwise specified in the item The under burnt or over burnt brick bats shall not be allowed.

**14.2.** The brick bats shall be measured by suitable boxes or as directed.

#### **M-15. Bricks**

**15.1.** The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws and nodules of free lime they shall have smooth rectangular faces with sharp corners and shall be of uniform colour.

The bricks shall be- moulded with a frog of 100 mm. x 40 mm. and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

**15.2.** The size of modular bricks shall be 190 mm.x 90 mm.x 90 mm.

**15.3.** The size of the conventional bricks shall be as under :

( 9" x 4.3/8" x 2.3/4" ) 225 x 110 x 75 mm.

**15.4.** Only bricks of one standard size shall be used on one work. The following tolerances shall be permitted in the conventional size adopted in a particular work.

Length  $\pm 1/8"$  ( 3.0 mm.) Width  $\pm 1/16"$  ( 1.50 mm. ) Height  $\pm 1/16"$  ( 1.50 mm. )

**15.5.** The crushing strength of the bricks shall not be less than 35 Kg/Sq. Cm. The average water absorption shall not be more the 20 percent by weight Necessary tests for crushing strength and water

absorption etc. shall be carried out as per I.S. 3495 ( Part-I to IV ) - 1976

#### **M-16. Stone**

**16.1.** The stone shall be of the specified variety such as Granite/Trap Stone/ Quartzite or any other type of good hard stones. The stones shall be only from the approved quarry and shall be hard sound, durable and free from defects like cavities, cracks, sand holes, flaws injurious veins, patches of loose or soft materials etc., and weathered portions and other structural defects Or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight. When tested in accordance with I.S. 1124-1974. The minimum crushing strength of stone shall be 200 Kg/Sq. Cm. unless otherwise, specified

**16.2.** The samples of the stone to be used shall be got approved before the work is started

**16.3.** The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of the stone shall be-so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface

#### **M-17. Laterite Stone**

**17.1.** Laterite stone shall be obtained from the approved quarry it shall be compacted in texture sound, durable and free from soft patch. It shall have minimum crushing strength of 100 Kg/Sq. Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying, the stone shall be allowed to weather for some time before using in work.

**17.2.** The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, and the edges true and square

**17.3.** Those types of stone in which white clay occurs should not be used

**17.4.** Special corner stones shall be provided where so directed.

#### **M-18. Mild Steel Bars**

**18.1.** Mild steel bars reinforcement for R.C C. work shall conform to I.S. 432 (Part -II) 1966 and shall be of tested quality. It shall also comply with relevant part of I.S. 456-1978.

**18.2.** All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing

**18.3.** For the purpose of payment, the bar shall be measured correct up to 10 mm. length and weight payable worked out at the rate specified below :

1.	6 mm	0.22 Kg/Rmt.	8.	20 mm.	2 47 Kg/Rmt
2.	8 mm.	0.39 Kg/Rmt.	9	22 mm.	2.98 Kg/Rmt.
3.	10 mm.	0.62 Kg/Rmt.	10.	25 mm.	3.85 Kg/Rmt.
4.	12 mm.	0.89 Kg/Rmt.	11.	28 mm.	4.83 Kg/Rmt.
5.	14 mm	1.21 Kg/Rmt.	12.	32 mm.	6.31 Kg/Rmt.
6.	16 mm	1 58 Kg/Rmt	13.	36 mm.	7 99 Kg/Rmt. *
7.	18 mm.	2.00 Kg/Rmt.	14.	40 mm.	9,86 Kg/Rmt.

#### **M-19. High Yield Strength Steel Deformed Bars**

**19.1.** High yield strength steel deformed bars shall be either cold twisted other rolled and shall conform to I.S. 1786-1966 and I.S. 1139-1966 respectively.

**19.2.** Other provisions and requirements shall conform to specification No. M-18 for Mild Steel Bars.

#### **M-20. High Tensile Steel Wires**

**20.1.** The high tensile wires for use in pre stressed concrete work shall conform to I.S.2090-1962.

**20.2.** The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength the minimum strength shall be taken as per Para 6-1 of the I.S. 1785-1962. Testing shall be done as per I.S. requirements.

**20.3.** The high tensile steel shall be free from loose mill scale, rust, oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through

a pressure box containing Carborundum.

**20.4.** The high tensile wire shall be obtained from manufacturers. in coils having diameter not less than 350 times the diameter of wire itself so that wire springs back straight on being uncoiled .

**M-21. Mild Steel Binding Wire**

**21.1.** The mild steel wire shall be of 1.63 mm. or 1.22 mm. ( 16 to 18 gauge ) diameter and shall conform to I.S. 280-1972.

**21.2.** The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust oil paint, grease loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar

**M-22. Structural Steel**

**22.1.** All structural Steel shall conform to I S. 226-1985: The steel shall be free from the defects mentioned in I.S 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973.

**22.2.** When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

**M-23. Galvanised Iron Sheets**

**23.1.** The galvanised iron sheets shall be plain or corrugated sheets of gauges as specified in item The G.I. Sheets shall conform to I.S.277-1977. The sheets shall be undamaged in carnage and handling either by rubbing off of zinc coating or otherwise. They shall have clean and bright surface and shall be free from dents, bends, holes, rust or white powdery deposit.

**23.2.** The length and width of G.I. sheets shall be as directed as per site condition.

**M-23.A :G.I. Valleys gutter, ridges**

**23.A.1.** The G.I. ridges and hips shall be of plain galvanised sheets Class - 3 of the thickness as specified in item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in process of bending.

**23.A.2.** Valleys gutters and flashings shall also be of galvanised sheet of thickness as specified in item Valleys Shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall They shall be bent to the required shape without damage to the sheet in the process of bending.

**M-24. Asbestos Cement Sheets**

**24.1.** Asbestos cement sheets plain, corrugated or semi-corrugated shall conform to I.S.459-1970 The thickness of the sheets shall be as specified in the item. The sheets shall be free from all defects such as cracks, holes, deformities chipped edges or otherwise damaged.

**24.2. Ridges & Hips :**

**24.2.1.** Ridges and hips shall be of same thickness as that of A.C. sheets. The types, of ridges shall be suitable for the type of sheets and location.

**24.2.2.** Other accessories to be used in roof such as flashing pieces eaves filler pieces, valley gutters, north light, and ventilator curves, barge boards etc, shall be of standard manufacture and shall be suitable for the type of sheets and location.

**M-25. Mangalore Pattern Roof Tiles**

**25.1.** The mangalore pattern tiles shall conform to I S 654-1972 for Class AA or Class A type as specified in item. Samples of the tiles to be provided shall be got approved from the Engineer-in-charge. Necessary tests shall be carried out as directed.

**M-26. Shuttering**

**26.1.** The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles The shuttering shall be supported on battens and beams and props of vertical bullies properly cross braced together so as to make the centering rigid. In places of bullies props, brick pillar of adequate section built in mud mortar may be used

**26.2.** The form work shall be sufficiently strong and shall have camber so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even

surface and its joints shall permit leakage of cement grout

**26.3.** If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge, before the reinforcement bars are placed in position.

**26.4.** The props shall consist of bulgies having 100 mm minimum diameter measured at mid length and 80 mm. at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq m laid on sufficiently hard base.

**26.5.** Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

**26.6.** The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and the surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

**26.7.** As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.

**26.8.** The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.

**26.9.** The shuttering for beams and slabs shall have camber of 4 mm per meter ( 1 in 250 ) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

#### **M- 27. Expansion Joints - Premoulded filler**

**27.1.** The item provides for expansion joints in R.C.C. frame structures for internal joints, as well as exposed joints, with the use of premoulded bituminous joint filler.

**27.2.** Premoulded bituminous joints filler i.e. performed strip of expansion joints filler shall not get deformed, or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joints filler that have been damaged shall be rejected.

**27.3.** Thickness of the pre-moulded joints filler shall be 25 mm. unless otherwise specified.

**27.4.** Premoulded bituminous joints filler shall conform to I S 1838-1961

#### **M-28. Expansion joints-Copper strips & hold .fasts**

**28.1.** The item provide for expansion joints in R.C.C. frame structure for internal joints, as well as exposed joints, with the use of premoulded bituminous joints filler.

**28.2.** Copper sheet shall be of 1.25 mm. width and or 1 25 mm. width and the " U " shape in the middle. Copper strip shall have holdfast of 3 m.m diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm or as shown in the drawing or as directed. The width of each flange ( horizontal side ) of the copper plate to be embedded in the concrete work shall be 25 mm depth of "U" to be provided in the expansion joint, in the copper plate shall be of 25 mm.

#### **M-29. Teak wood**

**29.1.** The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

**29.2.** Teak wood shall generally be free from large, loose dead or cluster knots, flaws, shakes, warps, twists, bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot decay, harmful fungi and other defects of harmful nature which will affect the strength, durability or its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting using any adhesive materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

**29.3.** All scantlings, planks etc., shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

**29.4.** The tolerances-in the dimensions shall be allowed at the rate of 1.5 mm. per face to be planed.

**29.5. First class teak wood**

**29.5.1.** First class teak wood shall have no individual hard and-sound knots, more than 6 sq. cm. in size and the aggregate area of such knots shall not be more than 1% of area of piece, The timber shall be closed grained.

**29.6. Second Class Teak Wood:**

**29.6.1.** No individual hard and sound knots shall be more than 15 sq. cms. in size and aggregates area of such knots shall be not exceed 2% of the area of piece.

**M-29. A Non-teak wood:**

The non-teak wood shall be chemically treated, seasoned as per I.S. Specifications and of good quality. The type of wood shall be got approved before collecting the same on site Fabrication of wooden members shall be started only after approval.

For this purpose wood of Bio, Kalai, Sires. Saded, Behda, Jamun, Sisoo will be used for door where as only Kalai. Sires, Halda. Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be free from large loose dead of cluster knots, flows, shakes, warps, bends or any other defects, It shall be uniform in substance and of straight fibers as far as possible It shall be free fro rots, decay, harmful fungi and other defects of nature which will effect the strength, durability or its usefulness for the purpose for which it is required. The colour of wood shall be uniform as far as possible. The scantlings planks etc. shall be saw in straight lines and planes in the direction of grain and of uniform thickness. The department will use the Agency to produce certificate from Forest Department in event of dispute and the decision of the Department shall be final and binding to the contractor. The tolerance in the dimension shall be allowed at 1.5 mm. per face to be planed.

**M-30. Wooden flush door shutters ( solid core )**

**30.1.** The solid core type flush door shutters shall be of decorative or non-decorative type as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per I.S.2202 ( part -I ) 1980. The timber shall be free from decay and insect attack Knots and knot holes less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross-bands shall conform to I.S. 303-1275

**30.2.** The face-panel of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The<sup>1</sup> hopping, rebating. opening of glazing, venation etc., shall be provided if specified in the drawing.

**30.3.** All edges of the door shutters shall be square. The shutters shall be free from twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

**30.4.** The shutters shall be tested for-

**(1) End immersion test:** The test shall be carried out as per I.S.2202 ( part-1 ) 1980 There shall be no delamination at the end of the test.

**(2) Knife Test :** The face panel when tested in accordance with I.S 1659-1979 shall pass the test.

**(3) Glue adhesion test :** The flush door shall be tested for glue adhesive test in accordance with I S 2202 ( part -I ) 1980. The shutters shall be considered to have passed the test, if no delamination occurs in the glue lines in the plywood and if no single determination more than 80 mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner Delamination at the knots, knot hole and other permissible wood defectects shall not be considered in assessing the sample.

**30.5.** The tolerance in size of scud core type flush door shall-be as under :

In Nominal thickness  $\pm 1.2$  mm. In Nominal height  $\pm 3$ m

**30.6.** The thickness of the shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any points.

**M-31. Aluminum doors, windows, ventilators**

**31.1.** Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S. 733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The section shall be as specified in the drawing and design. The fabrication shall be done as directed.

**31.2.** The hinges shall be cast or extruded aluminum hinges of same type as in window but of larger size.

**31.3.** The hinges shall normally be of 50 mm. projecting type. Non-projecting type of hinges may also be used if directed. The handles of door shall be of specified design. A suitable lock for the door Operable either from outside or inside shall be provided. In double shutter door, the first closing shutter shall have concealed aluminum alloy bolt at top and bottom.

**M-32. Rolling Shutters**

**32.1.** The rolling shutters shall conform to I.S. 6248-1979. Rolling shutters shall be supplied of specified type with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 m. width not less than 1.25 mm. thick and 80 mm wide for shutters 3.5 m. in width and above unless otherwise specified.

**32.2.** Guide channels shall be of mild steel deep channel section and of rolled pressed or built up ( fabricated ) joint less construction. The thickness of sheet used shall not be less than 3 mm.

**32.3.** Hood covers shall be made of M.S. Sheets not less than 0.90 mm. thick. For shutters having width 3.5 Meter and above, the thickness of M.S. sheet for the hood cover shall be not less than 1.25 mm.

**32.4.** The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire of strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc. shall be supported on strong M.S. of malleable C.I. brackets. The brackets shall be fixed on or under the lintel as specified with rawl plugs and screws bolts etc.

**32.5.** The rolling shutters shall be of self rolling up to 8 Sq. m. clear area without ball bearing and up to 12 Sq.m. clear area with ball bearing. If the rolling shutters are of larger, then gear operated type shutters shall be used.

**32.6.** The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.

**32.7.** The Shutters shall be completed with door suspension shafts, locking arrangements, pulling hooks, handles and other accessories.

**M-33. Collapsible Steel Gate**

**33.1.** The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flats etc. Either steel pulleys or ball-bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under.

(a) Pickets : These shall be of 20 mm. M.S. channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms. with an opening of 10 Cms.

(b) Pivoted M.S. flats shall be 20 mm x 6 mm

(c) Top and bottom guides shall be from tee of flat iron of approved size.

(d) The fittings like stoppers fixing, locking cleats, brass handles and cast iron rollers shall be of approved design and size.

**M-34. Welded Steel Wire Fabric**

**34.1** Welded steel wire fabric for general purpose shall be manufactured from cold drawn steel wire "as drawn" or galvanized steel conforming to I.S. 226-1975 with longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to I.S. 4948-1974. It shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be rust proof. The type of mesh shall be oblong or square as directed. The mesh sizes and sizes of wire for square as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock sizes permit.

**M-35. Expanded Metal Sheets**

**35.1.** The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface defects. Expanded metal sheet shall conform to IS-412-1975. Except that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance on nominal weight of expanded metal sheets shall be of  $\pm 10$  percent.

**35.2.** Expanded metal in panels shall be in one whole piece in each panel as far as stock sizes permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

**M-36. Mild Steel Wire ( Wire Gauze Jali )**

**36.1.** Mild steel wire may be galvanized as indicated. All finished steel wire shall be well cleanly drawn to the

dimensions and size of wire as specified in item. The wire shall be sound free from splits surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

#### **M-37. Plywood**

**37.1.** The plywood for general purpose shall conform I.S. 303-17-1975.

Plywood is made by cementing together than boards or starts of wood into panels. There are always an odd number of layers, 3,5,7,9, ply etc. The piles are placed so that grain of each layer is at right angles to the grain in the adjacent level.

**37.2.** The chief advantages of plywood a single board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and greater resistance to cracking and splitting with charge in moisture content.

**37.3.** Usually synthetic resins are used to gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates which maintain a temperature of 90 degree C to 140 degree C and a pressure of 11 to 14 Kg/ Sq. Cm on the wood. The time of heating may be anything from 2 to 60 minutes depending upon thickness

**37.4.** When water glue are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive the finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

**37.5.** According to I.S. 303-1975 the plywood for general purpose shall be of the grades namely BWR, WWR and CWR depending up to the adhesives used for bonding the veneers and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces each face being of three kinds namely A, Band C After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

**37.6.** Thickness of plywood Boards.

**TABLE**

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply.	3 mm.	5 ply.	5 mm.	7 ply.	9 mm.	9 ply.	16 mm
	4 mm.		6 mm.		13 mm.		19 mm.
	5 mm.		7 mm.		16 mm.	11 ply.	19 mm.
	6 mm.		8 mm.	9 ply.	13 mm.		25 mm.

#### **M-38. Glass**

**38.1.** All glass shall be of the brief quality, free from specks, bubbles, smokes veins, air holes blisters and other defects. The kind of glass to be used shall be as mentioned in the item or specification or in the special provision or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications for different kinds of glass shall be as under.

#### **38.2. Sheet Glass**

**38.2.1.** In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/Sq. m for panes up to 600 mm x 600 mm.

**38.2.2.** For panes larger than 600 mm x 600 mm and up to 800 mm x 800 mm the glass weighing not less than 8.75 Kg/Sq m shall be used For bigger panes up to 900 mm x 900 mm. glass weighing not less

than 8.75 Kg/Sq. m shall be used. For bigger panes up to 900 mm x 900 mm. glass weighting not less than 11.25 Kg/Sq. m. shall be used

**38.2.3.** Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I.S. 1761-1960. Sheet glass of the specified colours shall be used, if so shown, on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm plate glass of specified thickness shall be used

**38.3. Plate Glass:**

**38.3.1.** When plate glass is specified it shall be "polished patent plate glass" of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness, the thickness of plate glass to be supplied shall be 6 mm. and a tolerance of 0.20 mm shall be admissible

**38.4. Obscured Glass:**

**38.4.1.** This type of glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed or fluted, or frosted glass as may be specified as required. The thickness and type of glass shall be as per details on drawings or as specified or as directed

**38.5. Wired Glass:**

**38.5.1.** Glass shall be with wire netting embedded in a sheet of plate glass. Electrically welded 13 mm Georgian square mesh shall be used. Thickness of glass shall not be less than 6 mm. Wired glass shall be of type and thickness as specified

**M-39. Acrylic Sheets**

**39.1.** Acrylic sheets shall be of thickness as specified in the item and of an specified shape and size as the case may be. Panels may be flat or curved. It should be light in weight. It shall be colourless or coloured or opaque as specified in the item. Colourless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected for the sheets of larger thickness, it shall be extremely resistant to sunlight, weather and low temperatures.

It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets should be of such quality that they can be cut, bent, jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

**M-40. Particle board**

**40.1.** The particle boards used for face panels shall be of best quality free from any defects. The particle boards shall be made with phenolmaldehyde adhesive. The particle boards shall conform to I.S. 3087-1905 "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

**M-41. Expanded polystyrene or framed styrofoam slabs**

**41.1.** The expanded polystyrene ceiling boards and tiles shall be of approved make and shall be of sizes, thickness, finish and colour as indicated. It shall be of high density and suitable for use as insulating material. The insulating material shall be like slabs of Thermocole etc.

**M-42. Resin bonded fiber glass.**

**42.1.** The resin bonded fiber glass tiles or rolls shall be of approved make and shall be of sizes, thickness, and finish as indicated.

**42.2.** For test of Mineral wool thermal insulation [Blanket I.S. 3144-1965 shall be followed

**42.3.** Insulation wool blanks shall be with the following coverings on one or both sides as indicated

- (1) Bituminous Hessian Kraft paper suitable for use in position where moisture has to be excluded.
- (2) Hessian cloth or Kraft paper for keeping out dust
- (3) G.I wire netting, suitable for surfaces to be plaster over

**M-43. Fixtures and fastenings**

**43.1. General:**

**43.1.1.** The fixtures and fastenings, that is butt hinges, tee and strap hinges, sliding door bolts, tower bolts, door latch, bath-room latch, handles, door stoppers, casement window fasteners, casement



stays and ventilators catch shall be made of the metal as specified in the item or its specification.

**43.1.2.** They shall be of iron, brass, aluminum chromium plated iron, chromium plated brass, copper oxidised iron, copper oxidised brass or anodised aluminum as specified

**43.1.3.** The fixtures shall be heavy medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensue ease of operations.

**43.1.4.** The samples of fixtures and fastenings shall be got approved as regards, quality and shape before providing them in position

**43.1.5.** Brass and anodised aluminium fixtures and fastenings shall be bright finished

**43.2. Holdfasts:**

**43.2.1.** Holdfasts shall be made from mild steel flat 30 cm length and one of the holdfasts shall be bent at right angle and two nos of 6 mm. diameter holes, shall be made in it for fixing it to the frame with screws. At the other end, the holdfast shall be forked and bent at right angles in opposite directions

**43.3. Butt hinges:**

**43.3.1.** Railway standard heavy type butt hinges shall be used when so specified

**43.3.2.** Tee and strap hinges shall be manufactured from M S Sheet

**43.4. Siding door bolts (Aldrops):**

**43.4.1.** The aldrops as specified in the item shall be used and shall be got approved.

**43.5. Tower bolts (Barrel Type):**

**43.5.1.** Tower bolts as specified in the item shall be used and shall be got approved

**43.6. Door Latch:**

**43.6.1.** The size of door latch shall be taken as the length of latch.

**43.7. Bathroom Latch:**

**43.7.1.** Bathroom latch shall be similar to tower bolt.

**43.8. Handle:**

The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm. more than the size" of the handle.

**43.9. Door Catch:**

**43.9.1.** Door stoppers shall be either floor door stopper type or door catch type Floor stopper shall be of overall size as specified and shall have a rubber cushion.

**43.10. Door Stoppers:**

**43.10.1.** Door catch shall be fixed at a height to about 900 mm from the floor level such that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixity The catch shall be fixed 20 mm inside the face of the door for easy operation of catch.

**43.11. Wooden Door Stop with hinges:**

**43.11.1.** Wooden door stop of size 100 mm x 40 mm x 40 mm shall be fixed on the door frame with a hinges of 75 mm. size and at a height of 900 mm. from the floor level The wooden door stop shall be provided with 3 coats of approved oil paint

**43.12. Casement Window Fastener:**

**43.12.1.** Casement window fastener for single leaf window shutter shall be left or right handed as directed

**43.13. Casement stays (Straight Red Stay):**

**43.13.1.** The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed. Size of the stay shall be 250 mm to 300 mm. as directed.

**43.14. Ventilator Catch:**

**43.14.1.** The pattern and shape of the catch shall be as approved

**43.15. Pivot:**

**43.15.1.** The base and socket plate shall be made from minimum 3 mm. thick plate; and projected pivot shall not be less than 12 mm diameter and 12 mm. length and shall be firmly riveted to the base plate in

case of iron pivot and in single piece plate in the case of brass pivot.

**M-44. Paints:**

**44.1. (A) Oil paints :**

**44.1.1.** Oil paints shall be of the specified colour and as approved. The ready mixed paints shall only be used. However, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved stainer will be allowed. In such a case the contractor shall ensure that the shade of the paint so allowed shall be uniform.

**44.1.2.** All the paints shall meet with the following general requirements

- (i) Paint shall not show excessive setting in a freshly opened full can and shall easily be ready spread with a paddle to a smooth homogeneous state. The paint shall show no curdling, levering, caking or colour separation and shall be free from lumps and skins
- (ii) The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies
- (iii) The paint shall not skin within 48 hours in a three quarters filled closed container
- (iv) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections

**44.1.3.** Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever

**44.2. (B) Enamel paints:**

**44.2.1.** The enamel paint shall satisfy in general requirements in specification of oil paints, Enamel paint shall conform to I.S. 2933-1975.

**M-45. French Polish**

**45.1.** The French polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials:

- (i) Denatured spirit of approved quality
- (ii) Chandras
- (iii) Pigment.

**45.2.** The French polish so prepared shall conform to I S : 348-1 9C8.

**M-46. Marble chips for marble mosaic terrazzo**

**46.1.** The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weathering.

**46.2.** The size of various colours of marble chips ranging from the smallest up to 20 mm shall be used where the thickness of top wearing layer is 6 mm. The marble chips of approved quality and colours only as per grading as decided by the Engineer-in-charge shall be used for marble mosaic tiles or works.

**46.3.** The marble chips shall be machine crushed. They shall be free from foreign matter, dust etc. Except as above, the chips shall conform to I S 2114-1962

**M-47. Flooring Tiles**

**47.1. (A) Plain Cement tiles;**

**47.1.1.** The plain cement tiles shall be of general purpose type. These are the tiles in the manufacture of which no pigments are used. Cement used in the manufacture of tiles shall be as per Indian Standards.

**47.1.2.** The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture the tiles shall be subjected to pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1 : 3 by weight. The wearing face, through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportions of cement to aggregate in the wearing layer of the tiles shall be three parts of cement to one part chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist condition continuously at least for seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S.1237-1980 regarding strength resistance to wear and water absorption.

**47.1.3** The wearing face of the tiles shall be plane, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right angle and all edges shall be sharp and true.

**47.1.4.** The size of tiles generally be square shapes 24.85 Cm x 24.85 Cm. or 25 Cm x 25 Cm The thickness of tiles shall be 20 mm.

**47.1.5.** Tolerance of length and breadth shall be plus of minus one millimeter Tolerance on thickness shall be plus 5mm.

**47.1.6.** The tiles shall satisfy the tests as regards transverse strength, resistance to wear and water absorption as per I.S 1237-1980.

**47.2. (B) Plain Coloured Tiles:**

**47.2.1.** The tiles shall have the same specification as for plain cement tiles as per (A) above expect that they shall have a plain wearing surface wherein pigments are used. They shall conform it I.S. 1237-1980.

**47.2.2.** The pigments used for colouring cement shall not exceed 10 percent by weight of cement used in the mix. The pigments, synthetic or otherwise, used for colouring tiles shall have permanent colour and shall not contain materials detrimental to concrete

**47.2.3** The colour of the tiles shall be specified in the item or as directed

**47.3. (C) Marble mosaic tiles:**

**47.3.1.** These tiles have same specification as per plain cement tiles except the requirements as stated below

**47.3.2.** The marble mosaic tiles shall conform to I.S 1237-1980. The wearing face of the tiles shall be mechanically ground and filled. The wearing face of tiles shall be free from projections depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles and all edges shall be sharp and true.

**47.3.3.** Chips used in the tiles be from smallest up to 20 mm. size. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be had on the wearing face, a few samples with or without their full size photographs as directed shall be approved by the Engineer-in-charge, for approval.

**47.3.4.** Any particular samples if found suitable shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be presented The samples shall have to be made by the contractor till a suitable sample is finally approved for use in the work. The Contractor shall ensure that the tiles supplied for, the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour, shade, chips, distribution etc. required.

**47.3.5.** The tiles shall be prepared from cement conforming to Indian Standards or coloured port land cement generally depending upon the colour of tiles to be used or as directed.

**47.4. (D) Chequered Tiles :**

**47.4.1.** Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below

**47.4.2.** The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The centre to centre distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm

**47.4.3.** The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered tiles shall be plain coloured or mosaic as specified The thickness of the upper layer measured from the top of the chequers shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site

**47.4.4.** Tiles shall conform or relevant I.S 1237-1980. 47.5.

**(E) Chequered Tiles For Stair Cases :**

**47.5.1.** The requirements of these tiles shall be the same as chequered tiles as per (D) above except in following respects :

(1) The length of a tile including nose shall be 300 mm (2) The minimum thickness shall be 28 mm (3) The nosing shall have also the same wearing layer as at the top. (4) The nosing edge shall be rounded (5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves running parallel to nosing and at centers not exceeding 25 mm Beyond that the tiles shall have normal chequer pattern.

**M-48. Rough Kotah Storm**

**48.1.** The Kotah stones shall be hard even, sound, and regular in shape and generally uniform in colour. The colour of the stone shall generally be green Brown coloured shall not be allowed for use They shall be without any soft veins, cranks of flaws.

**48.2.** The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm. x 450 mm as directed However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified

**48.3.** The edges of minus 30 mm on accounts of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be  $\pm 3$  mm

**48.4.** The edges of stones shall be truly chiseled and table rubbed with coarse sand before paving. All angles and edges of the stones of shall be true, square and free from chipping and surface shall De true and plain

**48.5.** When machine cut edges are specified, the exposed and the edges at joints shall be machine cut The thickness of the exposed machine cut edges shall be uniform

**M-49. Polished Kotah Stoics**

**49.1.** Polished kotah stone shall have the same specification as per rough kotah stone except as mentioned below

**49.2.** The stones shall have machine polished surface. When brought on site, the stones-shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished The stones to be used for dedo, skirting, sink, veneering, sills steps etc. where machine polishing after the stones are fixed in situ is not possible shall be double polished

**M-50. Dholpur Stone Slab**

**50.1.** Dholpur stone slab shall be of best quality as approve by the Engineer-m-charge The stone slab shall be without my veins, cracks, and flaws The stone slab shall be even sound and durable regular in snaps and of uniform colour

**50.2.** The size of the stone shall be as specified in the item or detailed drawing or as approved by the Engineer-in-charge The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2 mm. The provision in respect of .polishing as for polished kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiseled or polished as specified in the item of work and all the four edges shall be machine cut All angles and edges of the stone slab shall be true and plane

**50.3.** The sample of stone shall be got approved by the Engineer-in-charge for a particular work It shall be ensured' that the stones to be used in a particular work shall not differ much in shade or tint from the approved sample

**M-51. Marble Slab**

**51.1.** Marble slab shall be white or of other and of best quality as approved by the Engineer-in-charge

**51.2.** Slabs shall be hard, close, uniform and homogeneous in texture. They shall have even crystalline gram and free from defects and cracks. The surface shall be machine polished to an even and perfect plane surface and edges machine cut true and square. The rear f ice shall be rough to provide key for the mortar

**51.3.** Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge. Size of the slab shall be minimum 460 mm x450 mm and preferably 600 mm 'x 600 mm. However, smaller sizes will be allowed to be used of the extent of maintaining required pattern.

**51.4.** The slab shall not be thinner than the specified thickness at its thinnest part. A few specimen of finished slab to be used shall be deposited by the Contractor in the office for reference

**51.5.** Except as above the marble slabs shall conform to I.S. 1130-1969

**M-52. Granite Stone slab**

**52.1.** Granite shad be of approved colour and quality. The stone shall be hard, even sound and regular in shape and generally uniform in colour. It shall be without any soft veins, cracks of flaws

**52.2.** The thickness of the stone shall be specified in items

**52.3.** AH exposed faces shall be double polished to tender truly smooth and even reflecting surface. The

exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

#### **M-53. P.V.C. Flooring**

**53.1.** P.V.C. sheets for P.V.C., floor covering shall be of homogenous flexible type conforming to I S 3462-1966. The P.V.C. covering shall neither develop any toxic effect while put to use nor shall give off any disagreeable odour.

**53.2.** Thickness of flexible type covering tiles shall be as specified in the description of the item

**53.3.** The flexible type shall be backed with Hessian or other woven fabric. The following tolerances shall be applicable on the nominal dimensions of the rolls or tiles :

(a) Thickness  $\pm 0.15$  mm.

(b) Length or Width

(1)	300 mm. Square tiles	$\pm 0.20$ mm.	(3)	900 mm Square tiles	$\pm 0.60$ mm.
(2)	600 mm. Square tiles	$\pm 0.40$ mm.	(4)	Sheets and roll	$\pm 0.10$ percent.

#### **53.4. Adhesive:**

**53.4.1.** The adhesive for PVC flooring shall be of the type and make recommended by the manufacturers of PVC sheets/tiles.

#### **M-54. Facing Tiles**

**54.1.** The facing tiles (burnt clay facing bricks) shall be free from cracks, and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right angled faces. The texture of the finished surface that will be exposed when in place shall conform to an approved sample consisting not less than for stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by ram and greater durability than common bricks. The tiles shall conform to I.S. 2691-1972.

**54.2.** The standard size of facing brick tiles shall be 19 x 9 x 4 cms. The facing brick tiles shall be provided with frog which shall conform to I.S. 11077-1976.

**54.3.** The permissible tolerance in dimensions specified above shall be as follows:

Size	Tolerance for	
	1st Class Brick	2nd Class Brick
19 cm.	$\pm 6$ mm.	$\pm 10$ mm.
9 cm.	$\pm 3$ mm.	$\pm 7$ mm.
4 cm.	$\pm 1.5$ mm.	$\pm 3$ mm.

The tolerance for distortion or warpage of face or edges of individual brick from a plane surface and from a straight line respectively shall be as follows:

Facing dimensions	Permissible tolerance
Max. below 19 cms.	Max. 2.5 mm.
-do- above 19 cms.	Max. 3.0 mm.

**54.5.** The average compressive strength obtained as a sample of five tiles when tested in accordance with the procedure laid as per I S 1077-1976 shall be not less than 175 Kg/Sq Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg / Sq.Cm.

**54.6.** The average water absorption for five bricks tiles shall not exceed 12 percent of average weight of brick before testing. The absorption for each individual bricks shall not exceed 25 percent.

**54.7.** The brick tiles when tested in accordance with I.S. 1077-1976, the rate of efflorescence shall not be more than "Slightly effloresced"

#### **M-55. White glazed tiles**

**55.1.** The tiles shall be of best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing, spots, chipped edges and corners. The glazing shall be of uniform shade.

**55.2.** The tiles shall be nominal size of 150 mm x 150 mm unless otherwise, specified. The maximum

variation the stated sizes other than the thickness of tile shall be plus or minus 1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 1977-19/0

**M-56. Galvanised iron pipes and fittings**

**56.1.** Galvanised iron pipes shall be of the medium type and of required diameter and shall comply with I.S. 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanised iron fittings shall be of the standard 'R' or equivalent make

**M-57. Bib cock and stop cock**

**57.1.** A bib cock is a draw off tap with a horizontal inlet and free outlet A stop cock is a valve with suitable means of connection for insertion in a pipe line for controlling or stopping the flow

**57.2.** They shall be of screw down type and of brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished bright.

**57.3.** The minimum finished weight of bib cock and stop cock shall be as given below

Diameter	Bib cock	Stop cock	Diameter	Bib cock	Stop cock
8 mm	0.25 kg.	0.25 kg.	15 mm	0.40 kg.	0.40 kg.
10 mm	0.30 kg.	0.35 kg.	20 mm	0.75 kg.	0.75 kg.

**M-58. Gun metal wheel valve**

**58.1.** The gun metal wheel valve shall be of approved quality. These shall be of gun metal fitted with wheel and shall be of gate valve opening full way and of the size specified. These shall conform to I.S. 778-1971.

**M-59. White glazed porcelain wash basin**

**59.1.** Wash basin shall be of white porcelain first quality best Indian make and it shall conform to I.S. 2556 (Part -IV) -1972 and I.S. 771-1979. The size of the wash basin shall be as specified in item. Wash basin shall be of one piece construction with continued over flow arrangements All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole as specified. Each basin shall have a circular waste hole which is either riveted or beveled internally with 65 mm. diameter at top and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the under side of the basin shall be provided Basin shall have an internal soap holder which shall fully drain into the bowl.

**59.2.** White glazed pedestal of the quality and colour as that the basin shall be provided where specified in the item. It shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from the floor to top of the rim of basin 750 mm. to 800 mm. as directed.

**M-60. European type water closet/with low flushing**

**60.1.** The European type water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979

**60.2.** 'S' trap shall be provided as required with water seal not than 50 mm. The solid plastic seat and cover shall be of best Indian make conforming to I.S. 2548-1980. They shall be made of moulded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

**M-61. Orrissa type water closet**

**61.1.** The Specification of Orrissa type white glazed water closet of first quality shall conform to I.S. 2256 (Part-III) -1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm x 400 mm with raised footrest.

**M-62. Indian type water closet**

**62.1.** The Indian type white glazed water closet of first quality shall be of size as specified in the item and conforming to I.S. 771-1979 and I.S. 2556 – (Part-II) 1981. Each pan shall have integral flushing. It shall

also have an inlet at back and on front for connecting flush pipes as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth. Pan shall be provided with 100 mm. diameter 'P' or 'S' trap with approximately 50 mm. Water seal and 50 mm. diameter vent horn.

**M-62. A. Foot Rests**

**62.A.1.** A pair of white glazed earthen ware rectangular foot to minimum size 250 mm.x 130 mm. x 20 mm shall be provided with the water closet.

**M-63. Glazed Earthen Ware Sink**

**63.1.** The glazed earthen-ware sink shall be of specified size, colour and quality. The sink shall conform, to I.S. 771 part – II – 1979. The brackets for sinks shall conform to I.S 775-1970

**63.2.** The pipes shall conform to I.S. 1239-part-I 1973 and I.S. 404-1962. for steel and lead pipes respectively. 32 mm. brass waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

**M-64. Glazed earthen-ware Lipped type flat back urinal/corner type urinal**

**64.1.** The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to I.S 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back of corner type urinal must be of 1st quality free from any defects, cracks etc.

**M-65. Low level Enamel flushing tank**

**65.1.** The low level enamel flushing tank shall be of 15 liters capacity. It shall conform to I S 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing tank shall have outlet 32 mm. diameter. The outlet shall be connected with W.C. pan by lead pipe or P.V.C. pipe as specified. The flushing tank shall be provided with inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing cistern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with bracket of cast iron so that it can be fixed on wall at specified height. The brackets shall conform to I.S. 775-1970.

**M-66. Cast iron flushing cistern.**

**66.1.** The cast iron flushing cistern shall be of 15 liters capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality free from any defects. The flushing cistern shall have outlet of 32 mm diameter. The lead pipe shall conform to I.S 404 (Part-I) - 1962; For fixing G.I. inlet pipes and overflow pipe 20 mm. dia. inlet and outlet shall be provided. The flushing cistern shall be provided with galvanised iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paint. The flushing cistern shall be fixed on two C I brackets. The C I brackets shall conform to I S 775-1970.

**M-67. Flush cock.**

**67.1.** Half turn flush cock (Heavy weight) shall be of gun metal chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant Indian Standard.

**M-68. Cast iron pipes and fittings.**

**68.1.** All soil water, vent and anti syphonage pipes and fitting shall conform to I S.1729-1964. The pipes shall have spigot and socket ends with head on spigot end. The pipes and fitting shall be true to shape smooth, cylindrical, their inner and outer surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pinholes or other imperfection and shall be neatly dressed and carefully fettled.

**68.2.** The end of pipes and fittings shall be reasonable square to their axis.

**68.3.** The size of cast iron pipes shall be of the diameter as specified in the description and shall be in lengths of 1.5 M., 1.8 M. including socket ends of the pipe unless shorter lengths are either specified or required at junctions etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

**68.4. Tolerances :**

**68.4.1.** The Standard weights and thickness of pipes shall be as shown in the following table

A tolerance up to minus 10 per cent may however be -allowed against these standard weights

Sr. No.	Nominal dia. of bore	Thickness	Overall	Weight of pipe	excluding ears
			1.5 m. long	1.8 m long	2.m long
1.	75 mm.	5.0 mm.	12.38 Kg.	16.52 Kg.	18.37 Kg.
2	100. mm.	5.0 mm.	18.14 Kg.	21.67 Kg.	24.15 Kg.

**68.4.2.** A tolerance up to minus 15 percent in thickness and 20 mm. length will be allowed For fittings tolerance in lengths shall be plus 25 mm. and minus 10 mm.

**68.4.3.** The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerance in weights and thickness shall be the same as for straight pipes.

**M-69. Nahni Trap**

**69.1.** Nahni trap shall be of cast iron and shall be sound and free from porosity or other defects which affect serviceability The thickness of the base metal shall not be less than 6.5 mm The surface shall be smooth and free .form craze, chips and other flaws or any other kind of defects which affect serviceability The size of nahni trap shall be specified and shall be of self cleaning design.

**69.2.** The Nahni trap shall be of-quality approved by the Engineer-in-charge and shall generally conform to the relevant Indian Standards.

**69.3.** The Nahni trap provide shall be with deep seal, minimum 50 mm. except at places where trap with deep seal cannot be accommodated. The cover shall be cast iron perforated cover shall be provided on the trap of appropriate size.

**M-70. Gully Trap**

**70.1.** Gully trap shall conform to I.S. 651-1980. It shall be some, free .from defects such as fire-cracks or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters.

**70.2.** The size of the gully trap shall be as specified in the item.

**70.3.** Each gully trap shall have one C.I. grating of square size corresponding to the dimensions, of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 mm. x 300 mm. the cover with frame inside dimensions 300 mm. x 300 mm. the cover and weighing not less than 4.53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

**M 71. Glazed Stone Ware pipe And Fittings**

**71.1.** The pipes and fittings shall be of best quality as approved, by the Engineer-m-charge. The pipe shall be of best quality manufactured from stone- ware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close, even texture, free from air blows, fire blisters, cracks and other imperfections, which affect the serviceability. The inner and outer surfaces shall be smooth and perfectly glazed. The pipe shall be capable to withstand pressures or 1.5 M lead without showing sign of leakage. The thickness of the wall shall not be less than 1/12th of the internal dia. The depth of socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 6 mm. around the pipe.

**71.2.** The pipes shall generally conform to relevant I S 651-1980.

**M-72. Wall Peg Rail**

**72.1.** The aluminum wall peg rail shall have three aluminum pegs approved quality and size. It shall be fixed on teakwood plank of size 450 mm x 75 mm x 20 mm. The teakwood shall be French polished or oil painted as specified.

**M-73. G.I. Water Spot**

**73.1.** The G.I. pipes of 40 mm dia shall be of medium quality and specials shall be of 'R' brand or equivalent brand of best approved quality



**73.2.** The pipe shall have length as required for the thickness of wall in which it is fixed and at outside end tee bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The water spout shall be provided as per detailed drawing or as directed

**M-74. Asbestos Cement pipe (A.C. pipe)**

**74.1.** The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1626-1980. Special like bends, shoes, cowls, etc. shall conform to relevant Indian Standards The intent of pipe shall have smooth finish, regular surface and regular internal diameter. The tolerance in all dimensions shall be as I.S. 1626-part-I-1980.

**M-75. Crydon Ball valve**

**75.1.** Ball valve of screwed type including polythene float and necessary level etc shall be of the size as mentioned in the description of item and shall conform to I.S 1703-1977

**M-76. Bitumen Felt For Water proofing And Damp Proofing**

**76.1.** Bitumen felt shall be on the fiber bases and shall be of type 2, self finished felt grade-2 and shall conform to I.S. 1322-1970

**M-77. Selected Earth**

**77.1.** The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the items If item does not indicate anything the selected earth shall have to be brought from outside.

**77.2.** The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way not to interfere with any construction all activities and in proper stacks.

**77.3.** When excavated material is to be used only selected stuff got approved from the Engineer-in-charge shall be used. It shall be stacked separately and shall, comply with all the requirements of selected earth mentioned above

**M-78. Barbed Wire**

**78.1.** The barbed wire shall be of galvanised steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of types-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two barbs shall be 75 mm unless otherwise specified in the item. The barbed wire shall be formed by twisting together two fine wires. One containing the barbs. The size of the line and point wires and barb spacing shall be as specified above. The permissible deviation from the nominal diameter of the line wire and point wire shall not exceed  $\pm 0.08$  mm

**78.2.** The barbs shall carry four points and shall be formed by twisting two point wires, each two turns tightly round one line wire making altogether four complete turns. The barbs shall have a length of not less than 13 mm and not more than 18 mm. The point shall be sharp and cut at an angle not greater than 35 degree of the axis of the wire forming the barbs.

**78.3.** The line and point wires shall be circular in section, free from scale and other defects and shall be uniformly galvanized. The line wire shall be in continuous length and shall not contain any welds other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

**78.4.** The lengths per 100 Kg. of barbed wire I.S. type I shall be as under:

Nominal 1000 meter Minimum 934 meter Maximum 1066 Meter.

## SECTION -4

### Excavation

#### **4.0.0. (A) Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead in loose or soft soil.**

##### **1.0. General**

**1.1.** Any soil which generally yields to the application of pickaxes and shovels, phawaras rakes or any such ordinary excavating implement or organic soil, gravel silt, sand turf loam, clay, peat etc., fall under this category

##### **2.0. Clearing the site**

**2.1.** The site on which the structure is to be built shall be cleared, and all obstructions loose stone, materials and rubbish of all kind bush wood and trees shall be removed as directed. The materials so obtained shall be property of the Government and shall be conveyed and stacked as directed within 50 m lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt

**2.2.** The rate of side clearance is deemed to be included in the rate of earth work for which no extra will be paid.

##### **3.0. Setting out**

After clearing the site the centre lines will be given, by the Engineer-in-charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply labours materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required and directed.

##### **4.0. Excavation**

The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately if not specified. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by removing and watering as required. No. earth filling will be allowed for bringing it to level. If by mistake or any excavation is made deeper or wider than, that shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation up to 1.5 m depth shall be measured under this item.

##### **5.0. Disposal of the excavated stuff**

**5.1.** The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers including ramming and watering etc.

**5.2.** The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead up to 50 M. and all lift.

##### **6.0. Mode of measurements & payment**

**6.1.** The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge. No payment shall be made for surplus excavation made in excess of above requirements or due to stopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

**6.2.** The rate shall be for a unit of one cubic meter

#### **4.0.0. (B): Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead in dense or hard soil.**

##### **1.0. Dense or Hard Soil**

Any soil which generally require close application of picks or jumpers or scarifiers to. loosen it stiff clay, gravel and stone etc. fall under this category.

##### **2.0. Workmanship**

The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation work shall be carried out in dense or hard soil,

##### **3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed

**3.2.** The rate shall be for unit of one cubic meter.

#### **4.0.0.(C): Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful**

**materials and disposing of the excavated stuff up to 50 meter lead in hard murrum.**

**1.0. Hard murrum.**

The hard murrum shall be clean of good binding quality and of approved quality obtained from approved quarries of disintegrated rocks which contain sons materials and natural mixture of clay of clarions origin The size of hard murrum shall not be more than 20 mm.

**2.0. Workmanship**

The relevant specification of item No. 4.0..0.(A) shall be followed except that the excavation work shall be carried in hard murrum.

**3.0. Mode of measurements & Payments**

**3.1.** The relevant specifications of item No. 4 0.0. (A) shall be followed.

**3.2.** The rate shall be for a unit of one cubic meter.

**4.0.0.(D): Excavation for foundation up to 1.50 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 meter lead-soft rock not requiring blasting.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation shall be earned out for foundation upon 1.5 M lift in soft rock not requiring blasting

**1.2.** The excavation in soft or disintegrated rock shall be carried out by crow bars, pickaxes or pneumatic drills or any other suitable means

**1.3.** If contractor desires to resort to blasting, he can do so with permission of the Engineer-in-charge but nothing extra shall be paid to him.

**1.4.** The materials available from soft excavation shall be properly stacked within 50 M. lead and 1 5 m. lift and shall be the property of department.

**1.5.** The classification of strata of the foundation soil shall be done by the Engineer-in-charge and shall be acceptable to the contractor

**1.6.** However this shall include the type of rock and boulder which may quarried or split with crow bars. Laterite and conglomerate also come under this category.

**2.0. Mode of measurements & Payment**

**2.1.** The relevant specifications of item No. 4.0 0 (A) shall be followed.

**2.2.** The rate shall be for a unit of one cubic metre.

**4.0.0.(E): Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful material and disposing of the excavated stuff up to 50 meter lead in hard rocks.**

**1.0. Workmanship**

**1.1.** The relevant specification of item No. 4.0.0.(A) shall be followed except that the excavation for foundation work shall be carried out in hard rock.

**1.2.** Excavation shall be done by blasting to the dimensions shown in the drawings or as directed. The blasting shall be carried out only with written permission of the Engineer-in-charge. All the laws, regulations etc,- pertaining to the precautions, acquisition, transport, landing and use of explosive shall be rigidly followed. The Magazine for the storage for the explosive shall be built to the design and specifications of explosive authority and located at the approved site No unauthorised persons shall be admitted into the magazine and when not in use it shall be kept securely locked No matches or inflammable materials shall be allowed in Magazine. The Magazine shall have an-effective lightning conductor. The rules of explosive 1940 revised from time 10 time shall be followed strictly for obtaining starting, handling, undertaking blasting work.

**1.3.** The contractor shall be responsible for damage to property, workmen public due to any accident due to use of explosives and operations

**1.4. Precautions**

**1.4.1.** The blasting operation shall remain in charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the detail of handling explosive and blasting operations. The blasting shall be carried out during fixed hours of the day, preferably during the mid-day lunch hours or at the close of the work as ordered in writing by the Engineer-in-charge. The hours of blasting shall be notified in advance to the people in the vicinity. All the charges shall be prepared by the man in charge only.

**1.4.2.** Red danger flags shall be displayed prominently in all direction during the blasting operations.

**1.4.3.** People except those who actually light the fuse shall be prohibited from entering into this area. The flags shall be stationed at 200 m. from the firing-site in all directions and all persons including workmen shall be excluded from the flagged area at least 1.0 minutes before the firing warning whistle being sounded for this purpose

**1.4.4.** During excavation in rock by blasting, the lowest 15 cm. of stratus shall be blasted with light charge so

as not to shatter or weaken the underlying rock on which the foundation will be actually laid. If excavation in rock is done to large widths and length than those shown on the drawings or as directed, no payment shall be made for such over break. If excavation is done to depths greater than shown on the drawings or directed, excess depth shall be made up with foundation grade concrete as directed at the contractor's cost.

**1.4.5.** The charged hole shall be drilled to the required depth and in suitable places when blasting is done with powder, the fuse cut to the required length shall be inserted in the holes and the powder dropped in. The powder shall be gently tamped with copper rod with rounded ends. The explosive powder shall then be covered with trapping materials which shall be tamped lightly out firmly. When blasting is done with dynamite and other high explosive, dynamite cartridges shall be prepared by inserting the square cut ends of fuse into the detonator, and finished with dippers at the open ends. The detonator should be gently pushed into the detonator and finished with dippers at the opened ends. The detonator should be gently pushed explosive. Bore holes shall be of such size that the cartridges can be easily passed down. The holes shall be cleared of all debris and explosive inserted. The space for about 20 cms, above the charge shall then be gently filled with dry clay pressed home and rest of tamping is with firmed any convenient materials gently packed with a wooden cover.

**1.4.6.** At a time not more than 10 such charge shall be prepared and fired. The man in charge shall blow a whistle in a recognised manner for cautioning the people. All the people shall then be required to move to number of explosions. He shall satisfy himself that all the charges have been exploded before allowing the workmen to go to the work site.

**1.4.7.** The contractor shall be fully responsible to strictly follow the prevailing rules and procedures regarding blasting procedures.

### **1.5. Misfire**

**1.5.1.** In case of a misfire the following procedure shall be observed :

**1.5.2.** Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charge.

**1.5.3.** If it is the blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at, about 45 cm. from the old and fired. This should blast the old charge. Should it not blast the old charge, the procedure shall be repeated till the old charge is blasted.

**1.5.4.** In case of charge of gelatins, dynamite etc, the man in charge shall gently remove the tamping and the primer with detonator and primer shall then be used to blast the charge. Alternatively the hole may be cleared of one foot of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 15 cm away and parallel to it. The man in charge shall report to the office all cases of misfire and cause of the same and what steps were taken in connection therewith.

**1.5.6.** If a misfire has been found to be due to defective or dynamite, the whole quantity in the box from which defective article was taken must be sent to authority as directed for inspection to ascertain whether all the remaining materials in the box are also defective or not.

### **1.6. Accidents:**

**1.6.1.** The contractor shall be solely responsible for any accident during the entire procedure of handling explosive and blasting and shall pay necessary compensation to persons affected or damage to lands or property etc, due to the blasting, without extra claims on the department.

### **1.7. Account:**

**1.7.1.** A careful and day to day account of explosives shall be maintained by the contractor in an approved manner and shall be open to inspection of the Engineer-in charge. Surprise visits may also be paid by the Engineer-in-charge to the storage and in case of any unaccountable shortage or unsatisfactory accounting, the contractor shall be liable to be penalised by forfeiture of part or whole of his Security Deposit or by cancellation of tender in which case he shall not be entitled for any compensation .-

### **1.8. Disposal of Excavated Materials:**

**1.8.1** No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5 m. or distance prescribed by the Engineer from the outer edge of excavation. All materials excavated shall remain the property of Government. Rate for excavation includes sorting out of useful materials and stacking them separately as directed within the specific lead. Materials suitable and useful for backfilling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purpose. The site shall be left clean of all debris on completion.

**1.8.2.** Disposal of excavated materials is subject to the following :

Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 50 meters as directed. Useful materials obtained from clearing site and excavation shall be stacked within a lead of 50 M beyond the building areas as directed. Materials suitable for back-filling shall be stacked at convenient places within a lead of 50 M. from the structure for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 50 M. and will be allowed to be used by the contractor on payment at rates laid down in the contract or if not so laid down, at scheduled rates of the Division or at a mutually agreed rates if there are no such rates in the schedule of rates.

**1.8.3.** If surplus materials are required to be conveyed beyond 50 M, conveyance will be paid for under a separate item

**2.0. Mode of measurements & Payment**

**2.1.** The work shall be measured for the work limited to the dimensions shown on drawings or directed Excavation to dimension in excess of the above will not be measured or paid for and if so ordered by the Engineer the contractor shall have to fill up the excess depth with cement concrete specified for foundation without extra payment.

**2.2.** Driving of sounding bars, drill holes to explore the nature of substratum up to a total length of meter distributed in 2 or 3 places in each foundation if necessary, will be considered incidental work and will not be paid for separately.

**2.3.** Removal of slips and blows in the foundation trenches will not be measured or paid for.

**2.4.** If it is necessary in the opinion of the Engineer-in-charge to carry foundation below the levels shown on the plans, the excavations for the 1.5 M of addition depth will be included in the quantity for the particular classification and will be paid for as extra at rate to be decided under the general conditions of contract unless, the contractor is willing to accept payment as tendered rates.

**2.5.** The rate shall be for a unit of one cubic meter

**4.0.0.1.(A): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 M. lead-loose or soft soil.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out to loose or soft soil with lift 1.5 M. to 3.0 M.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 4.0.0.(A) shall be followed.

**2.2.** The excavation work of from 1.5 M. to 3.0 M. shall be measured under this item

**2.3.** The rate shall be for a unit of one cubic meter

**4.0.0.1.(B): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in Dense or Hard soil.**

**1.0. Workmanship**

The relevant specifications of item No. 4.0.0.(B) shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0 M. lift in dense or hard soil.

**2.0 Mode of Measurement & Payment**

**2.1** The relevant specifications of item No.4.0.0.(A) shall be followed.

**2.2.** The excavation work from 1.5 to 3.0M shall be measured under this item

**2.3.** The rate shall be for a unit of one cubic meter.

**4.0.0.1.(C): Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in Hard murrum.**

**1.0. Workmanship**

**1.1.** the relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M lift in hard murrum.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed.

**2.2.** The excavation work from 1.5 M to 3.0 M shall be measured under

**2.3.** The rate shall be for unit of one cubic meter

**4.0.0.1.(D): Excavation for foundation for depth 1.5 M. to 3.0 M. including sorting out and stacking**

of useful materials and disposing of excavated stuff up to 50 M. lead in soft rock not required blasting.

**1.0. Workmanship**

The relevant specifications item No. 4.0.0.(D) shall be followed except that the excavation work shall be earned out from 1.5 M. to 3.0 M. lift in soft rock not required blasting.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No 4.0.0.(A) shall be followed.

2.2. The excavation work from 1.5 M, to 3.0 M lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic meter

**4.0.0.1.(E): Excavation for foundation for depth 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 50 M. lead in hard rock**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4.0.0.(E) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M. lift in hard rock.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation-work from 1.5 M, to 3.0 lift shall be measured under this item

2.3. The rate shall be for a unit of cubic meter

**4.0.0.2. (A): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff Upton 50 M. lead in loose or soft soil.**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4.0.0.(A) shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0. M. lift in loose or soft soil.

**2.0. Mode of Measurement & Payment**

2.1. Relevant specifications of item No. 4.0.0.(A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic meter.

**4.0.0.2.(B): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting our and stacking of useful materials and disposing of the excavated stuff up to 50 M. lead in Dense or Hard soil.**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 4 0.0.(B) shall be followed except that the excavation work shall be carried out from 3.0.m. to 5.0.m. lift in Dense or Hard soil.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed:

2.2. The excavation work from 3.0. M. to 5,0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.0.0.2.(C): Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful material and disposing of the excavated stuff up to 50 M. lead in Hard murrum.**

**1.0. Workmanship**

1.1. The relevant specifications items No. 4 0.0. (C) shall be followed except that the excavation work shall be carried out from 3.0 m to 5 0 M in Hard murrum.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 4.0.0.(A) be followed.

2.2. The excavation work from 3.0 M. to 5.0. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.0.0.2.(D) Excavation for foundation for depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff up to 50 M. in soft rock not required blasting.**

**1.0. Workmanship**

1.1. The relevant specification-of item NO 4 0.0.(D) shall be followed except that the excavation work shall be carried out from 3.0. M to 5.0. M soft rock not requiring blasting

**2.0. Mode of Measurement & Payment**

- 2.1. The relevant specification of item No. 4.0 O.(A) shall be followed.
- 2.2. The excavation work from 30 M. to 50 M. lift shall be measured under this item.
- 2.3. The rate shall be for a unit of one cubic meter
- 4.0.0.2.(E): Excavation for foundation depth from 3.0 M. to 5.0 M. including sorting out and stacking of useful material land .disposing of the excavated stuff up to 50 M. lead in Hard rock.**
  - 1.0. Workmanship**
    - 1.1. The relevant specifications of item No 4.0.0.(E) shall be followed except that the excavation work shall be earned out from 3.0. M. to 5.0 M in hard rock
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specification of item No. 4.0.0.(A) shall be followed.
    - 2.2. The excavation work from 3.0. M to 5.0 M. lift shall be measured under this item.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(A): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful material disposing of the excavated stuff up to 50 M. lead in loose or soft soil.**
  - 1.0. Workmanship**
    - 1.1. The relevant specification of item. No 4 0.0 (A) shall be followed except that the excavation work shall be earned out from more than 50 M. lift in loose or soft soil
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed
    - 2.2. The rate shall be paid extra over and above the rate of item No. 4 0 0.2.(A) for carrying' out excavation work for additional depth from 5.0 M. and above.
    - 2.3. The rate shall be for a unit of cubic per meter
- 4.0.0.3.(B): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting and stacking of useful materials disposing of excavated stuff up to 50 M. lead in Dense or Hard soil.**
  - 1.0 Workmanship**
    - 1.1. The relevant specifications of item No. 4.0.0.(B) shall be followed except that the excavation work shall be carried out from more than 5.0. M. lift in dense or hard soil.
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4 0.0 (A) shall be followed.
    - 2.2. The rate shall be paid extra over and above the rate of item No 4 0.0 2.(B) for carrying out excavation work for additional depth from 50 M. and above.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(C): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff up to 50 M. lead in Hard murrum.**
  - 1.0. Workmanship**
    - 1.1. The relevant specification of item No. 4.0.0 (C) shall be followed except that the excavation work shall be carried out from more than 50 M. lift in hard murrum.
  - 2.0. Mode of Measurements & Payment**
    - 2.1. The relevant specification of item No. 4.0.0.(A) shall be followed.
    - 2.2. The rate shall be paid extra over and above the rate item No 4.0.0 2.{C}for carrying out excavation work for additional depth from 50 M. and above.
    - 2.3. The rate shall be for a unit of one cubic meter.
- 4.0.0.3.(D): Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff up to 50 M. lead in soft rock not requiring blasting.**
  - 1.0. Workmanship**
    - 1.1. The relevant specifications of Item No. 4.0.0.(D) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in soft rock not requiring blasting.
  - 2.0. Mode of Measurement & Payment**
    - 2.1. The relevant specifications of item No. 4.0.0.(A) shall be followed.

**2.2.** The rate shall be paid extra over and above the rate of item No. 4.0.0.2.(D) for carrying out excavation work for additional depth from 5.0.(M) and above.

**2.3.** The rates shall be for a unit of one cubic meter per meter

**4.0.0.3.(E):** **Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful material disposing of excavated stuff up to 50 M. lead in hard rock.**

**1.0. Workmanship**

**1.1.** The relevant specification of item No 4.0.0(E) shall be followed except that the excavation work shall be carried out from more than 50 m. lift in hard rock

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No.4.0 O.(A) shall be followed.

**2.2.** The rates shall be paid extra over and above the rate of item No. 4.0.0 2.(E) for carrying out excavation work for additional depth from 5.0. M. and above.

**2.3.** The rate shall be unit of one cubic meter per meter

**4.12.** **Filling available excavated earth (excluding rock) in trenches, plinth sides of foundations, etc., in layers not exceeding 20 CM. depth, consolidating each deposited layer by ramming and watering.**

**1.0. Workmanship**

**1.1.** The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.

**1.2.** As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris, brick bats: mortar dropping etc., and filled with earth in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid The earth shall be rammed with iron rammers where feasible and with the but ends of crow-bars, where rammer cannot be used.

**1.3.** The plinth shall be similarly filled with earth in layers not exceeding 20 cms. adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

**1.4.** The finished level of filling shall be kept to shape intended to be given to floor.

**1.5.** In case off large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required, shall also be as specified.

**1.6.** The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no circumstances black cotton soil be used for filling the plinth.

**2.0. Mode of Measurements & Payment**

**2.1.** The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

**2.2.** The rate shall be for a unit of one cubic meter.

**4.24.** **Filling in plinth with sand under floors including watering, ramming consolidating and dressing etc. complete.**

**1.0. Materials**

**1.1.** Sand shall conform to M 6

**2.0. Workmanship**

The relevant specifications of item No. 4.12 shall be followed except that sand shall be filled in under floors, including watering, ramming, consolidating and dressing etc , complete.

**3.0. Mode of Measurements & Payment**

**3.1.** The relevant specifications of item No. 4.12 shall be followed.

**3.2.** The rate includes cost of collecting, carting sand with all lead and labour for filling the same in plinth under floors.

**3.3.** The rate shall be for a unit of one cubic meter.

**4.0.0.4.** **Filling in foundation arid plinth with murrum or selected soil in layers of 20 cm. thickness including watering, ramming and consolidating etc., complete.**

**1.0. Materials**

**1.1.** Murrum shall be clean, of good binding quality and of approved quality obtained from approved pots/ quarries of disintegrated rocks which contain silicon material and natural mixture of clay of clarions origin. The size of murrum shall not be more than 20 mm



**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 4.12 shall be followed except that the murrum or selected soil shall be filled in foundations and plinth in 20 cms layer including consolidating, ramming, watering, dressing etc. complete

**3.0. Mode of Measurements & Payment**

**3.1.** The relevant specifications of item No. 4.12 shall be followed-

**3.2.** The rate includes cost of collecting and carting murrum / or selected earth of approved quality with all lead and labour required for filling in trenches and plinth.

**3.3.** Rate shall be for a unit of one cubic meter.

**4.0.0.5. Filling in foundation and plinth with brick-bats / chhara in layers of 20 cms. thickness including watering, ramming and consolidating etc. complete.****1.0. Materials**

Brick bats shall conform to M.14

**2.0. Workmanship**

The relevant specification of item No. 4.12 shall be followed except that brick bats of-burnt bricks shall be filled in foundation and plinth in 20 cms layer including watering, ramming, consolidating etc.,\*complete.

**3.0. Mode of Measurements & Payment**

**3.1.** The relevant specification item No. 4 12 shall be followed.

**3.2.** The rate includes cost of collecting and carting brick bats/chhara with all lead and labour required filling in trenches and plinth.

**3.3.** The rate shall be for a unit of one cubic meter

**4.27. Boring holes 3.5 M. deep in ordinary soil (for cast in situ piles) and getting out the soil disposal of the surplus excavated soil as directed within a lead of 50 M. for following diameter for piles, (i) 200 mm. (ii) 250 mm, (iii) 300 mm.****1.0. Workmanship**

**1.0.** The ground shall be roughly leveled and after making the position of piles, the holes shall be bored with a spiral angle to the 3.5 M. depth and specified diameter using boring guide.

**2.0.** The bore holes shall be truly vertical and uniform bore through out of specified diameter, After boring to the required depth, the bore shall be cleared off the loose soil and disposal of surplus excavated stuff as directed within a lead of 50 M. . 2.0? Mode of Measurement & Payment

**2.1.** The rate for boring holes shall include :

(a) roughly leveling the ground in positions where piles are to be provided (b) Making the position of piles by pegs and boring guide and also for shifting of boring guide. (c) Bailing out water, if any met with during boring, (d) Disposal or surplus excavated soil within a lead of 50 M and'(e) All tools, plants, equipments and labour required for satisfactory completion or. work.

**2.2.** The rate shall be for a unit of one Number.

**4.28. Extra for under ramming inside the bore holes for under rammed piles of following nominal diameter :(i) 200 mm. (ii) 250, (iii) 300 mm.****1.0. Workmanship**

The relevant specifications of item No. 4.27 shall be followed except that after boring to the required depth, the bore shall be enlarged at the bottom by an under rammer 2 to 2 1/2 times the diameter of the bore as directed It shall be ensured that the bore for the pile shall be enlarged to the correct diameter.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specification of item No. 4.27 for under reaming the piles.

**2.2.** The rate shall be paid extra over and above the rate of item No. 4.27 for under ramming the piles.

**2.3.** The rate shall be for a unit of one number.

**SECTION 5****Plain & RCC Work**

- 5.1.6. Providing and laying in foundation and plinth/under floors lime concrete with hard broken aggregate 40 mm. nominal size and 40% mortar comprising of 1 Lime putty : 2 fine sand and curing complete excluding cost of form work.**

**1.0. Materials**

Water shall conform to M-1. Sand shall conform to M-6 Lime shall conform to M-2. Graded aggregate 40 mm. nominal size shall conform to M-12

**2.1. General**

**2.1.1.** Before starting the concrete the bed of the foundation trenches shall be cleared of all loose materials and watered and rammed as directed.

**2.2. Proportion of Mix**

**2.2.1.** The proportion of lime, sand and aggregate shall be specified in the item of the work and shall be measured by volume.

**2.2.2.** The lime mortar shall consist of proportion of 1 lime putty : 2 sand by volume. The lime mortar shall be prepared by wet process. Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in even layer and ground for 180 revolutions with sufficient water. The water shall be added as required during grinding and care shall be taken not to add more water so that it will bring the mixed materials to a consistency of stiff paste, thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

**2.2.3.** Lime mortar shall be kept, protected from sun and rain till used-up, covering it by tarpaulin or open sheds.

**2.2.4.** All the lime mortar shall be used as soon as possible after grinding. It should be used on the day on which it is prepared but in no case mortar- made earlier than 36 hours shall be permitted for use.

**2.3. Mixing:**

**2.3.1.** The concrete shall be mixed in mechanical mixer. Mixing shall be continued until there is uniform distribution of the materials and the mass is uniform in colour and consistency but in no case mixing shall be done for less than 2 to 3 minutes.

**2.4. Laying & Compacting:**

**2.4.1.** The concrete shall always be used while quite fresh It shall be laid (not thrown) in layers not exceeding 150 mm. in thickness and shall be well and quickly rammed with wooden or iron rammers, till the required compaction is achieved. The concrete laid shall not be of too fluid consistency. After it has been mixed no more water shall be added, but the surface during and after compaction shall be kept damp. In laying consecutive layers, the layer cast shall be well watered and made rough before the upper layer is laid. The concrete shall be kept continuously wet for period of 7 days from the date of placing of until it- is built over whichever is more.

**2.5. Mode of Measurement & Payment :**

**2.5.1.** The concrete work shall be measured in length, breadth and depth as specified on drawing or as directed, correct up to nearest centimeter and cubical content shall be worked out nearest up to two places of decimals.

**2.5.2.** The rate shall be for unit of one cubic meter.

- 5.1.8. Providing and laying in foundation and plinth/under floors lime concrete with graded bricks aggregate 40 mm. nominal size and 40% mortar comprising of 1 lime putty : 2 fine sand and curing complete, excluding cost of form work.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Lime mortar shall conform to M-10. Brick bats aggregate 40 mm. nominal sizes shall conform to M-14.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 5.1.6. shall be followed except that brick aggregate shall be used instead of graded stone aggregate.

**3.0. Mode of Measurements & Payment**

**3.1.** The concrete work shall be measured in length, breadth and depth as specified in drawing or as directed. Correct up to nearest centimeter and cubical content shall be worked out up to two places of decimals.

**3.2.** The rate shall be for a unit of cubic meter.

**5.3.2.(A) Providing and laying cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 40 mm. nominal size) and curing complete excluding the cost of form work in foundations and plinth.**

**1.0. Materials**

1.1. Water shall conform to M-1. Cement shall conform to M-3 Sand shall conform to M-6. Stones aggregate 40 mm. nominal size shall conform to M-12.

**2.0. Workmanship**

**2.1. General**

2.1.1. Before stating concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed

**2.2. Proportion of Mix:**

2.2.1. The proportion of cement, sand and coarse aggregate shall be one part of cement. 3 parts of sand and 6 parts of stone aggregates and shall be measured by volume.

**2.3. Mixing:**

2.3.1. The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case "of break-down of machineries and in the interest of the work, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency, However in such case 10% more cement than otherwise period 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

**2.4. Transporting & Placing the Concrete:**

2.4.1. The concrete shall be handed from the place, of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final-position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.

2.4.2. The concrete shall be laid in layers of 15 cms. to 20 cms.

2.5.1. The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.

**2.6. Curing:**

2.6.1. After the final set, the concrete-shall be kept continuously wet if required by pounding for a period of not less than 7 days from the date of placement.

**2.7. Mode of Measurement & Payment:**

2.7.1. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plan or as directed.

2.7.2. The rate shall be for a unit of one cubic meter.

**5.3.3.(A) Providing and laying cement concrete 1:4:8 (1 cement: 4 coarse sand : 8 graded stone aggregate 40 mm. nominal size) and curing complete, excluding cost of form work in foundations and plinth.**

**1.0. Materials**

1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6 stone aggregate 40 mm. nominal size shall conform to M-12.

**2.0. Workmanship**

2.1. Relevant Specifications of item No. 5.3.? shall be followed except that cement concrete shall be mixed in the preparation of 1:4:8 instead of 1:3:6 by volume.

**3.0. Mode of measurement and payment**

3.1. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed

3.2. The rate shall be for a unit of one cubic meter

**5.3.14.(A) Providing and laying cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 crushed stone aggregate 20 mm. nominal size) and curing complete including cost of form work in wall caps/coping.**

**1.0. Material & Workmanship**

1.1. The relevant specification of item No. 5.3.2. (A) shall be followed except that the work shall be carried out for coping and wall caps, except the stone aggregate 20 mm. nominal size shall be used. The concrete work of wall caps/coping.

**2.0. Mode of measurements and payment**

2.1. The relevant specification of item No. 5.3.2. (A) shall be followed except that the rate includes cost of necessary form work.

- 2.2. The rate shall be for a unit of one cubic meter.
- 5.3.3. Providing and laying brick bats cement 1:4:8 (1 cement : 4 coarse sand : 8 graded bricks bats), and curing complete excluding the cost of form work in foundation and plinth.**
- 1.0. Materials**
- 1.1. Water shall be conform to M-1 Cement shall conform to M-3. Sand shall conform to M-6 Brick bat shall conform to M-14
- 2.0. Workmanship**
- 2.1. The specification of this item shall be followed as per item No 5.3.14 (A) except that the proportion of brick bat cement concrete shall be 1 4:8 i e 1 part of cements 4 part of coarse sand and 8 parts of graded brick bat by volume, using graded brick bat as coarse aggregate instead of stone aggregates
- 3.0. Mode of Measurements & Payment**
- 3.1. The concrete work shall be measured in length, breadth and depth as specified on drawing limiting dimensions to those specified on drawings or as directed.
- 3.2. The rate shall be for a unit of one cubic meter.
- 5.3.4.(A) Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm. nominal size) and curing complete, excluding the cost of form work, for foundation and plinth.**
- 1.0. Materials**
- 1.1. Water shall conform to M-1. Cement shall conform to M-3 Sand shall conform to M-6 Stone aggregate 40 mm nominal size shall conform to M-12.
- 2.0. Workmanship**
- 2.1. The relevant specification of item No. 5.3.2. (A) shall be followed for the work except that the work is to be carried out in cement concrete 1:5:10
- 3.0. Mode of Measurement & Payment**
- 3.1. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed.
- 3.2. The rate shall be for a unit of one cubic meter.
- 5.3.8.(A) Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bats 10 mm. nominal size) and curing complete excluding, cost of form work in foundation and plinth.**
- 1.0. Materials**
- 1.1. Water shall conform to M-1 Sand shall conform to M-6 Cement shall conform to M-3. Brick bats shall conform to M-14.
- 2.0. Workmanship**
- 2.1. The relevant specification of item No 5.3.4 shall followed except that brick bats aggregate shall be used instead of stone aggregate.
- 3.0. Mode of Measurement & Payment**
- 3.1. The relevant specification of item No 5.3.4 shall be followed
- 3.2. The rate shall be for a unit of one cubic meter
- 5.3.2.(B) Providing and laying brick bat cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded-brick bats) and curing complete excluding cost of form work in foundation and plinth.**
- 1.0. The specification of item No 5 3.2 (A) shall be followed except that the brick bats shall be used as coarse aggregate instead of stone aggregates.
- 2.0. Mode of Measurement & Payment**
- 2.1. The relevant specification of item No 5.3.5 (A) shall be followed for mode of measurements and payment except that it excludes the cost of form work.
- 2.2. The rate shall be for a unit or one cubic meter.
- 5.4.18. Providing throating or plaster drip and molding to R.C.C. Chhajjas.**
- 1.0. Materials**
- Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6 Cement mortar shall conform to M-11
- 2.0. Workmanship**
- 2.1. The work shall be carried out as directed. The proportion of mix for finishing shall be in C.M. 1:2 by volume. Curing shall be done for not less than 7 days. The work shall be carried out in best workman like manner. The throating or plaster drip and mounding shall be one centimeter in thickness.

**5.7.5. Extra for providing and mixing Water Proofing material in cement concrete in mix proportions recommended by the manufacturers.**

**2.0. Workmanship**

**2.1.** The proportions of materials for the cement concrete shall be mentioned with the specifications of that item. The quantity of water proofing materials to be added and the method of addition shall be as specified by manufacturers.

**2.2. Mixing:**

**2.2.1.** The mixing of the water proofing materials in cement, water or concrete shall be done according to the specifications of the manufacture.

**3.0. Mode of Measurements and Payment**

**3.1.** The payment is extra over and above the rate of concrete for mixing water proofing proper.

**3.2.** The rate shall be for a unit of one lithe or kg. per quintal of cement in which water proofing material is added.

**5.7.1. Providing and laying damp proof course 25 mm. thick cement concrete 1:2:4 (1 cement : coarse sand :4 stone aggregate 10 mm. nominal size) and curing complete.**

**1.0.** The specifications of item No. 5.3.13. (A) of ordinary concrete with or without reinforcement shall be followed except that the size of the stone aggregate shall be 10 mm nominal size and the concrete work shall be carried out in 25 mm. thick damp proof course

**2.0. Mode of measurements & payment**

**2.1.** The rate includes cost of all materials and labour required to complete the item

**2.2.** The rate shall be for a unit one sq. meter.

**5.3.13. Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work in (A) foundation and plinth, (B) Independent piers, columns and pillars up to floor two level.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Graded stone aggregate 20 mm nominal size shall conform to M-12.

**2.0. General**

**2.1.** The concrete mix is not required to be designed by preliminary testes. The proportion of the concrete mix shall be 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) by volume concrete work shall have exposed concrete surface or as specified in the item

**2.2.** The designation ordinary M-100, M-150m M-200, M-250 specified as per I.S. correspond approximately to 1:3:6, 1:2:4, 1:1:1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively

**2.3.** The ingredients required for ordinary concrete containing one beg of cement of 50 kg. by weight (0.0342 Cu M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs. of cement maximum
1	2	3	4
M-100 (1:3:6)	300 Liters	Generally 1:2 for line aggregate to coarse aggregate by volume 160 but subject to an upper limit of 1:1.1/2 and lower limit	34 Liters
M-150 (1:2:4)	220 Liters		32 Liters
M-200 (1:1.1/2:3)			30 Liters
M-250 (1:1:2)	100 Liters		1:3 27 Liters

**2.4.** The water cement ratios shall not be more than specified in the above table. The cement content of the mix specified in the table shall be increased if the quantity of water in mix has to be met eased to overcome the difficulties of placements and compaction so that the water-cement ratio specified in the table is not exceeded.

**2.5.** Workability of the concrete shall be controlled by maintaining a water -cement-ratio that is found to give a concrete mix which is just sufficient wet to be placed and compacted without difficulty with the means available.

**2.6.** The maximum size of course aggregate shall be as large as possible within the limits specified but in no case greater than one forth of the minimum thickness of the member provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

**2.7.** For reinforced concrete work; coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

**2.8.** For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bar or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

**2.9.** Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be so important, and the nominal maximum size may some times be as great as or greater than the minimum cover.

**2.10.** Admixture maybe used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

### **3.0. Workmanship**

**3.1.** Proportioning : Proportioning shall be done by volume, except which shall be measured in terms of bags of 50 kg. weight, the volume of one such bag being taken as 0.0342 cu. meter Boxes of suitable size shall be used for measuring sand aggregate. The size of boxes (internal) shall be 35 x 25 cms. and 40 cms deep while measuring the aggregate and sand the boxes shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp saner, allowances for bulk age shall be made.

### **3.2. Mixing :**

**3.2.1.** For all work, concrete shall be mixed in a mechanical mixed which along with other accessories shall be. kept in first class working condition and so maintained throughout the construction Measured quantity of aggregate, sand and cement required for each batch shall be poured into the claim of the mechanical mixer while it is continuously running. After half a minute of dry mixing measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after-oil ingredients have been put into the mixer.

**3.2.2.** When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified

**3.2.3.** Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate Mixing plant shall be thoroughly cleaned before changing from one type of cement to another

### **3.3. Consistency:**

**3.3.1.** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with I.S. 1199-193. The slump of 10 mm. to 25 mm shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

### **3.4. Inspection:**

**3.4.1.** Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men machinery materials and for results obtained immediately before concreting all forms shall be thoroughly cleaned.

**3.4.2.** Centering design and its erection shall be got approved from the engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber kapachi or metal pieces shall not be used for this purpose.

### **3.5. Transporting and laying:**

**3.5.1.** The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All work shall be cleaned and made free from standing water dust, snow or ice immediately before placing of concrete. No concrete

shall be placed in any part of the structure until the approval of the engineer-in-charge has been obtained.

**3.5.2.** Concreting shall proceed continuously over the area between construction joints. Fresh concrete proper contraction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the engineer-in-charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

**3.5.3.** Unless otherwise agreed to by the Engineer-in-charge concrete shall be dropped in to place from a height exceeding 2 meters. When trucking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all lateness shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

**3.5.4.** All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the even of breakdowns. Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

### **3.6. Curing:**

Immediately after compaction, concrete weather including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking has Sian or other similar absorbent material approved, soon after the initial set, and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

### **3.7. Sampling and testing of concrete:**

**3.7.1.** Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days of 28 days as per requirements in accordance with I.S. 526-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work.	No of samples	Quantity of concrete in the works	No of samples
1-5 cmt.	1	16-30 cmt.	3
6-15 cmt.	2	31-50 cmt.	4
51 and above	4+ one additional for each additional 50 mm. or part thereof.		

**Note :** At least one sample shall be taken from each shift, Ten test specimens shall be made from each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

**3.7.2.** The average of the group of cubes cast for each day shall not be less than the specified cube strength of 150 K/g Cm<sup>2</sup> at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the Proportions given for a particular grade shall not, however be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

### **3.8. Stripping:**

**3.8.1.** The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time of removal of form work, due consideration shall be given to local conditions,

character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperatures are above 20°C) and where ordinary concrete is used, forms may be struck after expiry or periods specified in item No.9.1 (A) for respective item of form work.

**3.8.2.** All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soft and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal tiles are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge. After removal of form work and shutting, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

**3.8.3.** Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar, all fins, caused by form joints, all cavities produced by the removal of form tiles and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in proportions used in the grade of concrete that is being furnished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surface which are pointed shall be kept moist for a period of 24 hours. If rock pockets/honeycombs in the opinion of the Engineer-in-charge are of such an extent or character as to effect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of structure affected.

#### **4.0. Mode of Measurement & Payment**

**4.1.** The consolidated cubical contents of concrete work as specified in item shall be measured. No deduction shall be made for

(a) Ends of dissimilar materials such as joints, beams, posts, girders, falters, purling trusses, corbels and steps etc., up to 500 Sq. Cm. in section.

**4.2.** The rate includes cost of all materials labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of specified strength. The rate excludes the cost of form work.

**4.3.** The rate shall be for a unit of one cubic meter.

**5.4.1. Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work and reinforcement for reinforced work in : (A) Foundations, footing base of columns and mass concrete. (C) Slabs, landings, shelves, balconies, lintels, beams, girders and cantilever up to floor two level. (D) Columns, pillars, pots, and struts up to floor up to floor two level (E) Staircase up to floor two level (K) Vertical and horizontal fins up to floor two level.**

#### **1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.3.13 shall be followed except that the work shall be carried out for reinforced concrete work for work as specified in item 1.2. In addition, the following stipulations shall be followed for:

(a) The bars shall be kept in position by the following methods :

(i) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement. In case of cantilevered or doubly reinforced beams or slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 meter centers.

(ii) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, the templates shall be removed after concreting has been done below it. The bars may also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

**1.2.** AH bars projecting from pillars, columns, beams, slabs etc, to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.

#### **2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 5.3.13 shall be followed.



- 2.2. The volume Occupied by reinforcement shall not be deducted from R.C.C. work.
- 2.3. The rate shall be for a unit of one cubic meter.
- 5.4.4. **Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) for reinforced concrete chhajjas not exceeding 10cms. thickness up to floor two level including finishing the exposed surface with cement mortar 1:3 (1 cement : 3 fine sand) to give a smooth and even surface, centering and form work and curing complete excluding cost of reinforcement.**
- 1.0. **Materials & Workmanship**
- 1.1. The cement mortar shall conform to m-11.
- 1.2. The relevant specification of item No. 5.3.13 and 5.4.1 shall be followed except that the work shall be carried out for reinforced concrete chhajjas not exceeding 10 cms. in thickness.
- 1.3. The specifications for form work and centering shall be as per item No. 9.1.
- 1.4. The finishing work in cement mortar 1:3 (1 cement : 3 fine sand) shall be carried out as per specifications of item No. 17.49 (I), Before the plastering is done, the surface of the concrete shall be raked for proper bond.
- 2.0. **Mode of measurements & payment**
- 2.1. The relevant specification of item No. 5.3.13 and 5.4.1 shall be followed except that the work of chhajjas up to 10 cms. shall be earned out including centering form work and finishing the surface with cement mortar 1:3 ( 1 cement : 3 fine sand).
- 2.2. The rate shall be for a unit of one cubic meter,
- 5.4.10. **Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.**
- 1.0. **Materials**
- 1.1. Mild Steel bars shall conform to M-18. Mild steel binding wires shall conform to M-21.
- 2.0. **Workmanship**
- 2.1. The work shall consist of furnishing and-placing reinforcement to the shape and dimensions shown as on the drawings or as directed
- 2.2. Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.
- 2.3. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport-or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending Unless otherwise specified a "U" type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.
- 2.4. All the reinforcement bars shall lie accurately placed in exact position shown on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size, and by using stay blocks or metal chair spacers, metal hangers supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed Pieces of broken stone or brick and wooden blocks shall not be used Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars protruding from concrete and to which other bars are to be lapped and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 2.5. Bars crossing each other where required shall be secured by binding wire (annealed) of size not less than 1 mm. in such a manner that they do not slip over each other at the time of fixing and concreting.
- 2.6. As far possible, bars of full length shall be used. In case this is not possible. Over lapping of bars shall be done as directed When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick

twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending moment is maximum.

**2.7.** Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be jointed by couplings which shall have a cross-section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226.

**2.8.** When permitted or specified on the drawings, joints of reinforcement bars shall be welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, stains, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform to I.S. 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.

**3.0. Mode of Measurements & Payment**

**3.1.** For the purpose of calculating consumption, wastage shall not be permitted beyond 5 percent. Excess consumption over 5% will be charged at penal rate.

**3.2.** Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per M-18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.

**3.3.** The rate for reinforcement includes cost of steel binding wires, its carting from Department store to work site, cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars.

**3.4.** The rate shall be for a unit of One Kg.

**5.4.11. High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.**

**1.0. Materials**

**1.1.** Cold twisted steel bars (high yield strength deformed bars) shall conform to M.19. Mild steel binding wires shall conform to M-21.

**2.0. Workmanship**

**2.1.** The specifications of item No. 5.4.10 shall be followed except that the cold twisted steel bars shall be used with or without hooks at the ends. Deformed bars without hooks shall, however, comply with relevant anchorage requirements.

**3.0. Mode of Measurement & Payment**

**3.1.** The relevant specifications of item No. 5.4.10 shall be followed.

**3.2.** The rate shall be for a unit of One kg.

**5.4.13. Extra for additional lift of concrete for all R.C.C. work above floor two level excluding cost of reinforcement.**

**1.0. Materials & Workmanship**

The relevant specifications for item No. 5.4.1 shall be followed for the work except that the R.C.C. work shall be done for ground floor i.e. above plinth level to first floor level.

**2.0. Mode of Measurement & Payment**

**2.1.** The relevant specifications of item No. 5.4.1 shall be followed except that rate shall be for extra lift above plinth to floor two level over and above the rate of concrete at floor two level.

**2.2.** The rate shall be for a unit of one cubic meter per floor.

**5.4.13.(A) Extra for additional lift of reinforcement steel for all R.C.C. work above floor two level.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.4.10 as may be applicable, shall be followed except that the work shall be carried out above floor two level for each floor.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 5.4.10 or 5.4.11 as may be applicable shall be followed except

that the work shall be carried out above floor tow level.

**2.2.** The rate shall be for a unit of one kg. per floor.

**5.6.2.** **Providing up to floor two level precast cement concrete or grill 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm: nominal size) reinforced with 1.6 mm. dia mild steel size wire including roughening, cleaning fixing and finishing in cement mortar 1:3 and curing complete.**

**(A) 50 mm. thick (B) 40. mm. thick (C) 25. mm. thick (E) 100 mm. thick.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Mortar shall conform to M-11. Aggregates shall conform to M-12. Mild steel wire shall conform to M-21. Shattering shall conform to M-26.

**2.0. Workmanship**

It shall be cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm. nominal size), reinforced with 1.6. mm. dia mild steel wire unless otherwise specified. The thickness of the jali shall be as specified in the item. The jali shall be set in position true to line and level before the jambs sills and soffits to the opening are plastered. It shall then be properly cemented with cement mortar 1:3 (1 cement : 3 sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered gripping the jali uniformly on all sides.

**3.0. Mode of measurement of payment**

**3.1.** The item shall be measured in square meter.

**3.2.** The rate shall be for a unit of one square meter,

**5.8.1.** **Providing and laying controlled concrete M-150 and curing complete excluding the cost of form work and reinforcement for reinforced concrete work in:**

**(A) Foundation, footings, base of columns, and mass concrete, (B) Walls from top of foundation/level up to floor two level. (C) Slabs, pillars, posts and struts, up to floor two level (E) Staircase up to floor two level. (F) Vertical and horizontal fins up to floor two level.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8 Course aggregate shall conform M-12.

**2.0. General**

**2.1.** The relevant specification of item No. 5.4.1. of ordinary concrete shall be followed except that the concrete mix shall be designed form preliminary tests. The proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350 & M-400 with prefix controlled added to it. The letter M refers to mix and the numbers specify 28 days works cube compressive strength of 150 mm. cubes of the mix expressed in Kg./Cmt.

**2.2.** The proportion of cement, sand and coarse aggregate shall be determined of weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under:

Grade Concrete	Compressive strength of 15 cms. cubes in Kg./Cmt. at 28 days, conducted in accordance with I.S. 516-1959. Preliminary test Min.	Work test Min.
M-1 50	200	150
M-200	260	200
M-250	320	250
M-300	380	300
M-350	440	350
M-400	500	400

In all cases, the 28 days compressive strength specified in above be the criteria for acceptance or rejection of the concrete. Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for purpose as concrete belonging to the lower of the grades between which its strength lies.

**3.0. Workmanship**

**3.1.** The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work question and can be property compacted with means available except where ft can be shown to the satisfaction of the Engineer-in-charge, that supply of properly graded aggregate of uniform quality can be maintained till the completion of work, grading of aggregate shall be controlled by obtaining the coarse aggregates in different sizes and bending them in the right proportions as required. Aggregates of different sizes shall be

stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests..

**3.2.** In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag, a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighed separately from the aggregate. Water, shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean, and serviceable condition. Their accuracy shall be periodically checked.

**3.3.** It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates. I.S. 2386 (Part-III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement to be used in controlled concrete shall not be less than 220 kg./M-3 in plain concrete and not less than 250 kg/M-3 in reinforced concrete.

**4.0. Mode of measurement & payment**

**4.1.** The relevant specifications of item No.5.4.1 shall be followed, except that the controlled concrete R.C.C. work as specified in item shall be measured under this item. The rate excludes cost of form work.

**5.8.2. Providing and laying controlled cement concrete M-200 and curing complete, excluding the cost of form work and reinforcement for reinforced concrete work in :**

**(A) Foundations, footings base of columns, and mass concrete. (B) walls from top of foundation up to floor two level (C) Slabs, landings, shelves, balconies lintels, beams, girders and cantilever up to floor two level, (D) Columns, pillars, posts and struts upto floor two level (E) Stair cases up to floor two level (K) Vertical and horizontal fins upto floor two level.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 5.8.1 shall be followed except that the grading of concrete shall be controlled concrete M-200 grades for works 35 specified in item.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No, 5.8.1. shall be followed.

**2.2.** The rate shall be for one cubic meter.

**5.8.3. Providing and laying controlled cement concrete M-250 and curing complete excluding the cost of reinforcement of reinforced concrete work in:**

**(A) Foundations, footings, bases of columns, and the like and mass concrete (B) Walls from, top of foundation level up to floor two level (C) Slabs, landing, shelves, balconies, beams, girders and cantilever up to floor two level (D) Columns, pillars, struts up to floor two level.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 5.8.1. shall be followed except the grading of concrete shall be controlled concrete M-250 grades for the works as specified in the item.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 5.8.1. shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter.

**5.00.1. Providing and laying ordinary concrete 1:2:4 (1 cement : 2 coarse sand :4 graded stone aggregates 20 mm. nominal size) and finishing smooth with curing etc., complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in: (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms. and up to (III) Slabs having more than 10 cms. and up to 13 cms. thickness (IV) Slabs having more than 13 cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications for item No. 5.4.1. shall be followed for concrete work and relevant specifications of item No. 9.1. shall be followed for form work and centering. The concrete surface shall be smooth finished with cement mortar 1:3 (1 cement: 3 fine sand) as per item No. 17.59 (I) The thickness shall be as specified in the item.

**2.0. Mode of measurement & payment**

2.1. The relevant specification for item No. 5.4.1 shall be followed except that item shall include the item providing from work and centering work as directed.

2.2. The rate shall be for a unit of one cubic meter.

**5.00.2. Providing and laying controlled cement M-150 and finishing smooth with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in :**  
**(I) slabs up to 8 cms. thickness (II) Slabs more than 8 cms. 10 cms. (III) Slabs more the 10 cms. and up to 13 cms. (IV) Slabs more than 13 cms. and up to 15 cms.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for concrete work and item No. 9.1. shall be followed for form work and centering. The concrete surface shall be smooth finished with cement mortar 1:3 (1 cement : 3 fine sand) as per No. 17.59 (I) The thickness shall be as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant of item No. 5.8.1. shall be followed except that the item shall include the cost and from work and centering.

2.2. The rate shall be for a unit of one cubic meter.

**5.00.3. Providing and laying ordinary cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregates 20 mm. nominal size) exposed work with curing etc. complete. including the cost of work but excluding the cost of reinforcement for R.C.C. work in : (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms.-and up to 10 cms. thickness (HI) Slabs having more than 10 cms. and up to 13 cms. thickness. (IV) Slabs having more than 13 cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. There relevant specifications of item No. 5.4.1. shall be followed for concrete work and that of form work and centering work shall be followed as per item No. 9.1. and 9.7. the thickness of the slab shall be as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 5.4.1. shall be followed except that form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic meter.

**5.00.4. Providing any laying controlled cement concrete M-150 exposed work with curing ere., complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in : (I) Slabs up to 8 cms. thickness (II) Slabs having more than 8 cms. and up to 10 cms. thickness (III) Slabs having more than 10 cms. and up to 13 cms. thickness. (IV) Slabs having more than 13cms. and up to 15 cms. thickness.**

**1.0. Materials & Workmanship**

1.1. The relevant specification of item No 5.4.1. shall be followed for controlled concrete and the relevant specifications of item No. 9.7. and 9.1. shall be followed for exposed concrete form work and centering work. The thickness of the stab shall he as specified in the item.

**2.0. Mode of Measurement & Payment**

2.1. The relevant specifications of item No. 5.8.1. shall be followed except that the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic meter.

**5.00.5. Providing and laying ordinary cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 grades stone aggregate 20 mm. nominal size) for R.C.C. lintel including finishing smooth with curing etc. complete including the cost of form work but excluding the cost of reinforcement.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 581. shall be followed for concrete work, relevant specifications of item No. 17.59.(I) for finishing work and relevant specifications of item No. 9.1. shall be followed form work and centering work The concrete work shall be followed for the form work and centering work for exposed concrete work.

**2.0. Mode of measurement & payment**

2.1. The relevant specification of item No. 5.3.1. shah be followed except that the item includes the cost form work for exposed concrete work

2.2. The rate shall be for a unit of one cubic meter.

5.00.6. **Providing and laying cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and finishing smooth with curing etc., complete, including the cost of form work but excluding reinforcement for R.C.C. work in : (A) Beams : (I) Having cross sectional areas 0.05 to 0.08 Sq. meter. (II) Having cross sectional area more than 0.08 Sq. up to 0.12 Sq. mt (III) Having cross sectional area more than 0.12 Sq. Mt. and up to 0.18 Sq. Mt (B) Column; (I) Having cross sectional area 0.05. to 0.08 Sq. mt. (III) Having cross sectional area more than 0.12 Sq.Mt. and up to 0.18 Sq.mt.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.4.1. shall be followed for concrete work and item No. 9.1. shall be followed for form work and centering work. The finishing shall be done in cement mortar 1:3 (1 cement: 3 fine sand) as per item No. 17.59(1). The cross sectional area of beam shall be specified in item.

**2.0. Mode of measurement & payment**

2.1. The relevant specification of item No. 5.4.1. shall be followed but the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic meter.

5.00.7. **Providing and laying controlled cement concrete M-150 exposed work with curing etc. complete, including the cost of form work but excluding the cost of reinforcement for R.C.C. work in : (A) Beams : (I) Having cross sectional area 0.05 to 0.08 Sq. mt. (II) Having cross sectional area more than 0.08 Sq. mt. up to 0.12 Sq.mt (III) Having cross sectional area more than 0.12 Sq. mt. and up to 0.18 Sq.mt.: (B) Columns; (I) Having cross sectional area of 0.05 to 0.08 Sq.mt (II) Having cross sectional area more than 0.08 sq.mt. and up to 0.12 sq.mt. (III) Having cross sectional area more than 0.12 Sq.Mt and up to 0.18 Sq.mt.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work as specified in item for M-150 and relevant specifications of item 9.1 shall be followed for the form work centering work for exposed cement work.

**2.0. Mode of measurement & payment**

2.1. The relevant specifications of item No. 5.8.1 shall be followed except that the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic meter.

5.00.8. **Providing and laying controlled cement concrete M-200 exposed work with curing etc. complete, including the cost of form work but excluding the cost of reinforcement for R.C.C. work in (A) Beams : (I) Having cross section area 0.05 to 0.08 Sq. mt (II) Having cross sectional area 0.08 Sq.mt and up to 0.12 Sq. mt. (III) Having cross sectional area 0.12 Sq. and up to 0.18 Sq. Mt. (B) Columns : (I) Having cross sectional area 0.05 to 0.08 Sq.Mt. (II) Having cross sectional area more than 0.08 Sq.Mt and up to 0.12 Sq.Mt. (III) Having cross sectional area more than 0.12 Sq. mt. and up to 0.18 Sq.Mt.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work for work as specified in item for M-200 and relevant specifications of item 9.7 and 9.1 shall be followed for the form work and centering work for exposed cement work.

**2.0. Mode of measurements & payment**

2.1. The relevant specification of item No. 5.8.1. shall be followed except that the item includes the cost of form work and centering work for exposed work.

2.2. The rate shall be for a unit one cubic meter.

5.00.9. **Providing and laying controlled cement concrete M-250 exposed work with curing etc. complete including the cost of from work but excluding the cost of reinforcement for R.C.C. work in : (A) Beams : (I) Having cross sectional area 0.05 to 0.08 Sq.mt.(II) Having cross sectional areas more than 0.08 Sq.mt. and up to 0.12 Sq. mt (III) Having cross sectional area more than 0.12 Sq.mt. and up to 0.18 Sq. Mt. (5) Columns : (I) Having cross sectional area 0.05 to 0.08. Sq.Mt (II) Having cross sectional area more than 0.08 Sq. mt. and up to 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq.mt. and up to 0.18 Sq.mt.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work for the work as specified in the item for M-250 and the relevant R.C.C. lintels shall be carried out.

**2.0. Mode of measurement & payment**

2.1. The relevant specifications of item No. 5.4.1 shall be followed except that the cost of form work finishing and centering shall be included in the item.

2.2. The rate shall be for a unit of one cubic meter.

## SECTION – 6

### Masonry Work

**6.12 (A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundations and plinth in cement mortar 1:5 (1 cement :5 fine sand) modular bricks.**

#### **1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Brick shall conform to M-15. Cement mortar shall conform to M-11.

#### **2.0. Workmanship**

##### **2.1. Proportion:**

**2.1.1.** The proportion of the cement mortar shall be 1:5 (1 cement: 5 fine sand) by volume.

##### **2.2. Wetting of bricks:**

**2.2.1.** The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is as indication of through wetting of bricks.

##### **2.3. Laying:**

**2.3.1.** Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond; closures in such case shall be cut to required size and used near the ends of walls.

**2.3.2.** A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.

**2.3.3.** The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.

**2.3.4.** The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

**2.3.5.** Both the faces of walls of thickness greater than 23 cms. shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

**2.3.6.** All futures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar

##### **2.4. Joints:**

**2.4.1.** Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exposed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to done.

**2.4.2.** The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

##### **2.5. Curing:**

**2.5.1.** Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

##### **2.6. Preparation of foundation bed:**

**2.6.1.** If the foundation is to be laid directly on the excavated bed, the shall be leveled, cleared of all loose materials, cleaned and wetted before stating masonry, If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top to plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

#### **3.0. Mode measurements & payment**

**3.1.** The measurements of this item shall be taken for the brick masonry fully completed in foundation up to plinth. The limiting dimensions not exceeding those shown on the plinths or as directed shall be final. Battered tapered and curved portions shall be measured net.

**3.2.** No deduction shall be made from the quantity of brick work, for any extra payment made for embedding in masonry or making holes in respect of following items:

- (1) Ends of joists, beams, posts, girders, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 Sq.Cm.
  - (2) Openings not exceeding 1000 Sq.Cm.
  - (3) Wall plates and bed plates, bearing of slabs, chajjas and the like whose thickness does not exceed 10 Cms. and the bearing does not extend to the full thickness of wall.
  - (4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
  - (5) Iron fixtures, pipes up to 300 mm. dia hold fasts, and doors and windows built into masonry and pipes etc. for concealed wiring.
  - (6) Forming chases of section not exceeding 350 -Sq. Cm. in masonry.
- 3.3.** Apertures for fire places shall not be deducted nor shall be paid for separately.
- 3.4.** The rate shall be for a unit of one cubic meter.

**6.12. (B) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundations and plinth in cement mortar 1:5 (1 cement : 5 fine sand) conventional bricks.**

**1.0. Materials**

Cement mortar of proportion 1:5 shall conform to M-11. Conventional bricks shall conform to M-15.

**2.0. Workmanship**

The relevant specification of item No. 6.12 (A) shall be followed except that the bricks to be used shall be modular bricks and the proportion of cement mortar is 1:6.

**3.0. Mode of measurements & payment**

- 3.1.** The relevant specifications of item No. 6.12(A) shall be followed.
- 3.2.** The rate shall be a unit of one cubic meter.

**6.13.(A) Bricks work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm in foundation and plinth in cement mortar 1:6 (1 cement : 6 fine sand) with conventional bricks.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Bricks shall conform to M-15.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 6.12 (A) shall be followed except that the bricks to be used shall be conventional bricks and proportion of cement mortar shall in C.M. 1:6.

**3.0. Mode of measurements & payment**

- 3.1.** The relevant specification of item No. 6.12(A) shall be followed.
- 3.2.** The rate shall be for a unit of one cubic meter.

**6.0.0.1(A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in cement mortar 1:8 (1 cement : 8 fine sand), with Modular bricks.**

**1.0. Materials**

Water shall conform to M-1. Brick shall conform to M-15. Cement mortar shall be conform to M-11.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 6.12(A) shall be followed except that the proportion of cement mortar shall be cement mortar 1:8 and bricks used shall be conventional bricks.

**3.0. Mode of measurements & payment**

- 3.1.** The relevant specification of item No. 6.12(A) shall be followed.
- 3.2.** The rate shall be for a unit of one cubic meter.

**6.0.0.1.(B) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in cement mortar 1:8 (1 cement : 8 fine sand), with conventional bricks.**

**1.0. Materials**

Water shall conform to M-1. Brick shall conform to M-15, cement mortar shall be conform to M-11.

**2.0. Workmanship**

**2.1.** There relevant specifications of item No. 6.12(A) shall be followed except that the proportion of cement mortar shall be cement mortar 1:8.

**3.0. Mode of measurement & payment**

- 3.1.** The relevant specifications of item No. 6.12(A) shall be followed.
- 3.2.** The rate shall be for a unit of one cubic meter.

**6.0.0.1.(A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in time mortar 1:1.5 (1 Lime putty : 1.5 fine sand) modular bricks.**

**1.0. Materials**

Lime mortar of proportion (1:1.5) shall conform to M-10. Bricks shall conform to M-15.



**2.0. Workmanship**

2.1. The relevant specification of item No. 6.12(A) shall be followed except that the proportion of cement mortar shall be cement mortar 1:8 and bricks used shall be conventional bricks.

**3.0. Mode of measurements & payment**

3.1. The relevant specification of item No. 6.12(A) shall be followed.

3.2. The rate shall be for a unit of one cubic meter.

**6.001.(B) Brick work using common burnt clay building having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in cement mortar 1:8 (1 cement: 8 fine sand), with conventional bricks.**

**1.0. Materials**

Water shall conform to M-1. Brick shall conform to M-15, Cement mortar shall be conform to M-11.

**2.0. Workmanship**

2.1. The relevant specifications of item No. 6.12. (A) shall be followed except that the proportion of cement mortar shall be cement mortar 1:8.

**3.0. Mode of measurements & payment**

3.1. The relevant specifications of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic meter.

**6.0.0.2.(A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in lime mortar 1:1.5 (1 Lime putty: 1.5 fine sand) modular bricks.**

**1.0. Materials**

Lime mortar of proportion (1:1.5) shall conform to M-10. Bricks shall conform to M-15.

**2.0. Workmanship**

The relevant specification of item No. 6.12. (A) shall be followed except the masonry work shall be carried out in lime mortar 1:1.5 (1 lime putty 1.5 fine sand) in foundation and plinth.

**3.0. Mode of measurements & payment**

3.1. The relevant specification of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic meter.

**6.0.0.2.(B) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in lime mortar 1:1.5 (1 Lime putty : 1.5 fine sand) conventional bricks.**

**1.0. Materials & Workmanship**

The relevant specification of item No. 6.12(A) and 6.0.0.2(A) shall be followed except that the masonry work shall be carried out by using conventional bricks in lime mortar 1:1.5 (1 Lime putty: 1.5 fine sand) in foundation and plinth.

**2.0. Mode of measurements & payment**

2.1. The relevant specification of item No. 6.12(A) shall be followed.

2.2. The rate shall be for a unit of one cubic meter.

**6.0.0.3.(A) Brick work using common burnt clay building brick having crushing strength not less than 35 Kg. Sq. Cm. in foundation and plinth in lime mortar 1:2 (1 lime putty :2 fine sand) modular bricks.**

**1.0. Materials & workmanship**

The relevant specification of item No. 6.12(A) and 6.0.0.2(A) shall be followed except that the masonry work shall be carried out in lime mortar 1:2 (1 Lime putty : fine sand) in foundation and plinth,

**2.0. Mode of measurements & payment**

2.1. The relevant specification of item No. 6.12 (A) shall be followed.

2.2. The rate shall be for a one cubic meter.

**6.0.0.3(3) Brick work using burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in lime mortar 1:2 (1 Lime Putty : 2 fine sand) modular bricks.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 6.12 A and 6.0.03 shall be followed except that the masonry work shall be carried out in lime mortar 1:2 (1 lime : 2 fine sand) using conventional bricks in foundation and plinth.

**6.19.(A) Brick work using common burnt clay building brick having crushing strength not less than 35 kg/sq.cm. for super structure above plinth level up to floor two level in cement mortar 1:5 (1 cement: 5 fine sand) modular bricks.**

**1.0. Materials**

Bricks shall conform to M-15. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 6.12 (A) shall be followed except that the masonry work shall be carried out above plinth level to floor two level i.e. for ground floor.

**2.2.** The frames of doors, windows, cupboards etc. shall be housed into the brick work at the correct location and level as directed. The heavy steel doors, window frames etc. shall be built in with work, but for ordinary steel doors and windows required opening for frames, hold-fasts, etc., shall be in the wall and frame embedded later on in order to avoid damage to the frames.

**2.3.** Necessary scaffolding shall be provided. The supports of the scaffolding shall be sound and strong tied, together with horizontal pieces over which the scaffolding plunks shall be fixed. Simple scaffolding shall be allowed normally. In this case scaffolding hole shall rest in hole header horizontal course only. Minimum number of holes be left in brick work for supporting horizontal scaffolding poles. The contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

**2.4.** For the face of brick work, where plastering is to be done, joints shall be raked out to a depth not less than thickness of joints. The face of brick work shall be cleaned and mortar dropping removed on very same day that brick work is laid.

**3.0. Mode of measurements & payment**

**3.1.** The masonry work of G.F. i.e. above plinth level to floor two level shall be measured and paid under this item.

**3.2.** Brick work in parapet shall be included in the corresponding masonry item of store immediately below the floor above which the parapet is built.

**3.3.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.

(1) Ends of joints, beams, posts, girders, rafters, purlins trusses corbel, steps, etc. where cross sectional area does not exceed 500 sq.cm.

(2) Opening not exceed in 1000 sq.cm.

(3) Wall plate and bed plates bearing of slab, chhajjas, and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.

(4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, window etc.

(5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and window built into masonry and pipes etc. for concealed wiring.

(6) Forming charges of section not exceeding 350 sq.cm. in masonry.

(7) Apparatuses for fire places, shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.

**3.4.** The rate shall be for a unit of one cubic meter.

**6.19.(B) Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. for super structure above plinth up to floor two level in cement mortar 1:5 (1 cement: 5 fine sand) conventional bricks.**

**1.0. Materials & Workmanship**

The relevant specification of item No. 6.19(A) shall be followed except that brick masonry work shall be carried out with conventional bricks.

**2.0. Mode measurement and payment**

**2.1.** The relevant specification of item No. 6.19 (A) Shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter per meter.

**6.20 Extra for brick in super structure above floor two level.****1.0. Materials and workmanship**

The relevant specifications of item masonry work to be earned out shall be followed except that this work is for additional lift of one floor above two level.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specification of item No. 6.19 (A) masonry work shall be followed.

**2.2.** The extra payment shall be made for additional lift above floor two level to each additional floor over and above the rate of masonry work.

**2.3.** The rate shall be for a unit of cubic meter per floor.

**6.30.I(A) Half brick masonry in common burnt clay building having crushing strength not less than 35 kg/sq.cm. in cement mortar 1:4 {1 cement : 4 coarse sand) for super-structure above plinth level up to floor two level with conventional bricks.****1.0. Materials**

Bricks shall conform to M-15. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc shall conform to item no. 6.19.(A) except that the brick work of half shall be carried out.

**2.2.** Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 parts of sand by volume.

**2.3.** AH bricks shall be laid stretcher wise, breaking joints with those in the upper and lower courses. The wall shall be taken truly plumb. All courses shall be said truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for frequent checking.

**3.0. Mode of measurement and payment**

**3.1.** The half brick masonry work in foundation and plinth shall be measured under this item the limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.

**3.2.** The relevant specifications of item no. 6.12. shall be followed. The length shall be measured nearest to one cm.

**3.3.** The rate shall be for a unit of one sq. meter.

**6.30.I.(B) Half brick masonry in common burnt clay building bricks crushing strength not less than 35 kg/sq. cm. in cement mortar 1:4 (1 cement :4 coarse sand) for super-structure above plinth level up to floor two level with conventional bricks.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of Item No. 6.30.1 (A) shall be followed for bricks, wetting, laying of bricks, joints, curing, except that the bricks to be used shall be conventional bricks instead of modular bricks.

**2.0. Mode of measurement and payment**

**2.1.** The limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over specified dimensions shall be ignored.

**6.30.II.(A) Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in cement mortar 1:5 (1 cement : 5 coarse sand) with modular bricks in foundations and plinth.****1.0. Materials & workmanship**

The relevant specifications of item No. 6.30.I (A) shall be followed except the half brick masonry work shall be carried out in cement mortar 1:5 (1 cement : 5 coarse sand) with modular bricks in foundation and plinth.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item no. f, 30. I (A) shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter.

**6.30.II.(B) Half brick masonry on common clay building bricks having crushing strength not less than 35 kg/sq. cm. in cement mortar 1:5 (1 cement : 5 coarse sand) in foundation and plinth using conventional bricks.****1.0. Materials & workmanship**

**1.1.** The relevant specifications of item No. 6.30.I (A) shall be followed for bricks, wetting, laying of bricks, joints, curing, except that the bricks to be used shall be conventional bricks instead of modular bricks.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 6.30.I (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**6.30 HI.(A) Half brick masonry in common burnt clay building having crushing strength not less than 35 kg/sq. cm. in lime mortar 1:15 (1 lime putty : 1.5 coarse sand) in foundation and plinth with modular bricks.**

**1.0. Materials & workmanship**

The relevant specifications of item No. 6.30 (I)-A shall be followed except that the half bricks work shall be carried out in cement 1:5 (1 cement: 5 coarse sand) in foundation and plinth using conventional bricks.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item no. 6.30 (I)-A shall be followed.

2.2. The rate shall for a unit of one sq. meter.

**6.30.III(A) Half brick masonry in common burnt clay building having crushing strength not less than 35 kg/sq. cm. in lime mortar 1 :1.5 ( 1 lime putty : 1.5 coarse sand) in foundation and plinth with modular bricks.**

**1.0. Materials**

Modular bricks shall conform to M-15 water shall conform to M-1. Lime mortar or proportion L.M. 1:1.5 (1 Lime putty : 1.5 coarse sand) shall conform to M-10.

**2.0. Workmanship**

The relevant specifications of item No. 6.30 (I) (A) shall be followed except that the half brick masonry work shall be carried out in lime mortar 1:1.5 (1 Lime putty : 1.5 coarse sand) in foundation and plinth using modular bricks.

**3.0. Mode of measurements & payment**

3.1. The relevant specification of item No. 6.30 (I) A shall be followed.

3.2. The rate shall be for a unit of one sq. meter.

**6.30.111(8) Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in mortar 1: 1.5 (1 Lime putty : 1.5 coarse sand) in foundation and plinth with conventional bricks.**

**1.0. Materials**

Conventional bricks shall conform to M-15, water shall conform to M.1. Lime mortar or proportion L.M. 1:1.5 (1 Lime putty : 1.5 coarse sand) shall conform to M-10.

**2.0. Workmanship**

The relevant specifications of item No. 6.30 (I)-A shall be followed except that half brick masonry work shall be carried out in Lime Mortar 1:1.5 (1 Lime putty : 1.5 coarse sand) in foundation and plinth using conventional bricks.

**3.0. Mode of measurements and payment**

3.1. The relevant specifications of item No. 6.30 (I)-A shall be followed.

3.2. The rate shall be for a unit of one sq. meter.

**6.30 II(A) Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in cement 1:5 ( 1 cement : coarse sand) with hoop iron 25 mm. x 1.6 mm. or equivalent reinforcement at every third coarse embedded in cement mortar in foundation and plinth with modular bricks.**

**1.0. Materials**

Bricks shall conform to M-15. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-11. M.S. reinforcement shall conform to M-18.

**2.0. Workmanship**

2.1. Relevant specifications of bricks, wetting and laying of bricks, joints, curing, scaffolding etc. shall conform to item No. 6.30 (I)-A except the following :

2.2. Cement mortar used in masonry work shall be in proportion to 1 part of cement and 5 parts of sand by volume and shall conform to M-11, and this work is for half brick thickness for partitions walls.

2.3. The hoop iron 25 mm x 1.6 or equivalent reinforcement shall be provided at every third course. The ends of reinforcement shall be fully embedded in main walls on both sides as directed. Reinforcement shall be placed on the top of the bottom most course. Laps shall be of 15 cms. of mild steel bars or hoop iron.

2.4. The joints in the course where reinforcement is placed shall admit of mortar cover to the reinforcement.

**3.0. Mode of measurements and payment**

- 3.1. The rate shall be for half brick masonry work providing specified reinforcement, the limiting dimensions not exceeding those in the plan or as directed. The length shall be measured nearest to one cm.
- 3.2. Any work done extra over specified dimensions shall be ignored.
- 3.3. The rate shall be for a unit one sq. meter.

**6.30.II(B) Half brick masonry in common burnt clay building having crushing strength not less than 35 kg/sq.cm. in cement mortar 1:5 (1 cement : 5 coarse sand) with hoop iron 25 mm. x 1.6 mm. or equivalent reinforcement at every third course embedded in cement mortar in foundation and pith, with conventional bricks.**

**1.0. Materials & Workmanship**

- 1.1. The relevant specifications of item No. 6.30 I (A) shall be followed except that the work is to be carried out with conventional bricks instead of Modular bricks.

**2.0. Mode of measurements and payment**

- 2.1. The rate shall be for half brick work, including providing specified reinforcement, the limiting dimensions out with conventional bricks instead of Modular bricks.
- 2.2. The work done extra over specified dimensions shall be ignored.
- 2.3. The rate shall be for a unit of one sq. meter.

**6.33.(A) Extra for half brick masonry in superstructure above floor two level. Modular bricks.****1.0. Materials & Workmanship**

- 1.1. The relevant specifications for item No. 6.30 A & 6.30. B shall be followed except that this work is for additional lift over and above the payment of work up to floor two level.
- 1.2. The rate shall be for a unit of one sq. meter per floor.

**6.33.(B) Extra for half brick masonry work in superstructure above floor two level. Conventional bricks.****1.0. Materials & Workmanship**

- 1.1. The relevant specifications for item No. 6.30 A & 6.30. B shall be followed except that this work is for additional lift of each floor two level using conventional bricks.

**2.0. Mode of measurements and payment**

- 2.1. The relevant specification of item No. 6.33 (A) shall be followed.
- 2.2. The rate shall be for a unit of one sq. meter per floor

**6.55 (1) Half brick thick Honey-comb brick work with burnt work with burnt clay building bricks having crushing strengths not less than 35 kg/sq.cm. in C.M. 1:4 (1 cement : 4 coarse sand)**

**1.0. Materials**

Bricks shall conform to M-15 Cement mortar of proportion shall conform to M-11.

**2.0. Workmanship**

The relevant specifications of item No. 6.32(A) shall be followed except that the masonry work shall be carried out Honey-comb in thickness of half bricks in cement mortar 1:4 (1 cement: 4 coarse sand) and as and where directed with all lifts.

**3.0. Mode of measurements and payment**

- 3.1. The honey-comb work shall be measured in sq. meters. The full area of honey comb work shall be measured without with all lifts.
- 3.2. The rate shall be for a unit of one square meter of wall surface.

## SECTION-7

### Rubble Masonry Work

**7.6(1) Uncoarsed rubble masonry with hard stone approved quality in foundations and plinth in cement mortar 1:6 (1 cement : 6 coarse sand) including leveling etc. complete.**

**1.0. Materials:**

The cement mortar shall conform to M-11. Stone shall conform to M-16.

**2.0. Workmanship**

**2.1. Dressing of stones:**

Stone used for uncoarsed rubble masonry work shall be hammer dressed on the sides, and beds in which such a way as to close with the adjacent stone in the masonry work as strongly as possible. The face stones shall be dressed in such a manner as to give a specified pattern such as polygonal facing etc. The face of the stones shall be so dressed that bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on the face to be plastered, it shall not project by more than 19 mm., nor shall have depressions more than 10 mm. from the average wall surface.

**2.2. Laying:**

All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. The wall shall be built true to plumb (or true to required batter when so specified). All connected walls in a structure shall be raised up informally and regularly. However if for any specific reason, one part of masonry is required to be left behind the wall shall be racked back at an angle not steeper than 45. Vertical toothed joints in masonry shall not be allowed. The work shall be carried out regularly and masonry of any day wall not be raised by more than 1 meter in height.

**2.3.** The stone shall be laid in an uncoarsed fashion, or random facing etc. However the masonry is required to be brought to level at various stages viz. plinth level window sill level, roof level and any other level specifically shown in the drawings. This may be done first by adjusting the laying of stone to one level and then by providing leveling course of cement concrete 1:6:12 (1 cement: sand : 12 graded stone aggregate 20 mm. nominal size) or as otherwise specified.

**2.4.** Proper bonding shall be achieved by closely filling in adjacent stones as well as by using bond stones or through stones as described herein below. Face stones shall extend back sufficiently, and bond well with the masonry. The stone shall be carefully set so as to break joints and avoid formation of vertical joints. The depth of stone from the face of wall inwards shall not be less than weight or breadth at the face. The hearing or interior filling of the wall shall consist of rubble stones which may be of any shape. Neither the face stone nor the hearing stone shall be so small to pass through circular ring of 150 mm. internal diameter in any direction nor shall any of them shall have minimum thickness 100 mm.

**2.5.** All stone shall be carefully laid, hammered down by a wooden mallet into position and solidly embedded in mortar, chips and spawns of stone may be used wherever necessary to avoid thick mortar beds or joints at the same time ensuring that no hollow space is left anywhere in the masonry. The chips used shall not be more than 20% by volume of masonry. The hearting shall be laid nearly level with face stones except that at about one meter intervals vertical bond stone or plumes projecting about 150 to 200 mm. shall be firmly embedded to from vertical bounding in masonry.

**2.6. Bond stone:**

Bond stones or through stones running right across the thickness of the wall shall be provided in wall up to 600 mm. thick. In thicker walls two stones overlapping each other by at least 150 mm. shall be provided across the thickness of the wall to form bond stones. There shall be at least one bond stone for every 0.5 sq. mt of wall surface. The bond stone shall be marked by a distinguishing letter during construction for subsequent verification and shall be laid staggered in subsequent layers.

**2.7. Quoins:**

The quoins or corner stones shall be selected stone neatly dressed with hammer and/or chisel to form the required corner angle and laid header and stretcher alternatively, The bed top surface of quoins shall be chiseled dressed to give horizontal joints. The quoins shall have a uniform chisel draft of at least 25 mm. width at four edges of each exposed face, all the edges of the same face being in one plane. No quoins stone shall be smaller than 0.025 cum. in volume.

**2.8. Jamb Stones:**

The jamb stone shall be made with stone specified for quoins, that the stone provided on the jambs shall have their length equal to thickness of wall up to 600 mm. and a line of headers shall be provided for walls thicker than 600 mm. as specified for bond.

**2.9. Joints:**

All the joints shall be completely filled with mortar and width shall not exceed 25 mm. when plastering or pointing is not required to be done, the joints shall be struck flush and finished simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. by a racking tools, during progress of laying while the mortar is still green.

**2.10. Scaffolding:**

Single or double scaffolding shall be used. The scaffolding shall be strong and sound. The holes left in masonry for supporting scaffolding shall be filled and made good before plastering.

**2.11. Curing:**

Green work shall be protected from rains by covering the same. Masonry shall be kept constantly moist on all the faces for a period of at least 7 days. The top of masonry shall be flooded at close of the day.

**3.0. Mode of measurements and payment**

**3.1.** All work shall be measured on the basis of finished dimensions and measured net except where otherwise specified. Only specified dimensions shall be allowed. Anything extra shall be ignored. The masonry work in foundation and plinth shall be measured under this item. No deduction shall be made, not extra payment made for the following:

- (a) Ends of joints, beams, spots, girders, rafters, purloins, trusses, corbles, etc. each up to 500 sq. cm. in section.
- (b) Opening each up to 0.1 sq.m.
- (c) Wall plates and bed plates, bearing of chhaja and like up to 10 cm. depth (bearing of floor and roof slabs shall be deducted from masonry).
- (d) Drain holes and recesses for cement concrete blocks to embed hold fasts for doors windows.
- (e) Building in the masonry iron fixtures pipes up to 300 mm. dia. hole fasts of doors and windows.
- (f) Forming theses in masonry up to section of 350 sq.cm.

**3.2.** The rate shall be for a unit of one cubic meter.

**7.6.(II)                      Uncoursed rubble masonry with hard stone of approved quality in foundation and plinth in cement mortar 1:5 (1 cement : 5 coarse sand) including leveling up etc. complete.**

**1.0. Materials and workmanship**

The relevant specification of item No. 7.6(1) shall be followed except that the proportion of cement mortar shall 'be in C.M. 1:5 (1 cement : 5 coarse sand)

**2.0. Mode of measurements and payments**

**2.1.** The relevant specifications of item No. 7.6(1) shall followed.

**2.2.** The rate shall be a unit of one cubic meter.

**7.6.(III)                      Uncoursed rubble masonry with hard stone of approved quality in foundation and plinth in lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) including leveling etc. complete.**

**1.0. Materials:**

Lime mortar shall conform to M-10. The rubble shall conform to M-16.

**2.0. Workmanship**

The relevant specifications of item No. 7.6 (I) shall be followed.

**3.0. Mode of measurement and payment**

**3.1.** The relevant specifications of item No. 7.6 (I) shall be followed.

**3.2.** The rate shall be for a unit of one cubic meter.

**7.17(A)                      Coursed rubble masonry with hard stone of approved quality in foundation and plinth in cement mortar 1:6 (1 cement : 6 coarse sang) etc. complete.**

**1.0. Materials**

Cement mortar shall conform to M-11. The stone shall conform to M-16.

**2.0. Workmanship****2.1. Dressing of stones:**

The face stone shall be hammer dressed so as to give approximately rectangular blocks. They shall be squared on bed and side joints. The bed joints shall be rough chisel dressed for a depth of at least 50 mm. back from the faces and the side joints shall be so dressed to a depth of at least 40 mm. back from the face, such that no portion of the dressed surface is more than 10 mm. from a straight edge held against the surface. The remaining portions of surface shall not project above the chisel dressed bed and side joints. The bushing on the face shall not project by more than 40 mm. on an exposed face and 10 mm. on a face to be plastered. The hammer dressed stone shall also have a rough tooling for a minimum width of 25 mm. along the four edges of the face of the stone.

**2.2. Laying:**

**2.2.1.** All stones shall be wetted before laying. The wall shall be built up truly plumb (or to required better where so specified.)

All connected masonry in a structure shall normally be raised up uniformly and regularly. However, if for any specific reasons one part of wall is required to be left behind, such wall shall be raked back at an angle not steeper than 45°. vertical toothed joints in masonry shall not be allowed. The work shall be carried up regularly and masonry on any day shall not be raised by more than 1 meter in height.

**2.2.2.** All the courses shall be laid truly horizontal. The height of course shall not be less than 150 mm. nor more than 300 mm. Face stone shall be laid in alternate header and stretcher fashion. They shall be so arranged as to break joints by at least 75 mm. Stones shall be laid with grains horizontal so that the load is transmitted along the direction of their maximum crushing strength. The depth of stone shall not be less than the height or breadth. The breadth of a face stone shall also be not less than the breadth. The breadth of a face stone shall also be not less than 150 mm. Each face stone shall be of the same height in any give course. The courses shall be not less than 150 mm. Each face stone shall be of the same height in any give course. The courses shall be built in perpendicular to the pressure which the masonry will bear. In case of battered walls (such as retaining walls) the beds of the stone and the plate of courses shall be laid with their bed perpendicular to the battered face.

**2.2.3.** The hearting or the interior filling of the wall shall consist of flat bedded stones carefully laid on their proper beds in mortar, chips and spawns of stone being used where necessary to avoid excessive use of mortar, care being taken to see that no hollow space is left anywhere in the masonry. Chips shall not be used below the hearting stone to bring these up to the level of stones. The use of chips shall be restricted to be filling of interstices between the hearting stone but the volume of chips shall be limited to 15% of the total volume of the masonry.

**2.3. Bond Stones:**

The relevant specification of item No. 7.6 (I) Para 2.6 shall be followed except that the bond stone shall be provided for at least 1.8 m. length of every courses.

**2.2.4. Quoins:**

The quoins, which shall be of the same height as the course to which it belongs shall be formed from selected stone of at least 400 mm. length. They shall be laid square or beds on stretchers and headers alternatively. The beds shall be rough, chisel dressed to a depth of at least 100 mm. These stones shall have a minimum uniform chisel draft of 25 mm. width at four edges being in the same plane, quoin stone shall not be smaller than 0.025 cum. in volume and it shall also be not less than 300 mm. in length, 25 % of them being not less 500 mm. in length.

**2.5. Joints:**

All the bed joints shall be horizontal and all shall be vertical. Face joints shall not be more than 10 mm. thick. All joints shall be properly and completely filled with mortar. On faces where no plastering or pointing is required to be done the joint shall be flush and finished simultaneously while laying stones. In other cases the joints shall be raked to a minimum depth of 20 mm. by raking tools during the progress of work while the mortar is still green.

**2.6. Curing:**

The relevant specification of item No. 7.6 (I) area Para 2.9 shall be followed

**3.0. Mode of measurements & payment**

**3.1.** The relevant specification of item No. 7.6 (I) shall be followed.

**3.2.** The rate shall be for a unit of one cubic meter.

**7.17.(B) Coursed rubble masonry with stone of approved quality in foundation and plinth in cement mortar 1:5 (1 cement : 5 coarse sand) etc. complete.****1.0. Materials & Workmanship**

The relevant specifications of item No. 1.17 (A) shall be followed except that the proportion of cement mortar shall be C.M. 1:4 (1 cement : 5 coarse sand)

**2.0. Mode of measurement & payment**

**2.1.** The relevant specification of item No. 7.17 (A) shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter.

**7.17 (C) Coursed rubble masonry with stone of approved quality in foundation and plinth in C.M. 1:4 (1 cement : 4 coarse sand) etc. complete)****1.0. Materials & workmanship**

The relevant specifications of item No. 7.17 (A) shall be followed except that the proportion of mortar shall be C.M. 1:4 (1 cement : 4 coarse sand)

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 7.17 (A) shall be followed.



2.2. The rate shall be for a unit of one cubic meter.

**7.17(D) Coarsed rubble masonry with stone of approved quality in foundation and plinth in c.m. 1:3 (1 cement : 3 coarse sand) etc. complete.**

**1.0. Materials and Workmanship**

1.1. The relevant specification of item No. 7.17 (A) shall be followed except that the proportion of mortar shall be C.M. 1:3 (1 cement : 3 coarse sand)

**2.0. Mode of measurement & payment**

2.1. The relevant specification of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic meter.

**7.19(A) Coarsed rubble masonry with stone of approved quality for structure above plinth level up to floor two level in C.M. 1:6 (1 cement : 6 coarse sand) etc. complete.**

**1.0. Materials & Workmanship**

1.1. The relevant specification of item No. 7.17 (A) shall be followed except that the coursed rubble masonry work shall be carried out for superstructure above plinth level up to floor two level.

1.2. Single or double scaffolding may be used. The scaffolding shall be strong and sound. In case single scaffolding is used, the holes shall be carefully made good as directed.

**2.0 Mode of measurement & payment**

2.1. The relevant specifications of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic meter.

**7.75. Precast concrete block masonry (including quoin block, jamb blocks, closer etc.) with solid concrete blocks of approved size made of cement concrete 1:3:6 Mix. (1 cement : 3 coarse sand : 6 graded stone aggregate of 20 mm. and down gauge) in foundation and plinth in cement mortar 1:6.**

**1.0. Materials**

(a) Aggregate shall conform to M-12. (b) Sand shall conform to M-6. (c) Cement shall conform to M-3.

1.1. The solid cement concrete blocks shall be precast with concrete of 1:3:6 mix (1 cement: 3 coarse sand : 6 graded stone aggregate)

1.2. A block shall be deemed to be solid if the solid materials is not less than 75% of the total volume of the blocks calculated from overall dimensions.

1.3. The concrete mix used for block shall be one of the following:

1.4. The actual size of the block shall be one of the following:

Size : A. 39 x 30 x 19 cms. Size-B 39 x 20 x 19 cms. Size C 39 x 10 x 19 cms.

The size other than those specified above may be used with the approval of Engineer-in-charge.

1.5. The blocks may be either machine made or hand made. The concrete mix, the mixing of concrete the manufacture of blocks, curing and drying shall be in accordance with para-6 to 10 under I.S. : 2185-1967.

1.6. Faces of blocks shall be flat and rectangular Surface finish shall be rendered smooth or plastered with cement mortar 1:3 coarse sand)

1.7. The average compressive strength of eight blocks when determined in the manner described-in I.S. 2185 - 1967 shall not be less than 50 Kg/Sq. Cm. of gross area. The strength of lowest individual block shall not be less than 75 percent of average compressive strength of eight blocks.

1.8. Concrete blocks shall be stored and stacked properly in such a way as to avoid any contact with moisture at site. They shall be stock plied on planks or other supports free from contact with ground and covered to protect against wetting. Cement mortar of proportion 1:6 shall conform to M-11.

**2.0. Workmanship**

2.1. The blocks need not wetted before of during laying in the walls. In case climatic conditions so required, the top and the sides of block may only be slightly moistures so as to prevent absorption of water from the mortar and ensure the development of required bond with mortar.

2.2. Operations of laying precast cement concrete block masonry shall be carried out in accordance with instructions detailed in I.S. : 6042 -1952. The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and loose, its plasticity, thereby resulting in poor bond. For most of the work, the joints, both horizontal and vertical shall be 10 mm. thick except in the case of extended joint, construction, the mortar joints shall be struck off flush with wall surface and when the mortar has stated stiffening, it shall be compressed with rounded or U-shaped tool. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened in effect intimate contact between the mortar and the masonry unit and obtained a weather tight joint.

**2.3. Quoins and closures:**

Special quoins blocks (with a return face equal to half the length of normal face) shall be cast for all building blocks and slabs for external work. Proper half closures shall be cast and not cut from full size blocks. The returned ends of blocks for door windows reveals and quoins shall be finished with a fair face in the mould.

**2.4.** Only double scaffolding shall be used. The scaffolding be strong and sound. No holes in the masonry for supporting shall be allowed.

**2.5. Curing :** The curing of concrete block masonry shall be carried out for 7 days.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 7.6 (I) shall be followed.

**3.2.** The work of concrete block masonry in foundation and plinth shall be measured under this item.

**3.3.** The rate shall be for a unit of one cubic meter.

**7.82 (A) Precast concrete block masonry in partition walls 10 cms. thick with solid block of approved size (including quoins, blocks, jamb blocks closer etc) made of C.C. 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregates 20 mm. and down gauge) in C.M. 1:4.**

**1.0. Materials:**

**1.1.** The relevant specification of item No. 7.75 shall be followed except that the precast concrete blocks shall be of size suitable for 10 cms. size partition wall i.e. size c and the proportions of cement mortar shall be in cement mortar 1:4 (1 cement : 4 coarse sand).

**2.0. Workmanship**

The relevant specifications of item No. 7.75 shall be followed except that the work shall be for precast concrete block partition walls of 10 cms. thickness.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specifications of item No. 7.75 shall be followed.

**3.2.** The rate shall be for a unit of one cubic meter.

**7.0.0.1. White stone masonry block in coarse in superstructure with stone of approved quality in lime mortar 1:1.5 (1 Lime putty 1:5 fine sand) including raking out joints etc. complete.**

**1.0. Materials:**

**1.1.** The stone or bela shall be white hard sand stone or block. The stone shall be sound hard rough and durable. It shall be free from skin. The thickness of bela or block shall not be less than 15 cms. or as directed. The mortar used shall consist. One part of lime putty and 1.50 parts of fine sand. Lime mortar shall conform to M-10.

**2.0. Workmanship****2.1. Dressing of stone:**

Stone shall be chiseled on all the sides so that all six sides shall be in a rectangular shape and all the stones shall be so dressed that the bushing of the exposed face shall not project nor depressions for the general wall surfaces. The size of bela or block shall be as per thickness of the wall to be constructed or as directed.

**2.3. Laying:**

All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. All connected Walls in a structure shall normally be raised up uniformly and regularly. The vertical joint shall not be allowed and also it shall not be more than 12 mm. in thickness.

**2.3.** Proper bonding shall be made by laying bela or block side by side each other with lime mortar on bed as well as in between two bela or block vertically.

**2.4. Bond stones:**

Bond stones or through stones running right across the thickness of the wall shall be provided in walls up to 450 mm. thick. In thicker walls two bela or blocks or laying each other by at least 150 mm. each other shall be provided across the thickness of the wall to bond stone. Such bond stone shall be at least one for every 1.0 sq. mt. area of the wall surface.

**2.5. Joints:**

All the joints shall be completely filled up with mortar and their thickness shall not exceed by 12 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished, simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. during process of laying while mortar is still green.

**2.6. Scaffolding:**

Single or double scaffolding shall be used. It shall be strong and sound. The holes left in masonry for supporting shall be made good before plastering.

**2.7. Curing:**

Green work shall be cured for a period of 7 days continuously.

### **3.0. Mode of measurements & payment**

**3.1.** The work shall be measured on the basis of finished dimensions. No deduction shall be made nor extra payment shall be made for the following:

(a) Ends of joint, beams, posts, girders, rafters, purlins, corbels etc., each up to 500 sq.cms. in section (b) Opening each up to 0.10 Sq.m.(c) Small plates and bed plates, bearing of chhajias and like up to 10 cms. depth (bearing or floor and roof shall be deducted from masonry), (d) Drain holes and recesses for cement concrete blocks to embedded hold fasts of one cubic meter.

#### **7.0.0.2. White stone bela masonry work in partition walls up to 15 cms. thickness in C.M. 1:4 (1 cement : 4 coarse sand.)**

##### **1.0. Materials and workmanship**

The relevant specifications of item No. 7.0.0.1 as above shall be followed except that the proportion of mortar shall be in C.M. 1:4 (1 cement : 4 coarse sand.)

##### **2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 7.6 (I) shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter.

#### **7.0.0.3. White stone bela masonry block in coarse in superstructure with stone of approved quality in C.M. 1:5 (1 cement: 5 coarse sand) including raking the joints etc. complete.**

##### **1.0. Materials and Workmanship**

The relevant specifications of item No. 7.0.0.1. as above, except that the proportion of cement mortar shall be in C.M. 1:5 (1 cement : 5 coarse sand)

##### **2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 7:6 (I) shall be followed

**2.2.** The rate shall be for a unit of one cubic meter.

#### **7.0.0.4. White stone bela masonry block in coarse in superstructure with stone of approved quality in C.M. 1:6 (1 cement : 6 coarse sand) including raking the joints etc. complete.**

##### **1.0. Materials and Workmanship**

The relevant specifications of item No. 7.0.0.1 shall be followed except that the proportion of cement mortar shall be 1:6 (1 cement : 6 coarse sand)

##### **2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 7.6. (I) shall be followed.

**2.2.** The rate shall be for a unit of one cubic meter.

## SECTION -9

### Centering & Form Work

- 9.1.(A) Providing form work of ordinary timber planking so as to give a rough finish including centering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced concrete and plain concrete work in foundation, footings, bases of columns, and mass concrete.**

#### **1.0. Materials**

- 1.1.** The shuttering to be provided shall be of ordinary timber plank and shall conform to M-26.  
**1.2.** The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

#### **2.0. Workmanship**

- 2.1.** The form work shall conform to the shape lines and dimensions as shown on the plans and be constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safeguard against any settlement of the form-work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding, bracing etc. shall be as per design.

#### **2.2. Clearing and Treatment of forms:**

- 2.2.1.** All rubbish, particularly chipping shaving and saw dust shall be removed from the interior of the form before the concrete work is placed and the form in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforced bars.

#### **2.3. Stripping time:**

- 2.3.1.** In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.

- |      |   |                 |
|------|---|-----------------|
| (a)  | Sides of walls columns and vertical faces of beams..... | 24 to 48 hours. |
| (b)  | Beam soffits, (props, left under).....                  | 7 days.         |
| (c)  | Removal of props slabs:                                 |                 |
| (i)  | Slabs spanning up to 4.5 m.....                         | 7 days.         |
| (ii) | Spanning over 4.5 m.....                                | 14 days.        |
| (d)  | Removal of props & beams and Arches:                    |                 |
| (i)  | Spanning up to 6 m.....                                 | 14 days.        |
| (ii) | Spanning over 6 m.....                                  | 21 days.        |

#### **2.4. Procedure when removing the form work:**

- 2.4.1.** All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened

#### **2.5. Centering:**

- 2.5.1.** The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behavior or centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

- 2.5.2.** The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.

- 2.5.3.** The centering and form work shall, be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to property.

#### **2.6. Scaffolding:**

- 2.6.1.** All scaffolding, hoisting arrangements and ladders etc., required for the facilitating of concreting shall be provided and removed on completion of work by contractor at his own expense. The scaffolding, hoisting

arrangements and ladders etc. shall be strong enough to with stand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc. 2.6.2. The scaffolding, hoisting arrangements and ladder shall allow easy approach to the work spot and afford easy inspection.

**2.6.3.** The rate is applicable to all condition of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:

- (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering propping, bolting, wedging easing, striking and removal.
- (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm: width to beams, columns and the like.
- (c) Temporary openings in the forms for pouring concrete, if required removing rubbish etc.
- (d) Dressing with oil to prevent adhesion of concrete with shuttering and.
- (e) Raking or circular cutting.

**2.7. Re-Use:**

**2.7.1.** Before re-use, all form shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned and joints are gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

**3.0. Mode of Measurements & Payment**

**3.1.** Form work shall be measured as the area in square meters to shuttering in contract with concrete except in the case of inclined member and portion of curved profile and upper side in which case on area of underside shall be measured for payment.

**3.4.** Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the inter section point. No deduction shall be made from the form work of a column at inter section of beams.

**3.5.** The rate is for the completed item

**3.6.** The rate shall be for a unit of one sq. meter.

**9.1.(A) (i)** Extra for providing from work of ordinary timber planking so as to give a rough finish including centering, shuttering and propping etc., height of propping and centering below supporting floor to ceiling is between 4 to 5 m. and removal of the same for in situ reinforce or plain concrete work in foundations, footings, bases of columns etc. and mass concrete.

**1.0. Materials workmanship**

**1.1.** The relevant specification of item No. 9.1. (A) shall be followed except they the height of propping and centering below supporting floor to ceiling exceeding 4 m. but not exceeding 5 m.

**2.0. Mode of measurements and payment**

**2.1.** The payment shall be made extra over and above the payment made up to 4 m. height. The relevant specifications of item No. 9.1.(A) shall be followed. The rate shall be for a unit of one sq. meter.

**9.1.(B)(i)** Providing from work of ordinary timber planking so as to give a rough finish including centering, below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work in flat surface such as soffits of slabs, landing and the like floors etc. up to 200 mm. in thickness.

**1.0. Materials & Workmanship**

**1.1.** Relevant specifications of item 9.1. (A) shall be followed except that work is to be carried out for flat surfaces such as soffits of slabs, landings, and the like for floors etc. up to 200 mm, in thickness.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 9.1 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**9.1.(B)(ii)** Providing form work of ordinary timber planking so as give a rough finish including centering shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work in flat surface such as soffits of slabs, landings, and the like floors etc. above 200 mm. in thickness.

**1.0. Materials and Workmanship**

**1.1.** Relevant specifications of item No. 9.1 (A) shall be followed except that the work is to be carried out for flat surfaces such as soffits of slabs, landings, and the like for floors etc. up to 200 mm. in thickness.

**2.0. Mode of measurement and payment**

2.1. The relevant specifications of item No. 9.1 (A) shall be followed.

2.2. The rate shall be for a unit of sq. meter.

**9.1.(C) Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not excluding 4 m. and removal of the same for in situ reinforced concrete and plain concrete work in vertical surface such as walls (any thickness) partitions.**

**1.0. Materials and Workmanship**

The relevant specifications of item 9.1 (A) shall be followed except that the form work shall be carried out for vertical surfaces such as walls of any thickness, partitions etc.

**2.0. Mode of measurement and payment**

2.1. The relevant specifications of item No. 9.1 (A) shall be followed"

2.2. The rate shall be for a unit of sq. meter.

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No.9.1 (A) shall be followed.

1.2. The rate shall be for a unit on one sq. meter.

**9.1.(G)(i) Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work columns, pillars, posts, and struts, square rectangular, polygonal in plan.**

**1.0. Materials and Workmanship**

1.1. The relevant specification of item No. 9.1. (A) shall be followed except that the work is for columns, pillars, posts and struts, square, rectangular, polygonal in plan.

**2.0. Mode of measurement and payment**

2.1. The relevant specification of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**9.1.(H)(i) Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work in side and soffits of beam haunchings, cantilevers, girders, bressumers, and lintels not exceeding 1 m. depth.**

**1.0. Materials and Workmanship**

1.1. The relevant specification of item No. 9.1 (A) shall be followed except that the .work is for sides and soffits of beams, haunching cantilevers girders, bressumers and lintels not exceeding 1 M. in depth.

**2.0. Mode of measurement and payment**

2.1. The relevant specifications of item No. 9.1 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**9.1.(H)(2) Providing form work of ordinary timber Planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work in sides and soffits of beams, haunchings, cantilevers, girders, bressumers and lintels exceeding 1 m. in depth.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 9.1.(A) shall be followed except that the work is for side and soffits of beam hunchings, girders, bressumers and lintels, exceeding 1 m. in depth.

**2.0. Mode of measurement and payment**

2.1. The relevant specifications of item No 9.1.(A) shall be followed except that the work is for side and soffits of beams haunching cantilevers, girder bressumers and lintels, exceeding 1 m. in depth.

2.2. The rate shall for a unit of one sq. meter.

**9.1.(i) Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering and propping etc. height of propping and centering below supporting floor toe ceiling not exceeding 4 m. and removal of the same for situ reinforced and plain concrete work in edges of slabs and breaks in floor and walls.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for edges of breaks in floors and walls.

**2.0. Mode of measurements and payment**

**2.1.** The length and breadth shall be measured nearest to one Cm.

**2.2.** The rate shall be for a unit of one Sq. meter.

**9.1.(K)** **Providing form work of ordinary timber planking so as to give a rough finish including centering shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same in situ reinforced and plain concrete in small surface such as cantilevers ends, brackets and ends of the steps., caps and bases to pilasters and columns and the like.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 9.1.(A) shall be followed except that work is for small as cantilever ends, brackets and ends of steps, caps and bases to pilasters and columns and the like.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specification of item No. 9.1.(A) shall be followed.

**2.2.** The rate shall be unit of one sq. meter.

**9.1.(I)** **Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping .etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete in chullah hoods, weather sheds, chhajjas, corbels etc. including edges.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 9.1 (A) shall be followed except that the work is for chullah hoods, weather-sheds, chhajjas, corbels, etc. including edges of the same.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specification of item No. 9.1. (A) shall be followed.

**2.2.** The rate shall be for a unit of one square meter.

**9.1.(M)** **Providing from work of ordinary timber planking so as to give a rough finish including centering, shuttering and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in situ reinforced and plain concrete work in staircase with slopping or stepped soffits including risers and stringers excluding landing.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 9.1.(A) shall be followed except that the work is for staircases, with slopping or stepped including risers and stringers excluding landing.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 9.1. (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**9.1.(Q)** **Providing form work of ordinary timber planking so as to give a rough finish including centering shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for In situ reinforced and plain concrete work in vertical fins and vertical sun-breakers.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for vertical fins and vertical sun breakers.

**1.2.** The rate shall be for a unit of one sq. meter.

**9.7. Extra for providing form work with sweating of steel sheets so as to give a fair finish in :**

(A) Foundation, footings, base of columns etc. mass concrete.

(B) Flat surfaces such as soffits, of slab landing and the like.

(i) Floors etc. up to 200 mm. in thickness.

(ii) Floors etc. above 200 mm. in thickness.

(C) Vertical surfaces such as walls (Any thickness) partitions.

(D) Columns, pillars posts and struts.

1. Square, rectangular, bressumers, and lintels not exceeding 1 mm. depth.
2. Sides and soffits and beams, beam haunchings, cantilevers, girders, bressumers and lintels exceeding 1 mm. in depth.
  - (I) Edges of slabs, and breaks in floors and walls.
  - (K) Small surfaces such as cantilever ends, brackets, and ends of steps, caps and bases to pillars and columns including edges.
  - (L) Chollar woods, weather sheds, chhajjas, corrodes etc. and the like.
  - (M) Stair cases sloping or stepped soffits, including risers, skidders excluding landing.
  - (Q) Vertical fine and vertical sun breakers.

**1.0. Materials and Workmanship**

**1.1.** The relevant specification of item No. 9.1 .(A) to (Q) shall be followed except that the extra rate shall be paid for using sheathing of steel sheets, and plates of steel or plywood instead of ordinary timber plank, to obtain a desired smooth exposed finish of surface. The surface shall be presentable without further treatment.

**2.0. Mode of measurements and payment**

**2.1.** The measurement of form work shall be taken for the work done with steel sheathing, extra over and above the rate of form work of respective item ' ' from work done. The relevant specification of respective item No. 9.1. (A) to (Q) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.



## SECTION 10

### Wood Work, Doors & Windows

#### 10.1.(A) Providing wood work in frames of doors, windows, clerestory windows and other similar work, Wright, framed and fixed in position, Indian Teak wood.

##### 1.0. Materials

Wooded in frames shall conform to M-29.

##### 2.0. Workmanship

2.1. The item covers the requirement of frames for doors, windows, clerestory windows, their supply and fixing.

##### 2.2. Frames:

2.2.1. All members of frames shall be exactly at right angles. The right angle shall be checked from inside surfaces of the frames of the respective members.

2.2.2. All members of frames shall be straight without any warp of bow and shall have smooth surfaces well planed on the three sides exposed at right angles to each other. The surfaces touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall sizes within the tolerances as specified.

2.2.3. Frame shall have dovetail joints. When clerestory windows are included, it shall be provided by having full length one piece post for door or windows and clerestory window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame. When no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm. on upper floors, the vertical posts shall be fixed in the floor or masonry by forming notches 10 mm. deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry; course. The frame shall be erected in position and held plumb with strong support from north sides and built in masonry as it is being built. The transom shall be through tenoned into the mortises of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15 mm.

##### 2.3. Tolerance:

Unless specially mentioned otherwise tolerance of + 1.5. mm shall be allowed for each wrought face.

2.4. The tenons shall be closely fitting into the mortises and suitably pinned with wood dowels not less than 10 mm. dia. meter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

2.5. The concrete surface of tenon and mortise shall be treated before putting together with an adhesive of approved make.

2.6. Minimum number of three hold-fasts shall be fixed on each side of door and windows frames, one at the center point and the other two at 30 mm. from the top and bottom of the frames. In case of windows and ventilators frames. The size of each hold-fast shall be 300 x 25 x 6 mm. and of mild-steel with split end. The hold fasts shall be fixed with screws to frames.

2.7. Mild steel hold fasts shall be protected with a coating of coal asphalt tar. The surface of frame abutting the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

##### 3.0. Mode of Measurements and payment

3.1. The linear dimensions shall be measured correct up to 1 cm. The quantity shall be worked out correct to places of decimals of cu. m.

3.2. The rate shall be for a unit of 10 cu. diameter.

#### 10.4.(A) Providing work in trusses, purlins, falters, posts, post plates, wall plates, and like wrought, framed, hoisted and fixed in position, Indian teak wood.

##### 1.0. Materials

The teak wood shall conform M-29.

##### 2.0. Workmanship

2.1. The relevant specifications of item No. 10.1.(A) shall be followed except that wood work shall be carried out in trusses, purlins, falters, posts, plates, wall plates and like wrought framed.

2.2. The work shall be carried out as per detailed drawings supplied by the Department as directed;

2.3. The length of the each member shall be in one piece or as directed.

##### 3.0. Mode of measurement and payment

The length, breadth and depth shall be measured nearest to 1 cm. of unfinished member. The rate shall be for a unit of 10 cubic Decimeter.

**10.5. (A) Providing wood work in frames of false ceiling partition etc. swan and put up in position, Indian teak wood.**

**1.0. Materials**

The teak wood shall conform to M-29.

**2.0. Workmanship**

The relevant specification of item No. 10.1.(A) shall be followed except that the wood work shall be for false, ceiling, partitions, etc. swan and put in position.

**3.0. Mode of measurement and payment**

3.1. The relevant specifications of item No. 10.1.(A) shall be followed.

3.2. The rate shall be for a unit of Ten cubic Decimeter.

**10.12.(A)(i) Providing and fixing 35 mm. thick fully paneled shutters for doors, windows and clerestory windows including anodised aluminum butt hinges with necessary screws. Indian Teak Wood.**

**1.0. Materials.**

1.1. Wood for shutter shall conform to M-29. 2. Glass shall conform to M-38. 3. Anodised aluminum butt hinges shall conform to M-43.

**2.0. Workmanship**

2.1. The item covers the requirement of preparation of shutters for doors, windows, clerestory windows, their supply and fixing.

**2.2. Shutters:**

2.2.1. Paneled shutters shall be constructed in the form of timber frame work of styles and rails with panel inserted of type as specified in the detailed drawings. Panel shall be fixed by providing grooves in the style and rails. The styles and rails shall be joined to each other by mortise and tenon joints at right angles.

2.2.2. All members of the shutters shall be straight without any warp or bow and shall have smooth, well planed faces at right angles to each other.

2.2.3. The size of styles and rails shall be as per drawings or as directed. Styles and rails of shutters shall be made of one piece only.

**2.3. Timber paneling:**

2.3.1. Thickness of the panel shall be as specified in the item as shown in the drawing or as directed. If the panel is made from more than one piece the pieces shall be finished as shown in the detailed drawings and shall be joined with continuous groove with specified size. The end pieces of the panel and the top and bottom of the panel shall be provided with continuous tongue to frame into groove of the frame shutter. An air space of 1.5 mm. shall be left in the groove of frame of shutter while framing the panels in it.

2.3.2. The faces of the panel as well as various pieces of the panel shall be- closely fitted to the sizes of the grooves.

2.3.3. Finishing of the corners of raised panel edges shall be done as shown in drawings or as directed.

2.3.4. The thickness specified shall be finished thickness and no tolerance will be permitted.

**2.5. Fixtures and Fastenings:**

2.5.1. The rate shall include anodised butt hinges including fixing with iron screws. The size and number of hinges shall be as per table given in annexure-1.

**3.0. Mode of measurement and payment**

3.1. The rate for shutter includes cost of providing block and cleat for keeping the shutter in open position if directed.

3.2. The dimension of the shutter shall be measured clear size of the shutter in close position between the grooves of the frame.

3.3. The rate shall be for a unit of one sq. meter.

**19.12.(A)(II) Providing and fixing 35 mm. thick fully shutters for doors, windows and clear story windows including anodised aluminum but hinges with necessary screws, Indian teak wood.**

**1.0. Materials**

Teak wood shall conform to M-29 Glass shall conform to M-38. Anodised aluminum butt hinges shall conform to M-43.

**2.0. Workmanship**

2.1. The relevant specifications of item No. 10.12 (A) I shall be followed except that the 35 mm. thick shutters full glazed for doors, windows and clear story windows including anodised aluminum butt hinges with necessary screws.

**2.2. Glazing:**

**2.2.1.** The glass panels shall be embedded in putty and secured to the rebate by wooden beads, or moulding shape and size as approved with counter sunk screws of suitable size.

**2.2.2.** The glass panels shall be properly cut to fit the rebates of the frames and sashes fully with a slight minus margin of about 1.5. mm. on all sides. Before blazing, the frame shall be primed and prepared for painting so that wood may not draw oil out of putty. The rebate shall be putted to an extent to provide bedding all round the glass.

**2.2.3.** The glass shall then be bedded in putty and fitted to frames with wooden heads or moulding as directed and secured with counter sunk screws. The screws shall be spaced not more than 100 mm. from each corner and not more than 200 mm. apart.

**2.2.4.** The size of the rebate in the frame and size and shape of beads of moulding shall be as per detailed drawings or as directed. The beads or mouldings shall have mitered corners.

**3.0. Mode of measurement and payment**

**3.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**10.12(A)(III) Providing and fixing 35 mm. thick partly paneled and party glazed shutters, or doors, windows, including anodized aluminum butt hinges with necessary screws, Indian teak wood.**

**1.0. Materials**

Teak wood shall conform to M-29. Glass shall conform to M-38. Anodised aluminum but hinges shall conform to M-43.

**2.0. Workmanship**

The relevant specifications of item No. 10.12.(A) (II) shall be followed except that the 35 mm. thick shutter shall be partly paneled and partly glazed for doors, windows, clear story windows etc. as per drawings.

**3.0. Mode of measurement and payment**

**3.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq, meter,

**10.13.(A)(I) Providing and fixing 35 mm. thick full paneled, shutters for doors, windows and clear story windows including black enameled M.S. Butt, hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 10.12 (A) (II) shall be followed except that the hinges shall be of black enameled M.S. Butt hinges. The hinges, bolts and other items of iron mongery with moving parts shall be properly oiled by the contractor before handing over the building.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.13.(A)(II) Providing and fixing 35 mm. thick full glazed shutters for doors, windows and clear story windows including black enameled M.S. Butt, hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 10.12 (A) (II) shall be followed except that the hinges shall be of black enameled M.S. Butt hinges. The hinges bolts and other items of iron mongery with moving parts shall be properly oiled by the contractor before handing over the building.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed:

**2.2.** The rate shall be for a unit of one sq. meter.

**10.13(A)(III) Providing and fixing 35 mm. thick partly paneled and partly glassed shutters for doors, windows, and clearstory windows including black enameled M.S. Butt hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials & Workmanship**

The relevant specification of item No. 10.12 (A) (III) shall be followed except that the hinges shall be of black enameled M.S. butt hinges, bolts and other items of ironmongery with moving parts shall be properly oiled by the contractor before handing over the building.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 10.12. (A) (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.15.(A)(I) Providing and fixing 25 mm. thick paneled, shutters for cup-boards etc. including anodised aluminum butt hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials**

First class Indian teak wood for shutters shall conform to M-29. Glass shall conform to M-38. Anodised aluminum butt hinges shall conform to M.43.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 10.12. (A) (I) shall apply except that the thickness of shutter shall be 25 mm. for cup-boards.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**10.15.(A)(H) Providing and fixing 25 mm. thick fully glazed shutters for cup-boards etc. including anodised aluminum butt hinges with necessary screws, Indian teak wood.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 10.12.(A) (I) and 10.12 (A) (II) shall be followed except that the thickness of shutters shall be 25 mm. thick and partly paneled and partly glazed shutters as per drawings for cup-boards.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 10.12 (A)(I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.15.(A)(IH) Providing and fixing 25 mm. thick partly paneled and partly shutters for cub-boards etc. including anodised aluminum butt hinges with necessary screws, Indian teak wood.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 10.12.(A) (I) and 10.12 (A) (II) shall be followed except that the thickness of shutters shall be 25 mm. thick and partly paneled and partly glazed shutters as per drawings for cupboards.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 10.12 (A)(I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.16.(A)(I) Providing and fixing 25 mm. thick fully paneled, shutters for cup-boards etc., including black enameled M.S. butt hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials & workmanship**

**1.1.** The relevant specifications of item No. 10.12 (A) (I) shall apply except that the wood for shutters shall be Indian teak wood and black enameled M.S. Butt hinges are to be used instead of anodised aluminum butt hinges and thickness of shutter shall be 25 mm.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 10.12. (A) (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.16.(A)(H) Providing and fixing 25 mm. thick fully glazed shutters for a cup-boards etc., including black enameled M.S. Butt hinges with necessary screws, Indian Teak Wood.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 10.15.(A) (I) shall be followed except that the fully glazed shutters of 25 mm. thickness shall be of India Teak Wood fixed in position with black enameled butt hinges for cup-boards.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 10.12 (A) (I) shall followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.16.(A)(III) Providing and fixing 25 mm. thick partly paneled and partly glazed shutters for cupboards etc., including black enameled M.S. butt hangs with -necessary screws. Indian Teak Wood.**

**1.0. Materials**

The relevant specifications of item No. 10.15 (A) (I) & 10.15 (A) (II) shall be followed except that the shutters shall partly paneled and partly glazed of 25 mm. thickness of Indian Teak Wood fixed with black enameled butt hinges for cup-boards.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 10.12 (A)-shall be followed. **12.** The rate shall be for a unit of one sq. meter.

- 10.23. Providing and fixing 35 mm. thick paneled glazed or paneled and glazed shutters for doors, windows, and clearstory windows including anodised aluminum butt hinges with necessary screws. Indian Teak Wood shutters with (A) Plywood, (B) Particle, (C) Hard Board, (D) Asbestos Sheet panels.**

**1.0. Materials**

Indian teak wood for shutters shall conform to M-29. Glass shall conform to M-38.

- (A) Plywood shall conform to M-37.
- (B) Particle board shall conform to M-40. Anodised aluminum butt hinges shall conform to M-43.
- (C) Hard board shall of best quality and shall be as approved by Engineer-in charge.
- (D) A.C. sheet shall conform to M-24.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 10.12 (A) (I) shall apply to this item except that the work is shuttered with (A) plywood (B) particle board (C) hard board panels (D) A.C. sheets panels as specified in item.

**2.2.** The shutter shall be prepared by fittings styles and rails (top, bottom, lock and frieze) as for paneled leaves with simple chamfer on edge only. The styles and rails shall be grooved with just sufficient width for receiving panels and plain panels of specified type panels shall be fitted into the grooves.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

- 10.24. Providing and fixing 35 mm. thick paneled, glazed or paneled and glazed shutters for doors, windows and clearstory windows including black enameled M.S., butt hinges with necessary screws. Indian Teak Wood shutters with (A) Plywood (B) Particle board (C) Hard Board (D) Asbestos panels.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 10.23 shall be followed except that the hinges shall be of back enameled M.S. Butt hinges instead of anodised aluminum butt hinges and shutter with (A) Plywood (B) Particle board (D) Hard Board (D) Asbestos sheet panels as specified in item.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 10.12 (A) (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

- 10.30. Providing & fixing flush door shutters, solid core construction with frame of 1st class hard wood with cross band and face veneer or plywood face panels including anodised aluminum butt hinges with necessary screws (B) Non-decorative type and block board core. (2) 35 mm. thick.**

**1.0. Materials**

Flush door shall conform to M-30. Plywood shall conform to M-37. Anodised aluminum butt hinges shall conform to M-43.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 10.23 shall be followed except that the shutters be non decorative type and block board core with face veneer or plywood with 35 mm. thickness.

**2.2.** Ready made shutters shall be of correct size and shall fit into the door or other openings without excessive scraping of edges. Adding of battens etc., to make up to the size shall not be allowed.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specification of item No. 10.12 A (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

- 10.37. Extra for using bright finished M.S. Piano hinges instead of anodised aluminum butt hinges in flush door shutter (A) Nickel Plated Piano hinges.**

**1.0. Materials and workmanship**

**1.1.** The relevant specification of item No. 10.30 shall be followed except that the nickel plated piano hinges shall be provided and fixed. It shall conform to the latest Indian Standards and shall be got approved by the Engineer-in-charge.

**2.0. Mode of measurement & payment**

**2.1.** The extra payment shall be made on sq. M. basis of door over and above item No. 10.30 for providing finish M.S. planed hinges instead of anodised aluminum butt hangs.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.39. Extra for providing vision panel not exceeding 0.1 sq. m. in all types of flush doors. (A) Rectangular square.**

**1.0. Materials and workmanship**

**1.1.** The relevant specification of item No. 10.30 shall be followed except that the vision panel not exceeding 0.1 sq. m. shall be provided.

**1.2.** The glass panels shall conform to M-38 and this item is extra work of providing vision panel rectangular or square not exceeding 0.1 sq. in all types of flush doors.

**2.0. Mode of measurements & payment**

**2.1.** The payment shall be made over of item No. 10.30 for this extra work on shutter in which visions panels are provided.

**2.2.** The rate shall be for a unit of one sq. meter of door area.

**10.51. Providing and fixing 30 mm. thick wire gauze shutters using galvanised M.S. Wire of I.S. gauze designation 85-G with wire of 0.56 mm. dia butt hinges with necessary screws : Indian Teak Wood.**

**1.0. Materials**

Wire gauze ail shall conform to M-36. The teak shall conform to M-29. Anodised aluminum butt hinges shall conform to M-43.

**2.0. Workmanship**

**2.1.** Specification for item No. 10.12 A(I) shall be adopted for shutter and fixtures and fastenings except thru 30. mm. thick wire gauze shutter shall be provided.

**2.2. Wire gauze shuttering:**

**2.2.1.** The finished sizes of the wooden components like styles, rails, mountings, shall be as per the paneled doors. Each leaf shall have 2 panels of wire gauze as per drawings or as directed.

**2.2.2.** The styles, rails etc. shall be rebated 12 mm. along the side where they receive the gauze The galvanised iron webbing of 0.56 mm. dia mesh shall be used unless otherwise specified. The webbing shall be at 90 to 12 mm. along both sides of the rebate and fixed securely to the styles and rails and fillets of the size 10 mm x 10 mm, shall be securely and neatly fixed with small screws, spaced about 7.5. cm. centers round the rebate for each panel of webbing,- After the fillets are pressed well into the angle io hole the gauze hi two faces, the exposed edge of fillets shall be neatly rounded. The gauze shall be tightly stretched during fixing The space between the fillet and the rebate where the webbing is bent shall be neatly finished with putty, so that cut end of webbing may not be visible. Each shutter shall be fitted with a pair of anodised aluminum but! hinges with necessary iron screws.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specifications of item No. 10.12 shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**10.53. Providing and fixing 30 mm. thick wire gauze shutters using galvanised M.S. wire of wire gauze designation 85 G with wire of 0.56 mm. dia. for doors, windows, and clerestory windows including bright finished or/and black enameled M.S. butt hinges with necessary screws. Mango wood or equivalent quality.**

**1.0. Materials & workmanship**

The relevant specification of item No. 10.51 shall be followed except that the hinges to be used shall be bright finish or/and black enameled M.S. butt hinges with screws and the wood shall be used of Mango wood or equivalent quality of non teak wood.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specification of item No. 10.12 shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**10.54. Extra for providing and fixing galvanised M.S. gauze of I.S. gauge designation 140 G. to doors windows and clerestory windows with wire of dia 0.71 mm. instead of I.S. gauge designation 85 G. with wire of dia. 0.56 mm.**

**1.0. Materials & workmanship**

**1.1.** The relevant specification for item no. 10,51 & 10.53 shall be followed for this item except that the diameter of wire shall be 0.71 mm. of I.S. gauge designation 140 G. instead of 596 G. diameter I.S. gauge designation 85 G.

**2.0. Mode of measurements and payment**

**2.1.** The payment shall be made extra over and above the payment for galvanised M S wire gauge.

**2.2.** The rate I.S. gauge designation 85 G. shall of one sq. mt of size of doors and windows shuttles

**10.74. Providing and fixing 12 mm. thick and 100 mm. wide pellet of flat pressed 3 layer veneered particle board solid core with 25 mm. diameter aluminum curtain rod brackets including fixing with 25 mm. x 3 m. M.S. flat 10 long and plug etc. comp.**

**1.0. Materials**

(1) 3 layers veneered particle board solid core snail-conform to M-40 25. mm. diameter aluminum curtain rod and 25 mm. x 3 mm. x 10 cms. long M.S. flat and plugs shall of best approved quality as directed.

**2.0. Workmanship**

The work shall be done as per drawing and description given in the item of work. The wooden planks shall be planed smooth and oven on the exposed surface.

The pellet shall be fixed Jo level by means of 10 cms. long x 25 mm. x 3 mm. M.S. flat brackets lent in the form of angle and wooden plug fixed in the walls using wood screws. For pelmet up to 1.5 meter long two such brackets shall be used and additional bracket provided for longer pelmet at the rate of one per meter length extra. The curtain rods be fixed by suitable brackets at the ends to the pelmet as directed.

**3.0. Mode of measurement and payment**

**3.1.** Pelmets shall be measured in running meters along the sides and face.

**3.2.** The rate shall be for a unit of one running meter.

**10.84. Providing and fixing 40 mm. paneled, glazed or paneled and glazed partitions fixed to frames with iron screws etc., complete with India teak wood (Frames to be paid separately)**

**1.0. Materials**

Indian Teak wood shall conform to M-29. Glass shall conform to M-38. Iron screws on shall of best approved quality. Plywood asbestos shall conform to relevant specification of materials.

**2.0. Workmanship**

The work shall be done as per detailed drawing or as directed. The wooden frames shall be of sizes as indicated in the drawing and description of item. They shall be planed and finished smooth and even. The vertical styles and rails shall be framed by tenon and mortise joints.

The panels which may be of planks, asbestos, plywood, glass or any other materials specified shall be fixed in the grooves made in styles and rails or by means of rebate and beading fixed by suitable screws. When glazing is used as panels the glass shall be fixed by using putty in addition to beading, (he putty shall be used before applying material.

**3.0. Mode of measurement and payment**

Partitions shall be measured in square meters of the net area of the tiller materials provided. The rate shad be for a unit of one sq. meter.

**10.85. Providing and fixing decorative plywood 4 mm. thick in portions including fixing to frames with screws etc., complete with 50 mm. x 12 mm. teak wood beading (Frames to be paid separately)**

**1.0. Materials**

4 mm. thick decorative plywood shall be of best approved quality. Teakwood beading and screws shall of best approved quality as directed.

**2.0. Workmanship**

The relevant specifications shall be same, as per that of item No. 10.84 expect that partitions shall be with 4 rnm. thick decorative plywood and with teakwood beading.

**3.0. Mode of measurements and payment**

The specifications shall be same as that of item No. 10.84. The rate shall be for a unit of one square meter.

**10.86. Providing an fixing plain Asbestos cement sheet 6 mm. thick in partition including fixing to frames with screws etc., complete with 50 mm. x 12 mm. deodar wood beading (Frames to be paid separate)**

**1.0. Materials**

Plain A.C. Sheets shall conform to M-24. Deodar wood beading shall conform to M-29. A.

**2.0. Workmanship**

The relevant specification of item No. 10.84 shall be followed same except that plain asbestos cement sheet 6 mm. thick shall be used in partition and Deodar wood beading of size 50 x 12 mm. size shall be used.

**3.0. Mode of measurement and payment**

**3.1.** The relevant specifications of item No. 10.84 shrill pp followed except that the rate excludes cost of frame work.

**3.2.** The rate shall be for a unit of one square meter.

- 10.88. Providing and fixing in partition 4 mm. thick medium hard board approved quality including fixing to frames with screws etc., complete with 50 x 12 mm. Teak wood beading (Frame to paid separated)**

**1.0. Materials**

The hard board shall be 4 mm. thick and of best quality and made as approved. Teak wood beading shall conform to M-29.

**2.0. Workmanship**

The relevant specifications of item No. 18.84 shall be followed except that the hard board of 4 mm. thickness shall be used in partition and teak wood beading 50 x 12 mm. size shall be used.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 10.84 shall be followed except that the rate excludes cost of frame work.

**3.2.** The rate shall be for a unit of one square meter.

- 10.96. 26 mm. thick wooden shelves supported on 40 x 40 x 6 mm. T or Iron brackets fixed at suitable distances not exceeding 75 cms. apart with Mango wood or equivalent quality.**

**1.0. Materials**

The mango wood shall conform to M-29-A. Structural steel shall conform to M-22

**2.0. Workmanship**

The mango wood or equivalent quality not) teak wood shelves shall be prepared from 25 mm. thick planks. The planks shall be planed smooth. The planks shall be used in single piece up to 30 cms. width. The shelves shall be fitted in position by fixing 40 x 40 x 6 mm. T or L Iron brackets. The spacing of brackets shall not be more than 75 cms. The 40 x 40 x 6 mm. T or L from brackets shall be fixed firmly in position by imbedding the same in concrete. The shelves shall be fixed as directed. The season teak wood buttons of size 35 x 12 mm. shall be fixed on open side as directed.

**3.0. Mode of measurements and payment**

**3.1.** The shelves shall be measured in Sq. meter. The length and breadth of shelves shall be measured net.

**3.2.** The rate is inclusive of button provided:

**3.3.** The rate shall be for a unit of one sq. meter.

- 10.97. 40 mm. thick wood shelves supported on 40 x 40 x 6 mm. T or L Iron brackets fixed at suitable distance but not exceeding 75 cms. apart with mango wood or equivalent quality.**

**1.0. Materials & Workmanship**

The relevant specifications of item No. 10.96 shall be followed except that the thickness of shelves shall be 40 mm Thick teak wood buttons shall be provided of 50 x 12 mm. on all open sides.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item NO. 10.96 shall be followed.

**2.2.** The rate shall be for a unit of one square meter.

- 10.99. Providing and fixing M.S. round or square bars with M.S. flats at required spacing in wooden frames of windows and clerestory windows.**

**1.0. Materials**

M.S. bars and flats shall conform m. 18 and M-22 respectively.

**2.0. Workmanship**

**2.1.** The M.S. bars shall be fabricated as shown in the drawing or as directed. It shall conform to I.S. 226-1975 and I.S. 96 and I.S. 1977-1975. The M.S. bars shall be fixed at the required spacing in mild steel flats, after drilling holes in the latter. The diameter and spacing of these bars shall be as mentioned in the drawing or as directed. The bars shall be passed through drill holes drilled into the mild steels flats, fixed in the recess in frames. The flats shall be fixed with iron screws.

**3.0. Mode of measurements & payment**

**3.1.** The rate shall be for the M.S. round or square bars with M.S. flats provided and fixed in position as per the specifications for the completed item.

**3.2.** The rate shall be for a unit of one Kg

- 10.100.(A) Providing and fixing M.S. Grills of required pattern to wooden frames of windows etc., with M.S. flats at required spacing and frame around, square, or round bars with round headed bolts and nuts or by screws : plain Grill.**

**1.0. Materials**

The structural steel shall conform to M-22



**2.0. Workmanship**

**2.1.** The M.S. Grill shall be prepared as per the drawing or as directed for fixing to wooden frames of windows etc.

**2.2.** The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be reverted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts or screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to minimum of 2 Nos. on each side of the frame or as indicated in the drawing or as directed.

**2.3.** The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of the frame strips.

**3.0. Mode of measurements & payment**

**3.1.** No payment shall be made for weight of screws, bolts nuts etc. only weight of grill shall be paid.

**3.2.** The rate shall be for a unit of one kg.

**10.100.(B) Providing and fixing M.S. Grill of required pattern to wooden frames of windows etc. with M.S. plates, at required spacing and frame around, square or round bars with round headed bolts and nuts or by screws and with ornamental grill.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specification of item no. 10.100 (A) shall be followed except that the work is for of ornamental grill.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 10.100 (A) shall be followed.

**2.2.** The rate shall be for a unit of one Kg.

**10.102. Providing and fixing hard drawn steel wire fabric 75 x 25 mm. mesh of weight not less than 7.75 kg. per sq.M to window frames etc, including 60 x 20 mm. beading of teak wood.**

**1.0. Materials**

Hard drawn steel wire of 75 x 25 mm. mesh shall conform to M-34. Teak wood beading shall conform to M-29.

**2.0.** The steel wire fabric 75 x 25 mm. mesh of weight of not less than 7.75 kg per Sq.M. to windows frames etc. shall be fabricated as per detail drawings. The wire fabric shall be fixed to windows frame by teak wood beading of 60 x 20 mm. size be by means of screws.

**3.0. Mode of measurements & payment**

**3.1.** The wire mesh (Hard drawn) shall be measured net clear opening of frame of windows in which mesh is fitted. Nothing shall be paid extra for fixing mesh in groove below teak woods-beading.

**3.2.** The rate shall be for a unit of one sq. meter.

**10.103. Providing and fixing fly proof galvanised M.S. Wire gauge of I.S, Gauge designation 85 G. with wire of dia. 0.56 mm. to windows and clerestory windows including 60 x 20 mm. beading of Indian Teak Wood.**

**1.0. Materials**

The fly proof galvanised M.S. wire gauge shall conform to M-36. Teak wood .beading shall conform to M-29. **2.0. Workmanship**

The relevant specifications of item No. 10.102 Shall be followed except that fly proof galvanised M.S. wire gauge of I.S. gauge designation 85-G with wire of 0.56 mm. shall be provided.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specifications of item No. 10.102 shall be followed.

**3.2.** The rate shall be for a unit of one square meter.

**10.120. Providing and fixing first class Indian teak wood, 75 x 60 mm. moulded hand rails in , straight lengths completed.**

**1.0. Materials**

First class Indian teak wood shall conform to M-29.

**2.0. Workmanship**

The teak wood hand rail shall be of size 75 x 60 mm. The hand rail shall be prepared from first class Indian teak wood. The hand rail shall be moulded as per detail drawings. The hand rail shall be fixed in straight length as per detail drawings with screws. The relevant specifications of item No. 10.4 shall be followed except that the teak wood work shall be for a railing of specified size.

**3.0. Mode of measurements & payment**

3.1. The hand rail shall be measured in running meter.

3.2. The rate shall be for a unit of one running meter.

**10.0.0.(I) Providing and fixing glazed louvered Glass windows and ventilators with teak wood frame 10 x 75 mm. size including 3 coats of oil painting to wood work etc. complete,****1.0. Materials**

Indian teak wood shall conform to M-29. Glass shall conform to M-38.

**2.0. Workmanship**

The relevant specifications of item No. 10.1 (A) shall be followed for frame work except that the frame work of 10 x 7 cms. size of required size ventilators shall be provided with glazed glass louvers. The glass louvers shall be provided as directed. In the groove of 1.25 cms. depth made in frames, the thickness of glass shall be 5 mm. and glass shall be glass of best quality. The ventilation blades shall slope done towards the outside at an angle of 45°.

**3.0. Mode of measurements and payment**

3.1. The area of opening within the frame in which louvers are fixed shall be measured in sq. meters.

3.2. The rate included painting 3 coats to wood work with ready mix paint.

3.3. The rate shall be for a unit of one square meter.

**10.0.0.(II) Providing & fixing with wooden louvers plank 12 mm. thick windows and ventilators with teak wood frame 10x7 cms. size including 3 coats of oil painting to wood etc complete.****1.0. Materials & Workmanship**

The relevant specifications of item No. 10.00 (I) shall be followed except that the teak wood planks 12.00 thick louvers shall be provided.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 10.00 (I) shall be followed.

2.2. The rate shall be for a unit of one square meter

**SECTION-11****Steel Shutters, Windows, Ventilators**

- 11.2. (A) Steel work riveted, in built up sections, framed work including cutting, hosting fixing in position and applying a priming coat of red lead paint. In beam and joints, channels, angles tees, flats, with connecting plates or Angle cleats as in main & cross beams, Hop and jack falters, pralines connected to common rafters and the like.**

**1.0. Materials**

The structured steel work shall conform to M-22. Red lead paint shall conform to I.S : 102-1962.

**2.0. Workmanship**

**2.1.** The steel sections as specified or required, shall be cut, square and to correct lengths, as per drawings and design. The .cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of member, except as indicated in the drawing or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in suet] a manner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

**2.2.** Steel riveted or bolted in built up sections, frame work.

**2.2.1.** The steel structure as shown in the drawings or as per direction of the Engineer-in-charge shall be laid out on a level platform to full scale and to full size in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

**2.2.2.** Wooden templates 12 mm. to 19 mm. thick or metal sheet template shall be made to correspond to each connecting gussets plate and rivet holes shall be accurately marked on them and drilled. The templates shall be laid on the steel members and holes of the steel members shall also be marked for curing. The base of steel column and the .position of Anchor bolts shall be carefully set out

**2.2.3.** Ail stiffeners shall be formed by pressure and where practicable the metal shall not to be cut and welded in making these. In major work', or whore so specified, shop drawings giving complete details and information for the fabrication of the component parts of the structure including location, type, size, (origin and details or rivets, bolts or weld shall be prepared in advance of the actual fabrication and as distinctly marked or stenciled with paint with the identification mark as given in the stop drawings. The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal section.

Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, stained, or forced into position and when build up, shall be true and tree from twists, brinks, buckles, or open joints.

Before making holes in individual members for fabrication the steel work intended to be riveted or belted together shall be as ambled or clamped properly and tightly so as to ensure close abutting or lapping or the surfaces of the different members. All softeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or crossed true and straight and fitted close together. Web splice plates and tillers under stiffened shall be cut to fit within 3 mm. or flange Angles Web plates of Girders shall have no cover. Plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced ^,hall have clearance of not more than 6 mm. The erection, clearance for created ends of members connecting steel shall preferably be not greater than i.5 mm. The erection clearance at the ends o' beams without web cleats shall not be more than 3 mm. at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided.

Pains and rollers shall be accurately tuned to gauge. These straight and smooth and free from flows. The roller bearing shall be provided with adequate arraignment's fur holding the girders or truss resting on it. In columns caps and bases, the ends of shifts together with the attached gussets Angles, channels etc after riveting together shah be accurately mechanized so that the parts connected Butt against each other over the entire surfaces of contact connecting angles or channels shall he fabricated and placed in position with greater accuracy so that they are nut unduly reduced in thickness by machining. The ends of bearing stiffeners shall be mechanized or ground to tit tightly both at the top and bottom, Alt holes shall generally be drilled to the required size and at required, position. Sub punching shall be permitted provided it is done 3 mm. or less in diameter and reamer thereafter to the require size. The holes for rivets and bolts shall be larger by 0 4. to 6 mm. than the nominal diameter of rivets or black bolts depending upon me diameter of rivets.

Holes shall have their axis perpendicular to the surface bored through. The drilling or remarrying shall be free from burrs, and the holes should be clean and accurate holes for counter sunk bolts shall be made in such a mariner that their heads fit flush with the surface after fixing.

The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawings or as directed. Generally the following principles shall govern the use of rivets turned and fitted bolts, and black bolts.

- (i) Rivets and turned and fitted bolts shall be used where the connections is such that slip under load has to be avoided.
- (ii) Black bolts may be used very sparingly where a force is carried through a connection without impact, vibration or reversal or stresses.

#### **2.2.4. Riveting:**

The parts assembled for riveting shall be in close contact with each other and the bearing stiffeners shall bear tightly both at top and bottom without being drawn or caulked. Members to be riveted shall be properly pinned or bolted and rigidly held to gather while riveting. Drifting of holes shall not be permitted Except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding, the nominal diameter of rivets or bolts. Drifting done during assembling shall not distort the metal or enlarge the holes.

The shanks of rivets shall project beyond the plate-surface sufficiently so as to fill hole thoroughly and form the required head after riveting.

The riveting shall be done by hydraulic or pneumatic process. However, where such facilities are not available, hand riveting may be permitted. The rivet shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10 mm. may be fitted cold. Rivets shall be of heat finish with heads full and of equal size. All loose, burnt or badly formed rivets with concentric or deficient heads shall be cut out and replaced. The heads of rivets shall be central to shanks and shall grip the assembled member firmly. In cutting out rivets, care shall be taken so as not to injure assembled members, caulking or reequipping shall not be permitted.

For testing rivets, a hammer weighing approximately 0.25 kg shall be used. Both heads of the rivets shall be tapped, slack rivets will give a hollow sound and a jar.

All rivet heads shall be painted with red lead paint within a week of their fixing.

**2.2.5.** All bolt heads and nuts shall be hexagonal and of equal size unless specified otherwise. The screwed heads shall conform to I.S. 1363-1960 and the threaded surface shall not be tapered. The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly.

Where turned and fitted bolts are required to be used in place of rivets shall be provided with washers not less than 6 mm. thick so that the nut when tightened shall not bear on the unthreaded body of the bolt. Tapered washers shall be provided for all heads and nuts bearing on leveled surfaces. The threaded portion of the bolt shall not be within the thickness of the parts bolted together, the faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of locknuts, spring washers, cross-cutting or hammering down of threads as directed.

Bolts, nuts, and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming coat of red lead, as per relevant specification of painting.

### **3.0 Mode of measurements & payment**

**3.1.** The steel work shall be measured in general as under:

- (a) All work shall be measured on the basis of finished dimensions as fixed at site and measured net unless specified otherwise.
- (b) The weight of steel sections, steel rods, and steel strips in finished work shall be calculated on standard weight on the same basis on which steel is supplied to Contractor by department or those given in relevant I.S. : if steel is arranged by the contractor.
- (c) The weight of steel plates and strips shall be taken from relevant I.S. based on 7.35 kg./ sq. meter for every millimeter sheet thickness if steel is supplied to the contractor by department.
- (d) Unless otherwise specified, weight of cleats, brackets, packing pieces, bolts, nuts, washer, distance pieces, separators, diaphragm gusset (taking overall square dimensions) fish plates etc. shall be added to the weight of respective items.
- (e) In riveted work allowance is to be made for weight of rivet heads. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts.
- (f) For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg./cum.
- (g) Unless otherwise specified, no allowance shall be made for the weld metal in case of welded steel structure.

- (i) Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001m
- (j) Mill tolerance shall be ignored when weight is determined by calculation.
- 3.2.** The rate includes cost of all material, labour, erection, hoisting scaffolding, protective measure, required for proper completion of the item of work. This shall also include conveyance and delivery handling, loading, unloading and storing etc. required for completing the item described above including necessary wastage involved.
- 3.3.** The rate shall be for a unit of one quintal.
- 11.2.(D) Steel work riveted in built up section, framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint in trusses, and trussed, purlins, upto 25 m. span and 15 m. overall height.**
- 1.0. Materials & Workmanship**  
The relevant specifications of item No. 11.2 (A) shall be followed except that the work shall be for trusses and trussed purlins up to 25 m. span and 15 m. overall height.
- 2.0. Mode of measurement & payment**
- 2.1.** The relevant specifications of item No. 11.2. (A) shall be followed.
- 2.2.** The rate shall be for a unit of one quintal.
- 14.4.(A) Steel work welded, in built up sections frame work including, cutting, hoisting, fixing in position and applying a priming coat of red lead paint. In beams and joints, channels, angles tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins, connected to common fallers and the like.**
- 1.0 Materials & Workmanship**
- 1.1.** The relevant specification of item No. 11.2 (A) shall be followed except that the steel work shall be done by welding.
- 1.2.** Welding shall generally be done by electric process. Gas welding shall be resorted to, using oxyacetylene flame with specific prior approval. Gas welding shall not be permitted for structural steel work.
- 1.3.** The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded, shop and site welded as well as type of electrodes to be used, symbol for welding on plans and shop drawings shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult positions on scaffoldings etc. The welding work shall conform to I.S. 816-1969.
- 1.4.** Preparation of surfaces : Surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall be permitted.
- 1.5.** Assembly for welding : Before welding is commenced, the plates shall first be brought together and firmly clamped or spot welded at specified distance. This temporary connection has to be strong enough to hold the plates accurately in place without displacement.
- 1.6.** Precautions : All operations connected with welding and cutting equipment shall conform to safety requirement given in I.S. 818-1968.  
The following points shall be borne in mind during the process of welding:
- (b) Arc length voltage and amperage shall be suited to the thickness of material type of groove and other circumstances of the work.
- (c) The segments of welding shall be such that where possible the members which offer the greatest resistance to compression are welded first.
- 1.7.** The defective welds which shall be considered harmful to the structural strength shall cut out and reworked.
- 1.8.** Finished welds and adjacent parts shall be protected with clean boiled linseed oil and after all slag has been removed. Welds and adjacent parts shall not be painted after the same are approved.
- 1.9.** All the members shall be thoroughly cleaned of rust-scales, dust etc. and given a priming coat of red lead paint before fixing them in position.  
Testing of welding to be added in the specification I.N. 12.2.2.12-(i) to (viii)
- 2.0. Mode of measurements & payment**
- 2.1.** The relevant, specification of item No. 11.2 (I) shall be followed.
- 2.2.** The rate shall be for unit of one quintal.
- 11.4.(D) Steel work welded in built up section framed work, cutting, hoisting, fixing in position and applying a priming coat a red lead paint in trusses and trusses purlins up to 25 m. span and 15 m. overall height.**
- 1.0. Materials & Workmanship**  
The relevant specification of item No. 11.4.(A) shall be followed except that the work shall be for trusses and trussed purlins up to 25 m. span and 15 m. overall height.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 11.4 (A) shall be followed.

**2.2.** The rate shall be for unit for one quintal.

**11.6. Providing and fixing in position collapsible steel shutters with vertical channels 20 x 10x2 mm. braced with flat iron diagonals 20 x 5 mm. size with top and bottom rails of T Iron 40 x 40 x 6 mm. with 38 mm. dia steel pulleys complete with bolts, nuts, locking arrangements, stoppers, handles, including applying a priming coat red lead paint.**

**1.0. Materials**

The collapsible steel gate shall conform to M-33.

**2.0. Workmanship**

J-rails shall be fixed to the floor and to the lintel at top by means of Anchor bolts, embedded in cement concrete-of floor and lintel. The anchor bolts shall be placed approximately at 45 mm. centers alternatively in groove shall be formed along the runner for the purpose. The collapsible gate shall fixed at the sites by fixing the double channels in the T-iron rail and also by hold fasts bolted to the end double channel and fixed in the masonry of the side walls or the otherwise.

In case where the collapsible gate is not required to the lintel beams or slop above, a toe iron suitably designed may be fixed at the top embedded in masonry and provided with necessary clamps and roller arrangement at the top.

All the adjoining work damaged while fixing of gate shall be made good to match the existing work without any extra payment.

All the members of the collapsible gate including. T-iron shall be thoroughly cleaned of rust, scales dust etc., and given a priming coat of red lead, before fixing them in position.

**3.0. Mode of measurement and payment**

**3.1.** The collapsible gate shall be measured in sq. meter. The height of the gate shall be measured as the length of double channels and breadth from outside to outside of the end fixed double channels in open position of the gate. The rate includes providing handles, arrangements stoppers etc.

**3.2.** The rate shall be for a unit of one sq. meter.

**11.7. Providing and fixing 1 mm. thick M.S. sheet sliding shutters both frame and diagonal braces of 40 x 40 x 6 mm. Angle iron 3.15. M.S.S. gusset plates at junctions and comers, 25 mm. dia. pulley 40 x 40 x 6 mm. angle and T-iron guide rail at top and bottom respectively with handles, stoppers and locking arrangements etc. including applying priming coat of red lead paint.**

**1.0. Materials**

M.S. sliding shutters shall be fabricated of M.S. component as given in the description of item M.S. sheets 1 mm. thick shall be fixed to the frame with rivets or weld as approved. The shutters shall be provided with top and bottom guide rails of Angles or T-iron as specified and 25 mm. dia. steel pulleys at the-bottom guide black with steel pulleys at the top. The frame shall be riveted and /or welded and wherever riveting shall be done 3.15 mm. gussets plates shall be provided at the junctions.

**2.0. Workmanship**

**2.1.** The shutters shall be single or double leaf shutters as specified. The guide rails shall be sufficiently long and continued along the wall on the both ends so that the sliding shutters can rest against walls, leaving full opening when so required.

**2.2.** The guide rails shall be fixed to the floor by means of anchor bolts embed in the cement concrete floor. The steel section at the top shall be suitably supported from the walls. Two channel section shall suitably fixed vertically below the extreme clamps in the wall and floor to avoid the shutters from going out of the supports at the top and bottom. A suitable clamping arrangement will be provided at either end of the opening to avoid the shutters from rolling back into opening.

**2.3.** All the adjoining work damaged while fixing shall be made good to match the existing work.

**2.4.** All members of the sliding shutter including T-iron shall be thoroughly cleaned of rust scales dust etc. and given a priming coat of red lead before fixing them in position

**3.0. Mode of measurements & payment**

**3.1.** The sliding doors shall be measured on sq. meter. The height of the shutters shall be measured from outside to outside of the guide, rail and width outside of shutters including vertical channels in sides. The rate includes providing handles stopped and locking arrangement etc. complete.

**3.2.** The rate shall be for a unit of one sq. meter.

**SECTION-12****Labour for fixing fixtures & fastening****12.4. Fixing metallic tower bolts of sizes with necessary screws etc. complete (tower bolts and screws to be paid under separate items:)****1.0. Workmanship**

- 1.1. This item provides for labour for fixing metallic tower bolts of any size with screws, mitts etc,
- 1.2. The tower bolts shall be fixed in proper position as shown in the drawings or as directed. There shall be fixed truly vertical or horizontal as the case may be.
- 1.3. The screws shall be driven home with screw driver. In no case the screws shall be hammered in.
- 1.4. All recesses and seats shall be cut to the exact size for counter sinking etc. where so required.
- 1.5. Care shall be taken to see that no gaps are left between the fitting and the surface meant to receive the fittings.
- 1.6. The fittings shall be properly cleaned and left in original finish after fixing.

**2.1. Mode of measurements & payment**

- (1) Cutting of holes, recesses, and seats involved in process of fixing.
- (2) Cost of filling and cushioning materials where so required for proper seating of new fittings.
- (3) Cost of nails etc. for temporary positioning of fitting.
- (4) Cost of cleaning materials like old washed dhoti stain remover etc.
- (5) Cost of making good the over cut recesses or holes if any.
- (6) Cost of making hole of required size on the wooden frame for housing the bolt for locking.
- 2.2. The rate includes cost of labour involved in all operations required for proper completion of the items including carriage, handling, fixing etc. complete.
- 2.3. The rate shall be of unit of one number.

**12.5. Fixing metallic flush bolts of size with .necessary screws etc., complete (flush bolts and screws shall be paid under separate items):****1.0. Workmanship**

- 1.1. The relevant specifications shall be followed as per item No. 12.4. except for fixing metallic flush bolts instead of tower bolts.

**2.0. Mode of measurements and payment**

- 2.1. The relevant specifications of item No. 12.4. shall be followed.
- 2.2. The rate shall be for a unit of one number.

**12.8. Fixing metallic or plastic door handles of sizes with necessary screws etc. complete (door handles and screws to be paid under separate items)****1.0. Workmanship**

- 1.1. The relevant specifications of item No. 12.4. shall be followed except fixing door handles instead of tower bolts.

**2.0. Mode of measurements and payment**

- 2.1. The relevant specifications of item No. 12.4. shall be followed.
- 2.2. The rate shall be for a unit of one number

**12.10. Fixing metallic gate and shutter hooks and eyes of sizes (hooks and eyes to be paid under separate items)****1.0. Workmanship**

- 1.1. The relevant specifications shall be followed as per item No. 12.4 except that fixing of eye and hooks instead of tower bolts.

**2.0. Mode of measurements and payment**

- 2.1. The relevant specifications of item No. 12.4 shall be followed.
- 2.2. The rate shall be for a unit of one number (Hook & Eye)

**12.11. Fixing metallic door latches of size with necessary screws (door latches and screws to be paid under separate items) :**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed except that fixing metallic door latches instead of tower bolts.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The rate shall be for a unit of one Number.

**12.12. Fixing metallic mortise night latches with necessary screws including making necessary crews holes in wooden door shutters etc., complete (mortise night latches and screws to be paid under separate items):**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 above shall be followed except that the fixing of mortise night latches instead of tower bolts.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The rate shall be for a unit of one number.

**12.18. Fixing metallic ball catchers 100 mm. dia. (Ball catches to be paid under separate item):**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed same except fixing of ball catchers 100 mm dia.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specification of item No. 12.4 shall be followed.

**2.2.** The rate shall be for a unit of one number.

**12.20. Fixing metallic casement window fasteners with necessary etc. complete. (Casement window fasteners and screws to be paid under separate items):**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4. shall be followed except fixing metallic casement windows fasteners.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2:** The rate shall be for a unit of one number.

**12.21. Fixing metallic casement stays of sizes with necessary screws etc., complete. (Casement stays and screws to be paid under separate items)**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed except fixing of metallic casement stays.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The shall be for unit of one number.

**12.24. Fixing metallic cupboard of ward robe locks of sizes with necessary screws etc. complete (Locks and screws to be paid separately) :**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed except that fixing metallic cupboard or ward robe locks of size with necessary screws etc. complete.

**2.0. Mode of measurements & payment**

**2.1** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The shall be for a unit of one number

**12,25. Fixing metallic or plastic cupboard or ward robe knobs of size with necessary screws/ bolts etc., (knobs and screws/bolts to be paid separately) :**



**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed except that fixing metallic or plastic cupboard or ward robe knobs of sizes with necessary screws/bolts etc. complete.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The shall be for a unit of one number.

**12.26. Fixing metallic floor stoppers of sizes with rubber cushion, screws etc., to suit shutter thickness complete, (floor door stopper with rubber cushion and screws to be paid under separate items) :**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 12.4 shall be followed except that fixing metallic floor stoppers.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The shall be for a unit of one number.

**12.28. Fixing metallic door handles or knobs for mortise jocks with necessary screws etc. complete (doors, handles/knobs and screws to be paid separately) :**

**1.0. Workmanship**

The relevant specifications of item No. 12.4 shall be followed except that fixing metallic door handles or knobs for mortise with necessary screws etc. complete.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 12.4 shall be followed.

**2.2.** The rate shall be for a unit of one number.

**SECTION-13****Glazing****13.1.(I) Providing and fixing sheet glass, selected quality (type-C) bedded in putty and fixed with wooden beading including cost of wooden beading of first class teak wood and necessary cutting of glass 5 mm. thick.****1.0. Materials**

The glass shall conform to M-38. The wood beading shall conform to M-29, Putty shall conform to I.S. 419-1967.

**2.0. Workmanship**

The glass shall be sheet glass of selected quality of 5 mm. thick.

**2.1.** The size of glass for glazing shall allow a clearance of 2.5 mm. between the edges of glass and the wood or metal surrounds. The clearance may be increased, provided the depth of the rebate of groove is sufficient to provide not less than 1.5 m. cover to the glass. The detailed process of glazing shall be as specified in I.S. 3548-1966.

**2.2.** All stains from the surface of glass shall be removed and cleaned with thinner or spirit without any extra payment.

**2.3. Wooden beading :**

**2.3.1.** The size of the wood beads for glass panes shall be 1.5 cms. x 3 cms unless otherwise specified. Beads shall be secured to wooden frames with either panels pins or screws and to metal frames in the way provided for in the frame.

**2.3.2.** Sufficient putty compound shall be applied to the rebate so that when the glass has been pressed into the rebate, a bed of compound not less than 1.5 mm. thick will remain between the glass and the rebate. There should also be surplus of compound squeezed out above the rebate which should be stripped at an angle not under cut to prevent water accumulating. Beads should be bedded with compound against the glass and wood beads should also be bedded against the rebate. Care should be taken to see that no voids are left between the glass and the bead.

**3.0. Mode of measurement & payment**

**3.1.** All measurements of cutting shall, unless otherwise stated, be held to include the consequent waste.

**3.2.** Each pane' of glass shall be measured to the nearest 0.5 cms. both in width and height/length.

**3.3.** Irregular shaped or circular panes shall be measured as the smallest rectangular area from which the irregular or circular pane can be cut.

**3.4.** The rate includes cost of materials, labour required for completion of the item including hoisting, carriage, temporary erections like scaffolding etc.

**3.5.** The rate also includes :

(i) The wastages and breakage involved in the process.

(ii) Straight cutting on glass and glazing sheets.

(iii) Cost of subsidiary materials required for proper fixing and functioning of glass i.e. nails, spirit, putty, teak wood beading glass, pins, etc. complete.

**3.6.** The rate shall be for a unit of sq. meter.

**13.1.(M) Providing and fixing sheet glass selected quality (Type-C) bedded in putty and fixed with wooden beading including cost of wooden beddings of first class teak wood, and necessary cutting of glass 6 mm. thick.****1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 13.1 (I) shall be followed except that the sheet glass of selected quality shall be 6 mm. thick.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 13.1.(I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**13.3.(C) Providing and fixing rough cast wired glass 6 mm. thick bedded in putty and fixed with wooden beading including the cost of wooden beadings of Indian teak wood and necessary cutting of glass wired figures glass.**

**1.0. Materials :**

Wire figure glass shall conform to M-38. Wooden beading shall conform to M-29, Putty shall conform to I.S. 419-1967.

**2:0. Workmanship**

The relevant specification of item No. 13.1(1) shall be followed except that the wired figured glass of 6 mm. thick shall be used.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 13.1(1) shall be followed.

**3.2.** The rate shall be for a unit of one sq. nit.

**3.5.(3) Providing and fixing sheet glass ordinary quality bedded in putty and fixed with wooden beading including the cost of wooden beadings of first class teak wood and necessary cutting of glass 3 mm. thick.**

**1.0. Materials**

Glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S. 419-1967. **2.0**

**Workmanship**

The relevant specification of item No. 13.1 (I) shall be followed except that the wired figured glass of 6 mm. thick shall be used.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 13.1 (I) shall be followed.

**3.2.** The rate shall be for a unit of one sq. mt.

**13.5.(3) Providing and fixing sheet glass ordinary quality bedded in putty and fixed with wooden beading including the cost of wooden beadings of first class teak wood and necessary cutting of glass 3 mm. thick.**

**1.0. Materials**

Glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S. 419-1967.

**2.0. Workmanship**

**2.1.** The specification of this item shall be followed as per item No. 13.1(1) except that the sheet glass of ordinary quality shall be used and thickness of sheet glass shall be 3 mm. thick.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 13.1(1) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**13.5.(4) Providing and fixing sheet glass ordinary quality, bedded in putty and fixed with wooden beadings including the cost of wooden beadings of first class teak wood and necessary cutting of glass 4 mm. thick.**

**1.0. Materials and Workmanship**

The relevant specifications of item No. 135 (3) shall be followed, except that the thickness of ordinary sheet glass shall be 4 mm.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specification of item No. 13.1(1) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter,

**13.7. Extra for using ground glass (Frosted or obscured on one side) instead of plain glass.**

**1.0. Materials**

Glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S. 419-1967.

**2.0. Workmanship**

The specifications of this item shall be followed as per item No. 13.1 except that ground glass (Frosted or obscured on one side) shall be used.

**3.0. Mode of measurements and payment**

**3.1.** The payment shall be made on sq. mt. basis extra over and above the payment for plain glass for using ground glass [Routed or obscured).

3.2. The relevant specifications of item No. i3.5 (III) shall be followed.

3.3. The rate shall be for a unit of one sq. meter.

**13.11.(A) Difference in cost of material and labour involved in method of glazings if changed in item No. 13.1 to front and back puttied and sprigged 01 fixed with glazing pins :**

**1.0. Materials and Workmanship**

1.1. The relevant specification of item No. 13.1 shall be followed except that the glazing is to be done by front and back puttied and sprigged or fixed with glazing pins.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 13.1 (I) and 13.1 (II) shall be followed.

2.2. The extra rate for extra cost involved shall be paid over and above item No. 13.1(1) & 13.1 (II).

2.3. The rate shall be for a unit of one sq. meter.

**13.12. Grinding, polishing and round of edges or glazing sheets.**

**1.0. Materials**

The glass shall conform to M-38.

**2.0. Workmanship**

The edges of glass or glazing sheets shall be grained, polished and rounded off such that it renders uniform look throughout the length and shall be neatly finished. The work shall be carried out in best workman's like manner.

**3.0. Mode of measurements & payment**

3.1. The edges of glass round, polished and rounded off shall be measured in meter.

3.2. The rate shall be for a unit of one running meter.

**SECTION-14****Paving & Floor Finishing**

- 14.2.(A) 40 mm. thick marble chips flooring rubbed and polished (i.e. Terrazzo) to granolithic-finish with under layer 30 mm. thick cement concrete (1:2:4:) (1 cement :2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer, 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement : 1 marble powder by weight, in proportion of 4: 7 ( 4 cement marble powder mix : 7 marble chips by volume): Dark shade pigment with ordinary cement (in top layer only).**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-G. Stone grit shall conform to M-8.

The pigment incorporated in terrazzo shall be of permanent colour and shall conform to requirement mentioned in Appendix-A in IS: 2114-1962. Marble chips shall conform to M-46. The marble powder shall pass through I.S. Sieve Terrazzo-30.

**2.0. Workmanship**

2.1. Terrazzo finish shall be laid over a layer of base concrete in case of ground floor. When the terrazzo floor is laid over R.C.C. slabs a cushioning layer consisting of 75 mm. thick lime concrete shall be provided below the terrazzo floor. The terrazzo flooring shall consist of an under layer of cement concrete and layer of terrazzo which shall be laid monolithically.

**2.2. Under Layer :**

2.2.1. The under layer shall be of cement concrete mix 1:2:4. The maximum size of aggregate used shall not exceed 10 mm. Specification for cement concrete shall be followed as per item No. 5.4.1.

**2.3. Terrazzo Topping :**

2.3.1. The topping shall have mix of ordinary cement, and marble powder in proportion 3:1 (3 cement : 1 marble powder by weight) and marble aggregate shall be mixed in proportion 4:7 (4 cement marble powder : 7 marble chips by volume). The thickness of concrete and cushioning layer shall not be less than 10 cms. and 7.5 cms. respectively. The minimum thickness of under layer and topping shall be 40 mm.

**2.4. Panels :**

2.4.1. The floor both while laying the under layer and topping shall be divided into panels not exceeding 2 sq. m. in area so as to reduce the risk of cracking due to differential shrinkage or expansion of terrazzo and sub-floor. The joints be so located that the layer dimensions of any panel do not exceed 2 M. The panels shall preferably be separately. However where the butt joint are provided, the bays shall be laid alternatively allowing for an interval of at least 24 hours between the laying of adjacent bays.

**2.5. Mixing of materials :**

2.5.1. With a view to avoid variation in colour, mixing shall be done in trough or tub, and the complete quantities of cement and pigment required for one unit shall be mixed at the beginning of the work. Colour cement or cement and pigment mix shall be dry mixed with marble powder. The mix thus obtained shall be mixed with aggregate. Care shall be taken not to get the materials into a heap as this would result in coarser aggregates moving on the sides and cement to the centre. To the dry mix thus prepared, water shall be added in small quantities while materials are being worked to get a mix of proper consistency. The mixture shall be plastic but not so wet as to flow. The wet mix shall be used within half an hour mix of addition of water during preparation laying.

**2.6. Laying :**

2.6.1. The base shall be divided into panels with the help of dividing strips including the strips required for decorative design up to the finished surface level of the floor. Screeds strips shall be used where the dividing strips are not used. The base shall be cleaned of all dust, dirt laitance and any loose materials. It shall be then wetted with water mopped and smeared with cement slurry at 2.75 kg./sq.mt. Under layer shall be then be spread and leveled with a screening board. The top surface shall be left rough to provide a good bond to the terrazzo.

2.6.2. The terrazzo topping shall be laid while the under layer is still plastic but has hardened enough to prevent cement from rising to the surface. This is normally achieved between 18 to 24 hours after laying of under layer. A cement slurry preferably of the same colour as the topping shall be brushed on the surface immediately before laying the topping. The terrazzo mix shall be laid to a uniform thickness on the screed bed and be completed thoroughly by taping or rolling and trowel led smooth. Excessive troweling or rolling in early stages shall be avoided as it results in working up cement to the surface which will produce a surface liable to cracking and will require more grinding to expose marble chips. The terrazzo surface shall be tamped, trowel led, and brought true to required level by a straight edge and steel floats in such a manner that the maximum amount of marble chips come up and are spread uniform over the surface and no part of the surface is left without chips.

## **2.7. Curing :**

2.7.1. The surface shall be left dry for air curing for a period of 12 to 18 hours. Thereafter water shall be allowed to stand overnight in pools for period of minimum of four days. The floor shall be prevented from being subjected to extreme temperature.

## **2.8. Grinding and finishing :**

2.8.1. Grinding and finishing shall be done either by hand or by machine. In case of manual grinding, the process of grinding shall begin after two days, while in case of machine grinding, the process shall be started after seven days, after completion of laying.

2.8.2 First grinding shall be done by carborundum stones of 60-grit size. The surface shall then be washed clean and grouted with a grout of cement or /and coloring matter in the same mix and proportion as the topping in order to fill any pin holes that appear. It shall be allowed to dry for 24 hours and wet cured for four days in the same manner as mentioned in Para 2.7 above.

2.8.3. The second grinding shall be done with carborundum stone of 80 grit size. The surface shall then be prepared as after first grinding. The third grinding shall be done with carborundum stone of 120 to 150 grit size. The surface shall then be washed again and allowed to dry for 12 hours, and wet cured for four days as before. The fourth grinding shall be done with carborundum stone of 320 to 400 grit size. The surface shall again be washed clean and rubbed hard with felt and slightly moistened Oxalic acid powder @ 5 gms. per sq. meter of floor surface. After the finishing work is over, the surface shall be washed with dilute oxalic acid solution and dried for floor polishing, machine fitted with felt or Hessian bobs shall then be run over it until floor shines. In case wax-polished surface is required, wax-polished shall be applied on the surface with the help of soft linen over a clean and dry surface. The polishing machine fitted with bobs shall be run over it, clean saw dust shall be spread over the floor surface and polishing machine again operated which will remove excess wax and leave glossy surface. Floor shall not be left slippery.

## **3.0. Mode of measurements and payment**

3.1. Terrazzo flooring shall be measured as laid in sq. meters. Length and breadth shall be measured for visible area of work done. No deduction shall be made for nor extra for any opening in floor or area up to 0.10 sq. meter. The rate shall cover laying the floor at different levels in the same room or court-yard and nothing extra shall be paid on that account.

3.2. The rate includes the cost of all materials and labour involved in all operations described above. The rate shall also not include diving strip.

3.3. The rate shall be for a unit of one sq. meter.

**14.2.(B) 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement : 1 marble powder by weight) in proportion of 4 : 7 (4 cement : marble powder mix : 7 marble chips by volume) light shade pigment with white cement (in top layer only).**

## **1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 14.2 (A) shall be followed except that light shade pigment with white cement shall be used in top layer

## **2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

- 14.2.(C)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble power by weight) in proportion of 4:7 (4 cement : marble powder mix : 7 marble chips by volume). Medium shade pigment with approx, 50% white cement and 50% ordinary cement (In top layer only).

**1.0. Materials & Workmanship**

- 1.1. The relevant specifications of item No. 14.2. (A) shall be followed except that medium shade pigment with approximately 50% white cement and 50% ordinary cement in top layer only shall be used.

**2.0. Mode of measurements & payment**

- 2.1. The relevant specifications of item No. 14.2. (A) shall be followed.

- 2.2. The rate shall be for a unit of one sq. meter.

- 14.2.(D)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm, thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble power by weight) in proportion of 4:7 (4 cement : marble powder mix : 7 marble chips by volume). White cement without any pigment (in top layer only).

**1.0. Materials & Workmanship**

- 1.1. The relevant specifications of item No. 14.2.(A) shall be followed except that white cement without any pigment in top layer only shall be used.

**2.0. Mode of measurements & payment**

- 2.1. The relevant specifications of item No. 14.2.(A) shall be followed.

- 2.2. The rate shall be for a unit of one sq. meter.

- 14.2.(E)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble power by weight) in proportion of 4:7 (4 cement : marble powder mix : 7 marble chips by volume), light < de pigment with ordinary cement (in top layer only).

**1.0. Materials & Workmanship**

- 1.1. The relevant specifications of item No. 14.2(A) shall be followed except that the light shade pigment with ordinary cement (in top layer only) shall be used.

**2.0. Mode of measurements & payment**

- 2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

- 2.2. The rate shall be for a unit of one sq. meter.

- 14.4.(A)** Marble chips skirting (Terrazzo) or dodo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble by weight) in proportion of 4:7 (4 cement : 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3 (1 cement : 3 coarse sand) : Dark shade pigment with ordinary cement (in top layer only).

**1.0. Materials**

- 1.1. The relevant specifications of item No. 14.2 (A) shall be followed.

**2.0. Workmanship**

- 2.1. Under layer: The under layer for terrazzo on vertical surfaces like skirting and dedos shall be of stiff cement mortar 1:3 (1 cement : 3 coarse sand) finished rough so as to give a good bond to the topping.

- 2.2. Terrazzo topping shall not be less than 6 mm. thick and the combined thickness of under layer and topping shall be less than 20 mm. The other details shall be followed same as per specifications of item No. C 24 except that the light shade pigment with white cement in top layers shall be used.

### **3.0. Mode of measurements & payment**

3.1. The skirting and dedo shall be measured in square meters correct to two places of decimals. The height shall be measured from the finished level of floor.

3.2. The rate shall be for a unit of one sq. meter.

**14.4.(B) Marble chips skirting (Terrazzo) or dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble by weight) in proportion of 4:7 (4 cement : 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3 (1 cement : 3 coarse sand) : light shade pigment with white cement (In top layer only).**

#### **1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 14.4 (A) shall be followed except that the light shade pigment with white cement in top layers only shall be used.

#### **2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.4(A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**14.4.(C) Marble chips skirting (Terrazzo) or dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble by weight) in proportion of 4:7 (4 cement : marble powder mix 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3 (1 cement : 3 coarse sand) : medium shade pigment with approximate 50% white cement and 50% ordinary cement (In top layer only).**

#### **1.0. Materials and workmanship**

1.1. The relevant specifications of item No. 14.4(A) shall be followed except that the medium shade pigment with approximate 50% white cement and 50% ordinary cement in top layers only shall be used.

#### **2.0. Mode of measurement & payment**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed.

2.2. The rate shall be for a unit for one sq. meter.

**14.4.(D) Marble chips skirting (Terrazzo) or dodo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble by weight) in proportion of 4:7 (4 cement : marble powder mix 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3 (1 cement : 3 coarse sand) : White cement without any pigment (In top layer only).**

#### **1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 14.4 (A) shall be followed except that the white cement without any pigment in top layers shall be used.

#### **2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**14.4.(E) Marble chips skirting (Terrazzo) or dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble by weight) in proportion of 4:7 (4 cement : marble powder mix 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3 (1 cement : 3 coarse sand) : light shade pigment with ordinary cement (In top layer only).**

#### **1.0. Materials & workmanship**

1.1. The relevant specifications of item No. 14.4 (A) shall be followed and except that the light shade pigment with ordinary cement in top layers only shall be used.

#### **2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed and except that the light shade pigment with ordinary cement in top layers only shall be used.

2.2. The rate shall be for a unit of one sq. meter.



**4.16 Providing and laying cushioning layer on R.C.C. slab consisting of 75 mm. thick lime concrete using brick aggregate of 20 mm. nominal size 50% mortar comprising of 1 lime : 2 fine sand.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Lime mortar or proportion 1:2 shall conform to M-10. Brick aggregate 20 mm. nominal size shall conform to M-14.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 1.8 shall be followed except that the proportion of mix shall be 50% mortar comprising of 1 lime : 2 coarse sand and the size of brick aggregate shall be 20 mm. nominal size. The lime concrete work shall be carried out in 7.5 Cms. average thickness as a cushioning layer on R.C.C. slab.

**3.0. Mode of measurements and payment**

**3.1.** The lime concrete work shall be measured for visible area of work done.

**3.2.** The rate shall be for a unit of one sq. meter.

**14.19.(A) Precast terrazzo (Mosaic) tiles 20 mm. thick with white, black or white and black marble chips of sizes up to 6 mm. laid in floors, treads of steps and landings on a bed of 25 mm. average thickness of lime mortar 1:1.5 (1 lime putty : 1.5 fine sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete with precast files of light shades, using white cement.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Lime Mortar shall conform to M-10 cement mortar shall conform to M-1. The precast terrazzo tiles of 20 mm. thick shall be light shade using white cement and conform to M-47.

**2.0. Workmanship**

**2.1.** The work shall be carried out as per I.S. 1443-1972.

**2.2. Bedding :**

**2.2.1.** Before spreading the mortar, the sub-base of the floor shall be cleaned of all dirt, scum and loose materials and then well wetted without forming any pools of water on the surface.

**2.2.2.** In case; of R.C.C. floors, the top shall be left a little rough, all points of level for the finished surface shall be marked out. The lime mortar of proportion 1:1.5 (1 lime putty : 1.5 fine sand) or cement mortar of proportion C.M. 1 : as directed shall be then evenly and smoothly spread over the base. Bedding layer of mortar shall be not less than 10 mm. and average thickness of bedding shall be 25 mm.

**2.3. Laying :**

**2.3.1** Before laying the terrazzo (Marble/Mosaic) tiles, the tiles shall be thoroughly wetted with water. Neat cement grout of required-consistency at 4.4. Kg. cement/sq. mt. shall be spread on the mortar bed. The tiles shall be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slope, There shall be no hollows left. The joints shall be uniform thickness and in straight line as per the pattern.

**2.3.2** The surface of flooring shall be checked frequently with a straight edge at least two meters long so as to obtain a true surface with required slope.

**2.3.3.** The tiles which are fixed in the floor adjoining the wall shall go about 10 mm. under plaster. Skirting or dado shall be left unfinished for about 50 mm. above finished floor level and unfinished strip then left earlier shall be finished.

**2.3.4.** In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edges to give straight and true joints.

**2.3.5.** After the tiles have been laid, the surplus cement slurry and the joints shall be cleaned and washed fairly deep before cement hardens.

**2.3.6.** The day after tiles have been laid, the joints shall be cleaned or gray cement grout with a wire brush to a depth of about 5 mm. and then grouted with white cement with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill pin holes that may exist on the surface.

**2.4. Curing :**

**2.4.1.** The flooring shall be kept wet with damp sand or water for seven days. It shall be kept undisturbed at least for 14 days. The grinding shall normally be commenced after 14 days.

**2.5. Polishing :**

2.5.1. After the tiles are properly cured, first grinding shall be done with carborundum stone of 48 to 60 grade grit fitted in machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water, baring all pin holes. It shall then be covered with a thin coat of white cement mixed with or without pigments to match the colour of the topping of the tiles. Pin holes if any shall thus be filled. This grout shall be kept moist for a week. Thereafter second grinding shall be done when other works are finished. The machine shall be fitted with carborundum of grit 220 to 350 using water in abundance. The floor shall then be washed clean with water. Oxalic acid powder shall then be dusted at 33 grams per square meter on the surface and the surface rubbed with machine fitted with Hessian bobs or rubbed hard with pad of woolen rags. The floor shall then be washed clean and dried with a soft cloth or linen. The finished floor shall not sound hollow when tapped with mallet.

2.5.2. If any tile is disturbed or damaged it shall be refitted or replaced properly jointed and polished.

2.5.3. Testing of the tiles shall be carried out by the contractor at his own cost as per I.S. requirement for required test.

**3.0. Mode of measurements & payment**

3.1. The terrazzo tiles flooring shall be measured in sq. meters for visible area of work done.

3.2. No deductions shall be made nor extra paid for any opening in the floor area up to 0.1 sq. mt. Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or court yard. Mosaic tiles laid in floor borders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bonds formed of half or multiples of half size, standard tiles or other uncut tiles.

3.3. The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.

3.4. Extra rate shall however be paid for such area where width of treads does not exceed 30 cms.

3.5. The rate shall be include the cost of all materials, labour involved in all the operations as described above.

3.6. The rate shall be for a unit of one sq. meter.

**14.19.(B) Precast Terrazzo (Marble/Mosaic) tiles 20 mm. thick with white, black or white and black marble chips of size up to 6 mm. laid in floors treads of steps and landing on a bed of 25 mm. average thickness of lime mortar 1:1.5 (1 lime putty :1.5 fine sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles, including rubbing and polishing complete with precast tiles of medium shades using approximately 50% white cement and 50% ordinary cement.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 14.19(A) shall be followed except that the precast terrazzo (marble mosaic) tiles shall be of medium shades using approximately 50% white cement and 50% ordinary cement.

**2.0. Mode of measurement and payment**

2.1. The rate shall be for a unit of one sq. meter.

**14.19.(B) Precast Terrazzo (Marble/Mosaic) tiles 20 mm. thick with white, black or white and black marble chips of size up to 6 mm. laid in floors treads of steps and landing on a bed of 25 mm. average thickness of lime mortar 1:1.5 (1 lime putty :1.5 fine sand) or C.M. 1:6 jointed with neat cement slurry mixed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and polishing complete with precast tiles of dark shade using ordinary cement.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 14,19 (A) shall be followed except that the precast tiles shall be of Dark shade using ordinary Portland cement.

**2.0. Mode of measurements & payment**

2.1. The mode of measurement and payment shall be same as item No. 14.19 (A)

2.2. The rate shall be for a unit of one sq. meter,

**14.21.(A) Precast terrazzo (Marble Mosaic) tiles 20 mm. thick with marble chips of sizes up to 6 mm. in skirting and risers of steps not exceeding 30 cms. in height on 10 mm. thick cement plaster 1:3 C1 cement :3 coarse sand) jointed with neat cement slurry rubbing and polishing complete with tiles of light shades using white cement.**

**1.0. Materials**

Water shall conform to M-1. Cement Mortar shall conform to M-11. The precast terrazzo (Marble/Mosaic) tiles of light shades using white cement tiles 20 mm. thick shall conform to M-47.

**2.0. Workmanship****2.1. Laying :**

The work shall be carried out for skirting or dedo. Before fixing precast Terrazzo (Mosaic marble) tiles of shade and size as specified, the surface shall be prepared by heavy scraping, making joints etc, to the required line, level and plumb. The surface shall be thoroughly wetted before commencing the laying work. Thereafter about 10 mm. thick backing of cement mortar in specified proportion shall be applied on the surface in true line and level generally as per specifications of plaster item.

**2.2. Fixing :**

The back of each tile to be fixed shall be smeared with cement paste of matching colour and the mosaic tiles shall then be gently tapped against the surface, with a wooden mallet. The skirting shall be done only after the flooring is completed. Any pipes coming out of the wall through the dedo or skirting shall only be at the intersection of the horizontal and vertical joints. The tiles shall not have staggered joints. The joints shall be true to entire line both ways and vertical joints shall be in line with joints or flooring. Tiles shall be fixed as close as possible to the adjoining tiles and any difference in the thickness of the mosaic tiles shall be evened out in the cement paste so that all the tiles faces are set in conformity with one another. The skirting shall project uniformly and not more than 6 mm, thickness beyond the finished surface above. Top of skirting or dedo shall be truly horizontal. The risers of steps, skirting or dedo shall rest on top of treads of flooring. Wherever required the tiles shall be cut (sawn) and thin edges smoothed before use.

**2.3. Curing :**

Curing shall be done for 7 days continuously.

**2.4. Finishing:**

Skirting and dedo shall be hand polished to have an even smooth and shining surface. In case of skirting only 10 mm. x 10 mm. groove shall be provided at the junction of cement plaster and cement tiles.

**3.0. Mode of measurements & payment**

3.1. The terrazzo tiles with light shade using white cement base shall be paid under this item. The length shall be measured along finished surface of the riser, skirting or dedo, correct to a centimeter height measured from finished level of treads, or floor to the top (under side of treads in case of steps).

3.2. The rate shall include all materials and labour required for all the operations involved and described above.

3.3. The rate shall be for a unit of one sq. meter.

**14.21.(B) Precast terrazzo tiles 20 mm. thick with marble chips of sizes up to 6 mm. in skirting and risers of strips not exceeding 30 cms. in height on 10 mm. thick cement plaster C.M. 1:3 (1 cement :3 coarse sand) jointing with neat cement slurry including rubbing and polishing complete with tiles of : medium shades using approximately 50% white cement and 50% ordinary cement.**

**1.0. Materials and workmanship**

1.1. The relevant specifications of item No, 1\*1 21 (A) shall be followed except that the work is for using tiles of medium shades using approximately 5C/o white cement and 50% ordinary cement.

**2.0. Mode of measurements & payment**

2.1. The mode of measurements and payment shall be followed same as item No. 14.21 (A).

2.2. The rate shall be for a unit of one sq. meter.

**14.21.(C) Precast terrazzo tiles 20 mm. thick with marble chips of sizes up to 6 mm. in skirting and risers of steps not exceeding 30 cms. in height on 10 mm. thick cement plaster in C.M. 1:3 (1 cement :3 coarse sand) jointing with neat cement slurry including and polishing complete, with tiles of Dark shade using ordinary cement.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 14.21 (A) shall be followed except that the tiles of dark shade using Portland cement shall be used.

**2.0. Mode of measurements and payment**

2.1. The mode of measurements and payment shall be followed as per item No. 14.21 (A).

2.2. The rate shall be for a unit of one sq. meter.

- 14.25.(A) Chequered terrazzo tiles 22 mm. thick with marble chips of size up to 6 mm. in floor on 25 mm. thick bed of lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete, light shade using white cement.**

**1.0. Materials**

Water shall conform to M-1. White cement shall conform to M-4. Lime mortar of proportion 1:1.5 shall conform to M-10. Cement mortar shall conform to M-11. Chequered tiles shall conform to M-47 D.

**2.0. Workmanship**

2.1. The relevant specifications of Item No. 14.21 (A) shall be followed except that chequered tiles of light shade using white cement shall be used.

**3.0. Mode of measurement & payment**

3.1. The relevant specifications of item No. 14.21 (A) shall be followed.

3.2. The rate shall be for a unit of one sq. meter.

- 14.25.(B) Chequered terrazzo tiles 22 mm. thick with marble chips of size up to 6 mm. in floor on 25 mm. thick bed of lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) or C.M. 1:6 painted with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete, medium shade using approximate 50% the cement and 50% ordinary cement.**

**1.0. Materials and workmanship**

1.1. The relevant specification of item No. 14.25 (A) shall be followed except that chequered tiles of medium shade approximate 50% white cement and 50% ordinary cement shall be used.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

- 14.25.(C) Chequered terrazzo tiles 25 mm. thick with marble chips of size up to 6 mm. in floor on 25 mm. thick bed of lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc, complete, : Dark shade using ordinary cement.**

**1.0. Materials and workmanship**

1.1. The relevant specification of item No. 14.25 (A) shall be followed except that chequered tiles of dark shade using ordinary cement shall be used.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

- 14.27.(A) Chequered terrazzo tiles 28 mm. thick with marble chips of size up to 6 mm. in treads of stairs and staircases in 12 mm. thick bed of lime mortar 1:5 coarse sand) to C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete, Dark shade using ordinary cement.**

**1.0. Materials and workmanship**

1.1. The relevant specification of item No. 14.25 (A) shall be followed except that chequered tiles 28 mm. thick of light shade using white cement shall be used in trades, stair cases etc.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

- 14.27 (B) Chequered terrazzo tiles 22 mm. thick with marble chips of size up to 6 mm. in floor in on 25 mm. thick bed of lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete : Medium shade of using approximately 50% white cement and 50% ordinary cement.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 14.25(A) shall be followed except that the chequered tiles 28 mm. thick of medium shade using approximately 50% white cement and 50% ordinary cement shall be used in treads of stair, staircases etc.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 14.25 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**14.27.(C) Chequered terrazzo tiles 28 mm. thick with marble chips of sizes up to 6 mm. in treads of stairs and staircases in 12 mm. thick bed of lime mortar 1:1.5 (1 Lime putty: 1.5 coarse sand) or c.m. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and polishing complete : Dark shade using ordinary cement.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 14.25 (A) shall be followed except that chequered tiles 28 mm. thick of dark shade using ordinary cement shall be used in treads of stair, staircase etc.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 14.25 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter,

**14.29 White glazed tiles 6 mm. thick in flooring, treads of steps and landings laid on a bed of 12 mm. thick cement mortar 1:3 (1 cement : 3 coarse sand) finished with flush pointing in white cement.**

**1.0. Materials**

Water shall conform to M-1 Cement mortar shall conform to M-11 White glazed tiles shall conform to M-55

**2.0. Workmanship****2.1. Bedding :**

**2.1.1.** The sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the monsoon to place wooden planks across and squat on it.

**2.1.2.** The white glazed tiles shall be laid on cement mortar bedding of 12 mm. thick in C.M. 1:3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 12 mm. thickness. The proportion of the cement mortar shall be as specified in the item.

**2.2. Fixing tiles :**

**2.2.1.** The tiles before laying shall be soaked in water for at least two hours. Neat gray cement grout at 33 kg/Cement/Sq. mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be. no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

**2.2.2.** The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement grout with wire brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

**2.3. Cleaning :**

**2.3.1.** The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the .construction.

**3.0. Mode of measurements & payment**

**3.1.** The work done shall be measured in sq. mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dados or plastered face of wall as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made not extra paid for any opening in the floor of area-up to 0.1 sq.mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

3.2. The rate shall be for a unit of one sq. meter.

**14.32. White glazed tiles 6 mm. thick in skirting, risers of steps and dedo on 10 mm. thick cement plaster 1:3 (1 cement :3 coarse sand) and jointed with white cement slurry.**

**1.0. Materials**

Water shall conform to M-1 Cement mortar shall conform to M-11 White glazed tiles shall conform to M-55

**2.0. Workmanship**

**2.1. Preparation of Surface:**

In case of brick masonry wall, the joints shall be raked out to a depth of least 15 mm. while the masonry is being laid. In case of concrete wall the surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

**2.2. Laying ;**

**2.2.1.** The wall surface shall be covered with 10 mm. thick plaster of cement mortar 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both way. The back of tiles shall be floated with grey cement slurry set and edges with white cement slurry in bedding mortar. The tiles shall be gently tapped in position on after the other keeping the joints as thin as possible. Top of skirting or dedo shall be truly horizontal and the joints vertical or as per required pattern.

**2.2.2.** Risers of steps, skirting and dedo shall rest on top of treads or flooring. Where full size tiles cannot be fixed, They shall be cut to the required size and the edges be smoothened.

**2.2.3.** The joints shall be cleaned and flush pointed with white cement. The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour required for various operations described above. Risers of steps, skirting and dedo shall be measured in square meters, length and height shall be measured along the finished face of the skirting or dedo including curves, where special such as covers, internal and external angles, etc., used. The length and height shall be measured correct to the centimeter except in case of risers and skirting where height shall be measured correct to 3 mm

**3.2.** The rate shall be for a unit of one sq. meter.

**14.34. Providing and fixing 50 mm. internal or external -angles of white glazed tiles.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform M-11. Glazed tiles shall conform to M-55.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 14.32 shall be followed except that the internal or external angles of glazed tiles shall be of thickness not less than the tiles with which they are used. The fixing shall be done as per directions.

**3.0. Mode of measurements and payment**

**3.1.** Rate shall be including the cost of materials and labour involved in all the operation described above. Internal or external angles of glazed tiles shall be measured in running meters correct tip to a centimeter. length being measured on the exposed face of the special at its centre line. No extra payment shall be made for corner places at angles junctions of cover beads and cornices for using cut length of special.

**3.2.** The rate shall be for a unit on one running meter.

**14.36.(A) Providing and laying marble stone slab flooring over 20 mm. (Average) base of cement mortar 1:6 (1 cement : 6 coarse sand) or L. M. 1:1.5 laid and jointed with gray cement slurry including rubbing and polishing compete : Marbles slab 25 mm. thick.**

**1.0. Materials**

Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-1). Marble stone slab 25 mm. thick shall conform to M-51.

**2.0. Workmanship**

**2.1. Dressing of slabs :**

Every stone shall be cut to required size and fine chisel dressed to give a smooth and even surface on all sides to full depth. A straight edge laid along the sides of the stone shall be fully in contact with it Chisel dressing shall also be done on top surface to remove any waviness. The sides and top surface of marble

slabs shall be machine rubbed or table rubbed with coarse sand before using. All angles and edges or slabs shall be true, square and free from chipping.

2.2 The thickness of stone shall be 25 mm. The allowable tolerance shall be 2 mm. allowable. The 'tolerance shall  $\pm 5$  mm. in length and breadth.

### 2.3. Bedding:

Bedding of marble slabs shall either be lime mortar 1:1.5 (1 lime putty : 1.5 coarse sand) or cement mortar 1:6 (1 cement : 6 coarse sand) of average thickness 20 mm. thick as given in description of item. Minimum thickness at any place shall not be less than 10 mm.

### 2.4. Laying

The surface of sub-grade shall be cleared, wetted and mopped. Mortar of specified mix and thickness shall then be spread on an area sufficient to receive one marble slab. The slab be washed clean before laying. It be laid on top pressed and tapped gently to bring it in level with other slabs. It shall then be lifted and a side. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows, or depressions. The mortar shall then be allowed to harden it over this surface cement slurry or honey like consistency at 4.4 Kg. of cement per sq. meter. The edges of slabs already paved shall be buttered with gray cement. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slab. The joints shall be as fine as possible. Surplus cement on the surface of the slab shall be removed. The slab fixed in the floor adjoining the walls shall enter not less than 10 mm. under the plaster skirting or dado. The junction between the walls and floors shall be finished neatly. The finished surface shall be true to level and slopes as directed.

2.5. **Curing** : The floor shall be cured for a minimum period of seven days.

### 2.6. Polishing and finishing:

Unevenness at the meting edges of slab shall be removed by fine chiseling. Finishing etc. shall be done as per relevant specifications of item No. 14.21 (A) or terrazzo tiles flooring except that cement slurry with/or without pigments shall not be applied on the surface before each polishing.

### 3.0. Mode of measurements and payment

3.1. Marbles stone flooring with various kinds of marble shall be measured in sq. meter. The length and breadth shall be measured between-the finished face of skirting or dado or wall plaster No deduction shall be made nor extra shall be paid for any opening in the floor or area up to 0.05 sq. mt. Nothing extra shall be paid for laying stone at different levels in the same room. Treads and steps of stairs paved with marble stone slabs shall be also be measured under flooring.

3.2. The rate shall be for a unit of one sq. meter.

**14 43.(A) Kota stone slab (Polished, Green colour) flooring over 20 mm. (average) thick base of cement mortar 1:6 (1 cement : 6 coarse sand, or lime mortar 1:1.5 laid over and jointed with gray cement slurry including rubbing and polishing complete 25 mm. thick.**

### 1.0. Materials

1.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 Polished kota stone shall conform to M-49,

### 2.0. Workmanship

2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides shall be dressed shall have a full contract if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free from chippings and giving a plane surface. The thickness shall be 25 mm. (Average) as specified in the item but not less than 20 mm. at any place of the slab.

2.2. Bedding for the Kota stone slabs shall be of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of average thickness 20 mm given in the description of the item. Sub grade shall be cleaned, wetted and mopped Mortar of the specified mix and thickness shall then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining, the

walls shall enter not less than 10 mm. under the plaster, skirting or dedo. The junction between the wan and floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed

**2.3.** The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set properly

**2.4.** Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with carborundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 to 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge, wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polishing machine fitted with bobs shall be run over it.

**2.5.** The holes required for Nahni traps, pipes and any other fittings shall be made, without any extra cost.

### **3.0. Measurement & payment**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above. The kota stone flooring shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dedo plaster and no deduction shall be made nor extra paid for any opening in floor of areas up to 0.1 sq

**3.2.** The rate shall be for a unit of one sq. meter

**14.43.(B) Kota stone slab flooring over 20 mm. (average) thick base of cement mortar 1:6 (1 cement :6 coarse sand) or L.M. 1:1.5 laid over and jointed with gray cement slurry including and polishing complete : 30 mm. thick.**

### **1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No 14.43 (A) shall be followed except that the thickness of stone shall be 30 mm.

### **2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No 14.43 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**14.44. Kota stone slab 25 mm. thick in riser of steps dedo and pillars laid on 10 mm. thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with gray cement slurry including rubbing and polishing etc. complete.**

### **1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Kota stone slab 25 mm thick shall conform to M-49.

### **2.0. Workmanship**

**2.1.** The relevant specifications of item No. 14.43(A) shall be followed except that the kota stone fixed for risers of steps, dedo or skirting in C.M. 1:3 and the polishing shall be done manually instead of machine polishing.

### **3.0. Mode of measurements and payment**

**3.1.** The risers of steps, skirting or dedo shall be measured in sq. meter. Length shall be measured along the finished faces of risers, skirting or dedo. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.

**3.2.** The rate shall be for a unit of one sq. meter.

**14.46.(A) Rough chiseled dressed (Kota stone green) stone flooring over 20 mm. thick base of cement mortar 1:5 (1 cement :5 coarse sand), or L.M. 1:1.5 including pointing with cement mortar 1:2 (1 cement : 2 stone dust) etc. complete 25 mm. thick.**

### **1.0. Materials**

Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11. Rough chisel dressed stone shall conform to M-48.

### **2.0. Workmanship**

**2.1.** The relevant specifications of item No. 14.43 (A) shall be followed except that the rough chisel dressed stone of 25 mm. thickness of approved quality are to be fixed on cement mortar bedding in CM 1:5 or L.M. 1:1.5 of 25 mm. average thickness.

### **2.2. Dressing of stone slab :**

Every stone slab shall be cut to the required size and shape and rough chisel- dressed on top, if required, so that the dressed surface shall not be more than 6 mm, from straight edge placed on it. The sides shall



also be chisel-dressed to a minimum depth of 20 mm. so that the dressed edge shall at no place be more than 30 mm. from straight edge butted against it. Beyond this depth, the sides may be dressed slightly splayed so as to form an inverted V shaped joint with adjoining also. The surface shall be reasonable true and plane and all the angles and edges shall be square and free from chippings. Where the stone slabs are to be used for nosing, exposed edges shall be rough chisel-dressed to full depth and cut to the uniform thickness.

**2.3.** Thickness of the stone slab shall be 25 mm. with permissible tolerance of  $\pm 2$  mm.

**2.4. Laying :**

The surface of the sub-grade concrete shall be cleaned, wetted and mopped. The bedding of specified mortar mix shall be spread under each slab to the specified thickness. The slab shall be washed clean before laying. It shall be then laid on top, pressed and so that all hollows underneath filled surplus mortar works up through the joints. The top shall be tapped and brought level to the adjoining slab. The thickness of the joints shall not exceed 5 mm. Subsequent slabs shall be laid in the same manner

**2.5. Curing & Finishing :**

Any surplus mortar on the surface of the slab shall be cleaned off and joints-finished flush. The joints shall be raked out uniformly to a minimum depth of 12 mm. under the plaster, skirting or dado. The junctions between wall plasters and floor shall be finished neatly and without waviness. The pointing shall be done with C.M. 1:2. The pointing shall be cured for a minimum period of seven days. The finished floor shall not sound hollow when tapped with wooden mallet and the finished surface shall be true to level and slopes as directed.

**3.0. Mode of measurements & payment**

**3.1.** The relevant-specifications of item No. 14.43 (A) shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**14.46.(B) Rough chisel dressed (Kota stone green) stone flooring over 20 mm. thick base of cement mortar 1:5 (1 cement : 5 coarse sand) or Lime Mortar 1:1.5 including pointing with cement 1:2 (1 cement : 2 stone dust) etc., complete-40 mm. thick.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 14.46 (A) shall be followed except that the thickness of stone slabs shall be 40 mm. thick.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No 14.46(A) shall be followed.

**2.2.** The rates shall be for a unit of one sq. meter.

**14.71.(A) Cement concrete flooring for I.P.S, 1:2:4 (for Indian Patent Stones) (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid in one layer finished with a floating coat of neat cement 40 mm. thick.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 20 mm. nominal size shall conform to M-12. Cement concrete of 1:2:4 proportion measured by volume shall conform to relevant specifications of ordinary grade 1:2:4 concrete.

**2.0. Workmanship**

**2.1.** The cement concrete flooring of 40 mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixing may however be allowed for smaller quantities of work and in case of failure of machineries or as permitted by the Engineer-in-charge. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for period of 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose, Flooring or specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall depend upon the temperature

and atmospheric conditions. The surface shall be left for some time till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once when the slurry is applied and the second time when cement setting and finished floated smooth. The surface shall be marked with string or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so

required up to 25 mm. radius. Flooring in lavatories and bath rooms shall be laid after fixing of water closet and squatting pans and floor traps which shall be plugged while laying the floors and opened after the floors are completed. Any damage done to water supply or sanitary fittings during execution of work shall be made good.

**2.2.** After the final set, the concrete shall be kept continuously wet. if required by ponding for a period of not less than 7 days from the date of placement.

**2.3.** The form work shall be provided if necessary as directed by Engineer-in-charge. Concreting shall be done as per alternate bay method with necessary centering either by mastic or cement mortar as directed

**3.0. Mode of measurements & payment**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction shall be made or extra paid for any opening up to 0.1 sq. mt. In area in the floor, nothing extra shall be paid for laying the floor at different levels in the same room or the counter yard.

**3.2.** The rate shall be for a unit of one sq. meter.

**14.71.(B) Cement concrete flooring (Indian patent stone) 1:2:4 coarse sand 4: graded stone aggregate 20 mm. nominal size) laid in one layer finished with floating coat of neat cement : 50 mm. thick.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 14.71 (A) shall be followed except that the thickness of concrete flooring shall be 50 mm.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 14.71. (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**14.74. Cement concrete payment (25 mm. to 50 mm. thick) with 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 20 mm. nominal size) including finishing with a floating coat of neat cement complete.**

**1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 14.71 (A) shall be followed except that the thickness of concrete flooring vary from 25 mm. to 50 mm.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 14.71 (A) shall be followed except that thickness shall be measured correct up to 1 mm. flooring laid in borders, margins and treads of steps, shall be measured under item of flooring in respective of width.

**2.2.** The rate shall be for a unit of one cubic meter.

**14.81.(C) 20 mm. thick precast concrete tile with aggregate of sizes up to 6 mm. laid in floors, treads of steps and landings on 20 mm. thick bed of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 jointed with neat cement slurry with pigment to match the shade of the tiles complete with precast tiles of Dark Shades ordinary cement.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-6. Lime mortar 1:1.5 shall conform to M-10. Cement shall conform to M-11. Tiles shall conform to M-47 (A) cement concrete tiles shall conform to I.S. 1237-1959 and pigments to be admixed with mortar or for grouting shall conform to I.S. 2114-1962

**2.0. Workmanship**

**2.1.** The tiles shall be laid on the sub-grade of concrete of the R.C.C. slab. Bedding shall be in the mortar 1:1.5 or cement mortar (1:6). The amount of water added shall be minimum required for sufficient plasticity and workability C.M. or lime mortar where the ingredients shall be thoroughly mixed dry hard lumps removed and water added to give a good workability.

**2.2.** The base shall be cleaned of all dust, dirt and scum and properly wetted without allowing water pools. For a bedding of cement mortar shall be then spread evenly over the base of two rows of tiles and three to five meters in length. The top shall be kept rough so that cement slurry can be absorbed. The thickness of the bedding shall be not less than 10 mm. at any place. The laying of tiles shall be commenced with neat cement slurry of honey-like consistency and shall be spread over the mortar bed over an area sufficient to receive about 20 tiles. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level with the adjoining tiles. The joints shall be as narrow as possible and normally shall not exceed 1.5 mm. After the day's work the excess cement slurry on top shall be cleaned as also the joints with a broom struck and washed before the slurry sets hard. Next day the joints shall be filled with the cement grout of the same shade as the matrix of the tiles. Tiles which are fixed in the floor adjoining the wall shall go a minimum of 10 mm. under the wall plaster, skirting or dedo. For the purpose, plaster etc. may be left unfinished by about 50 mm. above the proposed finished level of the floor. The unfinished strip shall be plastered after laying the floor tiles. Where full tile cannot be used, tile shall be cut to the size to be used.

**2.3.** The flooring shall be cured for 7 days.

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above.

**3.2.** The rate shall be for unit of one sq. meter.

**14.86. Chequered precast cement concrete tiles 22 mm. thick with aggregate of sizes up to 6 mm. in floors, treads of steps and landings on 20 mm. thick bed of C.M. of 1:6 (1 cement : 6 sand) or lime mortar 1:1.5 (1 Lime putty : 1.5 coarse sand) jointed with cement slurry with pigment to match the shade of tiles.**

**1.0. Materials**

**1.1.** The relevant specifications of item No. 14.25 (A) shall be followed.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No 14.21 (A) shall be followed except that chequered precast cement concrete tiles 22 mm. thick shall be used in floors, treads of steps and landings on average 20 mm. thick bed of C.M. 1:6 or L.M. 1:1.5.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 14.21 (A) shall be followed.

**3.2.** The rate shall be for unit of one sq. meter.

**14.87. Extra for polishing and polishing the precast cement concrete tiles in flooring, skirting or dedo.**

**1.0. Workmanship**

**1.1.** Grinding and rubbing shall normally be commenced after 14 days of laying the tiles, except for skirting or small areas, machine shall be used for the purpose.

**1.2.** First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes It shall then be covered with a thin coat of gray or white cement mixed with or without pigments to match the colour of the topping of the tiles Pin holes if any shall thus be filled. This grout shall be kept moist for sufficient period as directed. Thereafter, second grinding shall be started with carborundum of 120 grit. Grouting and curing shall be followed again. Final grinding shall be done when other works are finished. The machine shall be fitted with carborundum of grit 220 to 350 using water in abundance. The floor shall then be washed clean with water Oxalic acid powder shall then be dusted as needed on the surface and the surface rubbed with machine fitted with Hessian bobs 01 rubbed hard with pad of woollen rags. The floor shall then be washed, cleaned and dried with a soft cloth of linen. The finished floor shall not sound hollow when tapped with a mallet.

**1.3.** If any tile is disturbed or damaged it shall be refitted or replaced properly jointed and polished. 1.4. For skirting, dedo or small areas where it is not possible to do machine polishing all the above operations are to be done manually.

**2.0. Mode of measurements and payment**

**2.1.** The rate shall include the cost of all materials and labour involved to all the operations as described above.

**2.2.** The rate shall be for a unit of one sq. meter.

**14.90. Providing and laying brick on edge flooring laid dry, grouted with C.M. 1:6 (1 cement : 6 coarse sand) including finishing the joints flush, curing etc. complete.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Burnt bricks shall conform to M-15.

**2.0. Workmanship**

**2.1.** The flooring shall be laid on concrete sub grade where so provided. The slope in the floor shall be provided in the sub-grade. Where sub-grade is not provided, the earth below shall be properly sloped, watered, rammed and consolidated. Before laying the flooring it shall be moisture. Plinth masonry off-eta shall be depressed so as to allow the sub grade concrete to rest on it.

**2.2. Laying :**

The brick shall be laid in plain, diagonal herring bond, or other pattern as directed. The bricks shall be dry laid properly and set home by gently tapping. On completion of the portion of flooring the vertical joints shall be grouted with C.M. 1:6 and all joints shall be finished flush. The joints shall be as fine as possible and not exceeding 5 mm. These points shall be filled with cement mortar 1:6.

**2.3. Curing :**

The brick paving shall be cured for 7 days.

**3.0. Mode of measurements and payment**

**3.1.** The length and breadth shall be measured correct to a centimeter between skirting dedo or wail plaster. No deductions shall be made nor extra paid for any opening up to 0.1 sq.mt. in area in the floor Nothing extra shall be paid for laying the floors at different levels in the same room or courtyard.

**3.2.** The rate shall be for unit of one sq. meter.

## SECTION-15

### Roof Covering

- 15.1. Providing corrugated G.I. sheets roofing fixed with galvanized iron 1J' or 1L' hook bolts and nuts 8 mm. dia. with bitumen and G.I. limpet washers filled with white lead complete excluding the cost of purline, rafters and trusses (1) 0.8 mm. thick sheet.**

**1.0. Materials :**

Corrugated G.I. sheets shall conform to M-23.

**2.0. Workmanship**

**2.1.** Spacing of purlines : One purline shall be provided at the ridge and one at the eaves. The spacing of other purlines for 0.8 mm. thick G.I. sheets shall not exceed 1.80 meters. The purline shall coincide with the centre line of the end lap. The ridge purlines shall be placed in such a way that the ridges can be fixed properly. The portion overhanging the wall support shall not be more than one fourth of the 'spacing of purlins.

**2.2.** The top surfaces of the purlines shall be painted before the sheets are fixed over them. Embedded portions of purlins shall be finished with tow coats of coal-tar.

**2.3. Laying of sheets :**

**2.3.1.** The sheets shall be laid in purlins to a true plane with the line of corrugations truly parallel or normal to the sides of area to be covered. The sheets shall not generally be built into gables and parapets. They shall be bent up along their side edges close to the wall, and the junction shall be protected by suitable flushing or by projecting drip course.

**2.3.2** The laps at end shall be provided 150 mm. minimum for roof slopes 1 in 2 (1 vertical : two horizontal) and steeper but 200 mm. shall be provided for flatter slopes than those above. The side lap shall be provided two ridges of corrugations at each side.

**2.3.3.** The sheets shall be cut to the dimensions or the shape of the roof either along their lengths or their width or in slant across the line of corrugations at hips and valleys. The sheets shall be cut carefully with a straight edge and chisel to give straight finish. The sheets shall be laid such that the laps are turned away from the usual direction of local heavy rain.

**2.3.4. Fixing of sheets :**

**2.3.4.1.** Sheets shall be fixed to the purlins or other roof members such as hips or valley rafter etc. with 1J' or 1L' galvanized hook bolts, and galvanized nuts 8 mm. dia. with bitumen limpet washers and G.I. washers. Limpet washers with white lead shall be used. Length of hook bolt shall be varied to suit the site requirement. Bolts shall be sufficiently long so that after fixing the project above the top of their nuts by not less than 12 mm the grip of 1J' or 1L' hook bolts on the sides of purlins shall not be less than 25 mm. There shall be minimum of three hooks bolts placed at the ridge of corrugations in each sheet in every purlin and their spacing shall not exceed 300 mm. Coach screw shall not be used for fixing the sheets to purlin, where the slopes of roof are not less than 2.1/2 degree (1 vertical and 2.1/2 horizontal). Sheets shall be jointed together at the side laps by galvanized iron bolts and nuts 25 mm. x 6 mm. size each bolt with a bitumen and G.I. limpet washer filled with white lead. Where the overlaps at the sides extend to two corrugations, these bolts shall be placed zigzag over lapping corrugations, so that the ends of the overlapping sheets are drawn tightly towards each other. The spacing of same bolts shall not exceed 600 mm. along each of the staggered rows.

**2.3.5.** Holes for all bolts shall be drilled and not punched in the ridges of the corrugations from the under side, while the sheets are on the ground. The holes in the sheets shall be at least 50 mm. from the edge. ' Sheets drilled wrongly shall be rejected. The holes in the washers shall be of the exact diameter of the hook bolts or the beam bolts. The nuts shall be tightened from above to give a leak-proof roof

**3.0. Mode of measurements and payment**

**3.1.** The measurements of the C.G.L sheet roof shall be taken for finished work in superficial area in general plane (not girthed on the roof). The laps between the C.G.I. Sheets both at their ends and along the side edges shall not be measured. The overlaps of C.G.I. sheets over the valley piece and their under lap under the ridge, hip and flashing piece shall be included in the measurements.

3.2. No deductions in measurements shall be made for openings for chimney stacks, sky light etc., of area up to 0.40 sq. mt. nor extra be paid for labour in cutting and for wastage etc. in forming such openings.

3.3. The rate of roof shall include the cost of all materials and labour involved in all operations described above. The rate also includes the cost of provision, erection and removal of the scaffolding, benching, ladders, templates and tools required for the proper execution and erection of the work. The rate includes the cost of purlins, rafters and trusses.

3.4. The rate shall be for a unit of one sq. meter.

15.7. **Providing ridges of hips 600 mm. overall in plain G.I. sheets fixed with G.I. 'J' or 'L' hooks bolts and nuts 8 mm. dia. G.I. limpet and bitumen washer etc. complete. 0.80 mm. thick sheet.**

#### 1.0. Material

The G.I. valley gutters and ridges shall conform M-23 A.

#### 2.0. Workmanship

2.1. The relevant specification of item No. 15.1 shall be followed except that the work shall be carried out for ridges or hips. The overlaps for ridges and hips on either side over the C.G.I. sheets and end legs shall be minimum 225 width of the ridges and hips shall be as described in the item.

2.2. Ridges shall be fixed to the purlins with same 8 mm. dia. G.I. hook bolts and nuts and bitumen and G.I. limpet washers, which fix the sheets for the pureline. Hips shall be fixed to the roof members with the same 8 mm. dia G.I. hook bolts and nuts and bitumen and G.I. limpet washers which fixed the sheets. At least one of the fixing bolts shall pass through the end laps of the ridges and hips on other sides. If this is not possible, extra hook bolt shall be provided. End laps of ridges and lips shall be jointed together by galvanized iron seam bolts and G.I. Washers. There shall be at least two such bolts in each end lap.

2.3. Ridges and hips shall fit in squarely on the sheets.

#### 3.0. Mode of measurements and payment

3.1. The measurements of ridges or hips shall be taken for finished work in length along their centre lines.

3.2. No laps shall be measured.

3.3. The payment for ridges and hips shall be made in a similar way as in case of C.G.I, sheet roofing.

3.4. The rate shall be for a unit of one running meter.

15.8. **Providing valleys 900 mm. overall in plain 1.6 mm. thick G.I. Class-3 fixed with 'J' or 'L' hook bolts and nuts galvanized from 'J' or 'L' hook bolts and 8 mm. dia. G.I. limpet and bitumen washers complete.**

#### 1.0. Materials

1.1. The G.I. valleys 900 mm. overall in galvanized plain sheet of 1.6 mm. thickness shall be of class-3. The valleys shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall. There shall be bent to the required shape without damage to the sheets in the process of bending.

#### 2.0. Workmanship

2.1. The relevant specifications of item NO. 15.1. shall be followed except that the work shall be carried out for G.I. valleys 900 mm. overall with G.I. sheets 1.6 mm. thickness.

2.2. Wherever the edge of a roof sheeting or valley gutter is turned up against a wall, the edge shall be weather proofed with a flashing. Flashing shall be bent to shape and fixed. Lap over the sheet shall be not less than 150 mm. over the roofing sheets. The end between the flashing sheets shall not less than 225 mm.

2.3. The flashing shall be inserted into brick work or masonry joints to a depth of 50 mm. These joints shall be filled with cement mortar (1:3). The flashing shall be well secured to the masonry. Whenever flashing has to be laid at a slope, it shall be stepped at each course of masonry, the step being out back at angle or not less than 30 degrees to the vertical.

2.4. Valleys shall be bent to shape and shall have end lap projection on either side under C.G.I, sheet not less than 225 mm. Valleys shall be fixed to the roof member below, with same 8 mm. dia. G.I. hook, bolts and nuts and bitumen and G.I. limpet washer which fix the sheets to these members. At least one of the fixing bolts shall pass through the end laps of the valley piece. If necessary extra bolts shall be provided for this purpose.

#### 3.0. Mode of measurements and payment

3.1. The measurements for valley shall be taken for finished work in length along their centre lines.

- 3.2. No laps shall be measured.
- 3.3. The rate excludes the cost of boarding underneath which shall be paid separately.
- 3.4. The rate of flashing includes the cost of mortar for fixing in wall and other labour and materials required for it.
- 3.5. The rate shall be for a unit of one running meter.

**15.10.(I) Providing and fixing 150 mm. wide 450 mm. overall semicircular plain, G.I. sheets clas-3 Gutter with iron brakes 40 mm. x 3 mm. size bolts nuts, washers etc. including making necessary connections with rain water pipes : 0.80 mm. thick.**

**1.0. Materials**

1.1. These shall be of plain galvanized sheets Class-3 of 0.80 mm. thickness. The gutter shall be designed to carry the maximum discharge from the roof without flowing over and shall be constructed wherever possible with sunk channel or gutter.

**2.0. Workmanship**

2.1. The longitudinal edges shall be turned back to the extent of 12 mm. and beaten to form a rounded edge. The ends of the sheets at junctions of pieces shall be hooked into each other and beaten flush to avoid leakages.

2.2. The size of gutters shall be as specified in the item.

2.3. The gutter shall be laid with a minimum fall in 120. Gutter shall be true to line and slope and shall be supported on fixed M.S. Flat iron brackets bent to shape or any other suitable bracket.

**3.0. Mode of measurements and payment**

3.1. The measurements of gutters shall be taken for finished work in length along their centre lines. No. laps shall be measured.

3.2. The rate gutter shall include the cost of all labour and materials specified above including all specials such as angles, junctions, drop ends or funnel shaped connecting pieces, stop ends etc. flat iron brackets and bolts and nuts required for fixing the latter to the roof members.

3.3. The rate shall be for a unit of one running meter.

**15.20.(A)(I) Providing asbestos cement sheets, roofing fixed with G.I. plain and bitumen washers complete excluding cost of purlins, fakers and trusses : 7 mm. thick, corrugated sheet.**

**1.0. Materials :**

1.1. Asbestos cement sheets shall conform to M-24.

**2.0. Workmanship**

2.1. The maximum spacing of purlins shall be 1.6 meters in case of 7 mm. thick A.C. sheets and 1.4 meters for 6 mm. thick A.C. sheets.

**2.2. Laying & fixing of Sheets**

The sheets shall be laid on the purlins and other roof members as per cods practice. The top bearing surfaces of all purlins and other roof members shall be in one plane so that the sheets when being fixed shall not be required to be forced down to rest on the purlins. The finished roof shall present uniform slope and the line of corrugation shall be straight and true. The sheets shall be laid with smooth side upwards. Corrugated sheets shall be valid starting at the eaves either from left to right or right to left depending upon the direction of wind. Before actual laying of the sheets is started, the purlins spacing and the size of sheets shall be checked to ensure that the arrangements shall provide the laps required and the specified overhang at the eaves. In case the sheets are laid from right to left, the first sheet shall be laid uncut but the remaining sheets in the bottom row shall have the top left hand corners cut or mitered. The sheets in the second and other immediate rows shall have bottom right and corner of the first sheet cut. All other sheets except the last sheets shall have both bottom right hand corner of the first sheet cut. All other last sheet shall have only top left hand corner cut. The last of the top row sheets shall have the bottom right hand corner cut with exception of the last sheet which shall be left uncut. If the sheets are laid from left to right, the first sheet shall be laid and cut and the remaining procedure shall be reversed.

2.3. The free overhang of the sheets at the eaves shall not exceed 400 mm. in case of 7 mm. thick sheets and 300 mm. in case of 6 mm. thick sheets.

2.4. The meter described above is necessary to provide snug fit. Where 4 sheets meet at a lap the length of meter shall be 150 mm. and the width of miter shall be equal the width of the side lap. The cutting may be done with ordinary wood-saw at site.

**2.5. Laps :**

The sheets shall be laid with an end lap of 150mm. minimum. In case of roof with a' pitch flatter than 1 vertical to 2.1/2 horizontal (Approx. 22) or in the case of very exposed situations appropriate larger Taps may be provided. The sheets shall be laid with side lap of half a corrugation.

**2.6. Fixing Accessories :** The sheets shall be secured to the purlins and other roof members by means of 8 mm. dia galvanized iron bolts (J) type hook bolts in case of angle iron purlins and 'L' type bolts in case of R.S. joints, precast concrete, or timber purlin, and nuts bearing on galvanized iron washers and bitumen washers. The grip of 'J' or 'L' bolts on the side of purlins shall not be less than 25 mm, Each galvanised iron 'J' or 'L' hook bolts shall have bitumen washer and galvanised iron washer placed over the sheets before the nuts is screwed down from above. On each purlin there shall be one hook bolt on the crown adjacent to the side lap on either side bitumen washer shall be of approved quality. The G.I. flat washer shall be 25 mm. in diameter and 1.60 mm. thick and bitumen water shall be 35 mm. in dia. and 1.5 mm. thick with hole to suit the required size of fixing accessory. Each nut shall be screwed lightly at first. After a dozen or more sheets are laid, the nuts shall be tightened to ensure a leak proof joint and also nuts tightened only to extent so as to prevent damage to the sheets. The length of the 'J' bolts or crank bolts shall be 75 mm. more than the depth of purlins for single sheet fixing and 90 mm. more where two sheets overlap or where ridges or other accessories are to be fixed. The minimum length of coach screw for timber purlins shall be 110 mm.

**2.7. Holes :**

The holes for fixing the sheet shall be drilled in the centre of end lap to sheets to suit the purlins i.e. on the centre line of the purline, if these are of timber and square head coach screws are used, or as close as possible to the back of purlins if 'J' or 'L' bolts are used as with steel angles or precast concrete or timber purlins. Holes for hook bolts etc. shall be 2 mm. more than diameter of the fixing bolts. No holes shall be nearer than 40 mm. to any edge of sheet or accessory.

**3.0. Mode of measurement & payment**

**3.1.** The relevant specifications of item 15.1 shall be followed, except that the over lap of the corrugated sheets over valley gutters, roof lights, caves, filler piece and underlay of the corrugated sheets below ridges, hips north light curves, flashing pieces, roof light sheets and large board shall be included in the measurement. No deduction shall be made for holes cut for extractor or cowl type ventilators. Deductions shall be made for roof light sheets.

**3.2.** The rate shall be for a unit of one sq. meter.

**15.20.(A)(III) Providing asbestos cement sheets roofing fixed with G.I. plain and bitumen washers complete excluding the cost of purlins, rafters and trusses: 6 mm. thick corrugated sheets.****1.0. Materials and Workmanship**

The relevant specifications of item No. 15.20 (A)(I) shall be followed except that the thickness of A.C. sheets shall be 6 mm.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 15.20 (A)(I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**15.25.(D) Providing and fixing ridges and hips in asbestos cement sheets roofing with G.I. 'J' or 'L' hook, bolts and nuts 8 mm. dia. G.I. plain and bitumen washers complete. North tight adjustable ridges.****1.0. Materials**

**1.1.** The ridges and hips of Asbestos cement sheets roofing shall conform to M-24.

**2.0. Workmanship**

**2.1.** The relevant specifications of item 15.20 (A) (I) shall be followed except that the work is to be carried out for ridges and hips in A.C. sheet roofing.

**2.2.** The ridges shall be laid as per manufacturer's instructions with rolls of the two wings in case of adjustable ridges, fitting closely and with a separation of serrated ridges registering correctly with the sheet underneath. The staggered lapping of two wings of adjustable ridge section and the lap between the adjustment pieces on the same wing of ridges shall be as per manufacturer's instructions. The end portion of the wing of the adjustable ridges which project beyond the verges of the roof shall be cut and trimmed off neatly.



**2.3. Hips :**

In laying hip pieces, serrations to suit the corrugations in the sheets below should be cut in them so that they shall be snug fit over the sheets. The wings of ridges shall be fixed to the sheet below with seam bolts and nuts 8 mm. dia. G.I. 'J' or 'L' hook bolts and bitumen and G.I. washers which fix the sheets to the purlins. In addition, in north light adjustable ridges, the roll of the two wings shall be jointed together at their crown, with 8 mm. dia G.I. seam bolts and nuts at the rate of two numbers per pair wings. Each seam bolt shall be provided with one bitumen and a pair of G.I. washers. Where the plain wing angular or plain C.C. (1.2:4) up to a full length of the overlaps. The exposed face shall be finished perpendicular to the sheeting. Wings of hips shall be fixed to the roof members below with the same 8 mm. dia. G.I. 'J' or 'L' bolts end nuts which fix the sheets to the member. In addition, they shall be secured to the sheet below with 8 mm. dia G.I. seam bolts, nuts and washers so that taken together with hook bolts, there shall be bolt on each wing at least at every fifth Corrugation of the sheets below in case of corrugated and at least every second corrugation of the sheet below in case of semi corrugated sheets. Each seam bolt shall be provided with one bitumen and pair of G.I. washers.

**3.0. Mode of measurements & payment**

**3.1.** Measurements of ridges, hips and other accessories shall be for finished work and the length shall be taken along the centre line. The lap shall not be measured. The under lap of ridges under expansion joint pieces shall be measured.

**3.2.** The rate of ridges and hips shall not include the cost of expansion joint pieces, closing of gap, between plain ridge and the sheet corrugation with concrete.

**3.3.** The rate shall be for a unit of one running meter.

**15.26. Filling cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm. nominal size) in gaps of A.C. sheet corrugation and wing of ridges.****1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Coarse sand shall conform to M-6. Stone grit shall conform to M-8.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 5.4.1 of C.C. shall be followed except that the work shall be for filling gaps of A.C. sheet corrugation and wings of ridges.

**3.0. Mode of measurements & payment**

**3.1.** The measurements of filling gaps in ridges, hips of A.C. sheet corrugation and wings of ridges shall be for finished work. The length shall be measured along the centre line.

**3.2.** The rate shall be for a unit of one running meter.

**15.27 (III) Providing and fixing asbestos cement roofing accessories with galvanised iron 'J' or 'L' hook bolts and nuts, G.I. plain and bitumen washer etc. complete : North light and ventilator curves.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 15.10 (I) shall be followed except that the work is carried out for accessories for asbestos cement roofing north light and ventilator curves.

**1.2.** The accessories such as north light and ventilator curves shall be laid and secured with same G.I. hook bolt to secure the sheets to the roof, or with separate G.I. hook bolts to the roof members below and/ or with 8 mm. dia. G.I. bolts nuts and washers to the sheeting, generally as per manufacturer's written instructions.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 15.25 (D) shall be followed.

**2.2.** The rate shall be for a unit of one running meter.

**15.29.(I) Providing and fixing asbestos cement socketed half eaves gutter with bolts, nuts, bitumen washer etc. and flat iron brackets 40'mm. x 3 mm. size including asbestos rope and plastic roofing compound in joints complete : 150 mm. nominal size.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 15.10(f) shall be followed except that the asbestos cement socketed half round eaves gutter shall be provided. The size of gutter shall be 150 mm. nominal.

**1.2.** Gutters shall be laid with a minimum fall of 1 in 120 which should be increased where possible. Gutters shall be true to line and slope and shall be laid with requisite accessories such as drop ends, stop ends, nozzles, m angles and union slips, as directed. The size of outlet of drop ends and nozzles shall be the same as the size of rain water pipe into which they discharge water. Gutters and their accessories shall be supported by m.s. flat/ iron bracket. Where these are required to be fixed to the side of rafter they shall be fixed with 40 mm. by 3 mm. section bent to shape and fixed rigidly to the sides of the rafter with 3 Nos. of 10 mm. dia. bolts, nuts and washers. The brackets shall overlap the rafter not less than 300 mm. and connecting bolts be 115 mm. centers.

**1.3.** Where the brackets are to be fixed with purlins, these shall consist of 40 x 3 mm. M.S. flat iron bent to shape with one/and turned at a right angle and fixed to the purlins face with a 10 mm. dia bolt, nut and washer. The perpendicular overhang portion of 40 mm. x 3 mm. bracket shall be stiffened by another 40 x 3 mm. flat bent to right angle shape with its longer leg connected to the bracket with two numbers of 6 mm. dia. M.S. Bolts nuts and washers and its shorter legs fixed to the face of purlins with one number 10 mm. dia bolt nuts and washers. The overhang of the vertical portion of the flat iron bracket from the face of the purlin shall not exceed 225 mm.

**1.4.** Requisite slope in the gutter shall be given in the line of bracket. The brackets shall be placed at not more than 900 mm. centers.

**1.5.** The gutters shall be fixed to the brackets with 2 Nos. 8 mm. G.I. seam bolts and nuts, each bolt and nut being equipped with a pair of bitumen and G.I. washers. These connection bolts shall normally be above the water line of the gutter..

**1.6.** Spigot and socket end of gutters of socketed half round gutter and their accessories shall be connected together at their laps with one row of 8 mm. dia. G.I. bolts and nuts. Each of the bolts and nuts shall be provided with a pair of bitumen and a pair of G.I. washers. The gap between socket and spigot shall be packed with approved plastic roofing compound and flanked on the both sides with 6.35 mm. dia asbestos rope. The connecting G.I. Bolt shall be then tightened so that the lapped joint becomes leak-proof. The outer face of packed asbestos rope shall not be further than 6 mm. from the edges of the spigot and socketed ends. Where both ends of gutters and / or their accessories to be connected together are spigot ends, they shall be laid as butt jointed with 1.5 mm. gap in between over union clips. The union clips connected to the two butt ends of the gutter or other sections with two rows. The gap between union clips and ends of gutter sections or accessories shall be packed with plastic roofing compound flanked with edges of 6.35 mm. dia asbestos ropes as before. The whole joint shall be made leak-proof by tightening the bolts.

**2.0. Mode of measurements & payment**

**2.1.** The asbestos socketed half round eaves gutter shall be measured for finished work and the length shall be measured along the centre line. -

**2.2.** The rate of gutters shall include the cost of providing and fixing accessories such as drops ends, stop ends, nozzles, and fixing union clips together with bolts, nuts and washers.

**2.3.** The rate shall be for a unit of one running meter.

**15.29.(II) Providing and fixing Asbestos cement socketed half round eaves gutters with bolts, nuts, bitumen washers etc. and flat iron brackets 40 mm x 3 mm. size including Asbestos rope and plastic roofing compound in joint etc. complete. 300 mm. nominal size.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 15.29 (I) shall be followed except that the size of the Asbestos socketed eaves half round gutter shall be 300 mm. nominal size.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 15.29(1) shall be followed.

**2.2.** The rate shall be for a unit of one running meter.

**15.51. Tiled roofing with Mangalore pattern roof tiles including teak reefers of size 50 mm. x 25 mm.**

**1.0. Materials**

(1) Mangalore pattern roof tiles shall conform to M-25, (2) Teak wood batten shall conform to M-29.

**2.0. Workmanship**

**2.1. Laying**

The maximum distance between centre to centre of rafters shall be not more than 500 mm. Teak wood reapers 50 mm. x 25 mm. be nailed to each rafter at central distances suited to the size of the tiles by

means of nails 50 mm. long. The reapers shall be of well seasoned teak wood and shall be straight pieces of uniform size and colour and not shorter than the length necessary to cover at least four rafter. The under face and sides of the reapers shall be planned before fitting up. Joints shall come over the rafter. The joints of two adjacent rows of reapers shall not come over the same rafter. At the eaves, there shall be two reapers of such thickness and shape that the uniformity of the top slope of the roof shall be preserved.

**2.2. The work of valleys shall be executed as under :**

Galvanized iron sheet 1200 mm. wide and 1.25 mm. thick shall be used for valleys. The sheet shall be extended by about 450 mm. under the tiles on either side in a depth of 100 mm. at centre. The sheet shall be carried 75 mm. into the wall and set with cement mortar unless flushing is specified. The laps, if any, on the slope shall be 300 mm. The sheets shall be laid over the reapers and nailed. Two reapers 50 mm x 25 mm. each shall be fixed over the galvanized iron sheet 150 mm. away from the centre line of the valley, on either side to keep the tiles and mortar from falling into the gutter of the valley.

**2.3. Laying :**

The tiles shall be laid from the eaves towards the fidges after fitting of the reapers, the rebate of the tiles resting fully against the reapers. The joints of the hips and ridges tiles and also those between them and the plain tiles shall be set in and well grouted with lime mortar and the mortar surface painted and finished off with a mixture of red paint and port land cement or preserve informality of colour. The finished slope of roof shall be uniform from ridges to eaves. The eaves line shall be perfectly straight, horizontal and parallel to each other. The end over gables shall be protected by lime borders and neatly finished.

**2.4.** At the side of valleys and for 230 mm. on either side of the roof at valleys cement plastering 12 mm. thick shall be done to prevent the rain water from the gutter leaking by the sides of valleys.

**2.5.** At the eaves, wide tie shall be placed over the ends of the last tiles and secured by means of galvanized iron washers and screws 25 mm. into the rafter to prevent tiles from being blow up. Care shall be taken to put the screws in the, ridges and not in the gutter or the tiles, Where full tiles are not necessary, half tiles manufactured for the purpose shall be used.

**3.0. Mode of measurements and payment**

**3.1.** The measurement of the roof shall be taken for finished work for superficial area flat in the plane, of the roof and not girthed. Laps shall not be measured.

**3.2.** No deduction in measurements of roofed shall be made for openings of area up to 0.40 sq. mt. nor shall any extra be paid for labour and wastage in forming such openings.

**3.3.** The rate includes the cost of all materials and labour including ridges, hips, eaves and bottoms.

**3.4.** The rate shall be for a unit of one square meter.

**15.75 Providing and fixing five courses water proofing treatment with bitumen felt consisting/ of second and fourth course of blown bitumen or/and residual bitumen applied hot 1.20 kg./sq. mt. of area for each course and first course with fiber base bitumen saturated underlay type and third course with fiber base self finished felt type 2 Grade-I, fifth and final course of stone grit 6 mm. and down size or pea sized gravel spreaded at 0.008 cum/sq.mt. including preparation of surface, excluding grading complete.**

**1.0. Materials**

The tar felt shall conform to M-76. The bitumen primer shall conform to I.S. 3388-1965. The bitumen shall conform to I.S. 702-1961. The grit or gravel shall conform to M-8.

**2.0. Workmanship**

**2.1. Preparation of surface :**

**2.1.1.** Well defined cracks other than hair cracks in the roof structure shall be cut to V section cleaned and filled up flush with cement sand slurry or with bitumen conforming to I.S. 702-1961. The surface to be treated shall have minimum slope of 1 in 120. The grading shall be carried out prior to the application of water proofing treatment by cement mortar or lime surkhi mortar or as specified in description of item.

**2.1.2.** The surface or room, part of parapet and gutters, drain mouths etc. over which the water proofing treatment is to be applied shall be cleaned of all foreign matter such as funguses, moss and dust by wire brushing and dusting.

**2.1.3.** Drain outlet shall suitably placed with respect to the roof gradient to ensure rapid drainage and prevent local accumulation of water on the roof, surface, masonry drain mouth shall be widen sufficiently and rounded with cement mortar.

**2.1.4.** For cast iron drain outlets, a groove shall be cut all round to touch the treatment.

**2.1.5.** When a pipe passes through a roof on which water proofing treatment is to be laid a cement concrete angle fillet shall be built round it and the water proofing treatment taken over the fillet.

**2.1.6.** In case of parapet wall over 450 mm. in height for trucking in the water proofing treatment a horizontal groove 75 mm. wide and 65 mm. deep at minimum height of 150 mm. above roof level shall be left in the vertical face at the time of construction. The horizontal face of the groove shall be shaped with cement mortar 1:4.

**2.1.7.** In case of low parapet where the height does not exceed 450 mm. no groove shall be provided and the water proofing treatment shall be carried right over the top.

**2.1.8.** In case of existing R.C.C. and stone and vertical face of the parapet wall, a fillet 75 mm. in radius shall be constructed.

**2.1.10.** At the drain mouths the fillet shall be suitably cut back and rounded off for easy application of water proofing treatment and easy flow of water.

**2.1.11.** Outlet at every low dividing wall about less than 300 mm. in height cut open to full depth and the bottom and the sides shall be rounded smooth and corners rounded off for easy application of water proofing treatment.

## **2.2. Priming coat:**

**2.2.1.** Bitumen primer shall conform to I.S. 3335-1965. A priming coat consisting of bituminous solution of low viscosity shall be applied with brush on the roof and wall surface at specified weight per unit area to assist adhesion to bonding materials as specified in the description of the item.,.

**2.2.2.** Where a floating treatment to water proofing with self finished bitumen felt is required i.e. where water proofing treatment is required to be isolated from the roof structure, a layer of bitumen saturated felt (under lay) shall be spread over the roof surface and tucked into the flashing grooves. To keep the underlay free from the structure nonbonding materials shall be used below underlay. Overlapping to the adjoining strip of underlay shall be minimum of 75 mm. as sides and 10 mm. at ends, and shall be sealed with the same bonding materials, as used for self finished felt treatment. The underlay shall be of type I saturated felt conforming to I.S. 1322-1970.

## **2.3. Laying of Felt :**

**2.3.1.** The self finished tar felt shall be cut to the required lengths, brushed clean to dusting materials, laid out flat on the roof to eliminate curls and subsequent sketching. The felt shall be laid in lengths running at right angles to the direction of run off gradient commencing at the lowest level and working up to crest, so that the lower laps of the adjacent felt layer offer minimum obstruction to the flow of water. The felt shall not be laid in a single piece of very long lengths as it is likely to shrink. 6 to 8 meters are suitable length. The roof shall be cleaned and dried before the felt treatment is begun. Each length shall be laid in position and rolled up for a distance of half its-lengths. The hot bonding materials heated to correct working temperature as specified by manufacturer shall be poured on the roof across the full width of the felt as the latter is steadily unfolded and pressed down. The excess of bonding materials which squeezes out at the ends shall be removed as the laying proceeds. The pouring shall be so regulated that the correct weight of the bonding materials as per unit area is spread uniformly over the surface. When the first half of the tar felt has been bonded to the roof, the other half shall be rolled up and then unrolled on the hot bonding materials in the same way. Subsequent strips shall also be laid in the same manner. Each strip shall overlap the proceeding one by at least 75 mm. at the longitudinal edges and 100 mm. at the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and trailing of bitumen near edges or laps shall be leveled by heating the overlaps with blow lamp and leveling down unevenness.

**2.3.2.** Third layer of bonding materials in four course treatment shall be carried out in similar manner after the flashing has been complete.

**2.3.3.** Water proofing treatment shall be carried out in the drain pipe or out-lets by at least 100 mm. The Water proofing treatment laid on the surface shall overlap the upper edge of water proofing treatment in the drain outlets by at least 100 mm. Flashing felts shall be laid as flashing. Wherever junction of vertical horizontal surfaces occurs longitudinal laps shall be 100 mm. The lower layer of flashing felt shall overlap the roofing felt by 100 mm on vertical and sloping faces. Last course of flashing should not be of stone grit or pea sized gravel but it shall be replaced by providing two coats of bitumen solution of approved quality.

**2.3.4.** The lower edge of flashing shall overlap the flat portion for the roof and the upper edge of the flashing shall be trucked into the horizontal groove 75 mm. thick wide, 65 mm. deep provided at minimum height of 150 mm. from top of the roof surface. The flashing treatment shall be firmly held in place in the grooves with wooden wedges at intervals and the grooves shall be filled with cement mortar 1:4 (1 cement : 4 coarse sand) or cement concrete (1:2:4) (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm. nominal size) and surface finished smooth with the rest of wall. The cement work shall be cured of bituminous solution shall be applied on the vertical and sloping surface of flashing.

**2.3.5.** After the top flashing felt layer has been laid, the penultimate layer of bonding material shall be applied over the roofing felt and horizontal overlap, and vertical and sloping surfaces of flashing shall be spread uniformly over the hot bounding materials on the horizontal roof surface and pressed into it with wooden roller.

**2.3.6.** The material for surface finish shall be spread as described in the item over top layer.

**2.3.7.** If ballooning occurs the defects may be rectified as under.

**2.3.8.** Remove the gravel on the ballooned surface. The cut open and squeeze out the trap vapor by firm pressure applied by hand, seal the bitumen felt so lifted back on the surface by applying additional bitumen, finally seal the cut with piece of bitumen felt with bitumen application.

### **3.0. Mode of measurements & payment**

**3.1.** The measurements for this item shall be taken as under:

(a) Water proofing of roof with bitumen shall be measured in sq. mt. length and breadth shall be measured correct to centimeter.

(b) Measurement shall be taken for the superficial area of roofing and flashing treatment including flashing over the parapet wall, low dividing walls and expansion joints and at the pipe projection etc. Overlapping and tucking into flashing grooves shall not be measured.

(c) Slopping and vertical surface of water proofing treatment shall be measured under the four or five course treatment as the case may be irrespective of the fact that the final course of grit or gravel is replaced by bitumen primer.

(d) In measurements, no deductions shall be made for either openings or recesses for chimney stacks, roof lights etc. for areas up to 0.40 sq. mt. not anything extra shall be paid for extra labour and materials in forming such openings. For similar area exceeding 0.04 sq. mt. deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.

(e) The grading (coba bedding) shall be paid separately but cleaning of surface and treatment shall not be measured or paid separately.

**3.2.** The rate includes cost of all materials and labour.

**3.3.** The rate shall be for a unit of one sq. meter.

**15.87(A) Providing and fixing on wall face C.I rain water pipe including filling the joints with spun yarn soaked in neat cement slurry and cement mortar 1:2 (1 cement : 2 fine sand) 75 mm. dia.**

### **1.0. Materials**

Water shall conform to M-1. The C.I. rain water pipes and fittings shall conform to M-68. Cement mortar shall conform to M-11.

### **2.0. Workmanship**

**2.1.** C.I. rain water pipes shall be of the specified diameter and shall be in full lengths of 1.8 meters including socket ends of the pipes unless shorter lengths are required at junction with fittings.

### **2.2. Fixing :**

The pipe and fittings shall be fixed in vertical alignment unless otherwise specified and shall be secured to the walls at joints with M.S. clamps. The clamps shall be M.S. sheet 30 mm. bent to required shape and size so as to fit tightly on the socket of pipe when tightened with screw bolts. It shall be formed out of two semi-circular pieces, hinged with 6 mm. dia M.S. pin on one side and provided flanged ends on the other side with holes to fit in the screw bolt and nut 40 mm. long. The clamps shall be provided with hook made out of 275 mm. long, 10 mm. dia M.S. bar invested to the ring at the centre of one semicircular piece. The clamps shall be fixed to the walls. The clamps shall be kept above 25 mm. clear of finished face of wall so as to facilitate cleaning and painting the pipes.

**2.3.** The pipe shall be fixed vertically. The spigot of the upper pipe shall be properly fitted in the socket of the lower pipe such that there is uniform annular space filling with the jointing material. The annular space between the spigot and socket shall be filled with, a few turns of spun yarn soaked in cement slurry or with stiff cement mortar 2:1 (1 cement : 2 fine sand) well pressed with caulking tools and finished smooth at top at an angle of 45°, sloping up. The joint shall be kept wet at least for 7 days by tying four fold of gunny bag to pipe and keeping it moist constantly.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 15.93(B) of A.C. rain water pipes shall be followed except that the C.I. rain water pipe shall be fixed.

**3.2.** The rate shall be for a unit of one running meter.

**15.88.(A) Providing and fixing M.S. Holder bat clamps of approved design to C.I. or S.C.I. pipes embedded and including cement concrete blocks (108 mm. x 100 mm. size) in 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and cost of cutting holes and making good the wall etc. complete : 75 mm. dia.**

**1.0. Materials of Workmanship**

**1.1.** The relevant specifications of item no. 15.94(6) shall be followed except that the M.S. holder bat clamps of approved design shall be C.I. rain water pipe-75 dia.

**1.2.** The bat clamps shall be fixed as directed with C.C. blocks of 100 mm. x 100 mm. The relevant specification of item No. 5.4.1 shall be followed for concrete work.

**2.0. Mode of measurements and payment**

**2.1.** The bat clamps of M.S. holder suitable for 75 mm. dia shall be measured for finished item.

**2.2.** The rate includes cost of all materials and labour etc. required for satisfactory completion of this item.

**2.3.** The rate shall be for a unit of one number.

**15.90(A) Providing and fixing and embedding sand C.I. rain water pipe in the masonry surrounded with 12 mm. thick cement mortar of the same mix as that of masonry : 75 mm. dia. pipe.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. The C.I. pipe and fittings shall conform to M-68.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 15.87 (A) shall be followed except that C.I. pipe 75 mm. dia shall be embedded in masonry surrounded with 12 mm. thick cement mortar.

**2.2.** The pipes shall be fixed in the masonry work as it proceeds. The pipe shall be kept vertical or to the line as directed. The pipe shall have minimum surroundings of 12 mm. thick cement mortar at every portion of external surface. The length shall be caulked with spun yarn and cement mortar as soon as the next length of pipe is placed in position. The socket end of the pipe shall be kept closed till the next length of pipe is fitted and jointed to prevent any brick-bats or concrete or pieces of wood falling in and clogging the pipes.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 15.87 (A) shall be followed.

**3.2.** The rate shall be for a unit of one running meter.

**15.93(6) Providing and fixing on wall face asbestos cement rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement : 2 coarse sand) complete : 80 mm. dia.**

**1.0. Materials**

**1.1.** Asbestos cement pipes of 80 mm. dia shall conform to I.S. 1626-1960 for pipes fixed on wall face. A.C. pipe shall conform to M-74.

**2.0. Workmanship**

**2.1.** Asbestos cement rain water pipes and fittings shall be of the diameter, size and type specified in the item. The pipe shall be full lengths of 2 meter as far as possible. All the pipes shall be fixed on wall face at locations indicated on drawings or as ordered by the Engineer-in-charge. Pipe shall be secured to face of wall below all joints by M.S. clamps with wooden gut ties.

**2.2.** The spigot of the upper pipe shall be properly fitted into the socket of the lower pipe such that there is uniform annular space for fitting with the jointing materials. One third depth of annular space between the

item. The pipe shall be full lengths of 2 meter as far as possible. All the pipes shall be fixed on wall face at locations indicated on drawings or as ordered by the Engineer-in-charge. Pipe shall be secured to face of wall below all joints by M.S. clamps with wooden gut ties.

**2.2.** The spigot of the upper pipe shall be properly fitted into the socket of the lower pipe such that there is uniform annular space for fitting with the jointing materials. One third depth of annular space between the socket and the spigot shall be filled with spun-yarn soaked in bitumatic jointing compound and shall be pressed home by means of caulking tool. The remaining 2/3 depth of the joints shall be filled in with stiff cement mortar 1:2 and shall be pressed with caulking tool and finished smooth at top at an angle of 45 sloping up.

**3.0. Mode of measurements and payment**

**3.1.** The pipe shall be measured including all fittings along its length in running meter. No allowance shall be made for the portion of pipe length entering the sockets of the adjacent pipe or fittings.

**3.2.** The rate includes the cost of all materials and labour involved in all the operations including jointing.

**3.3.** The rate shall be for a unit of one running meter.

**15.93.(C) Providing and fixing on wall face asbestos cement rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement : 2 coarse sand) complete : 100 mm. dia.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 15.93 (B) shall be followed except that the diameter of pipes shall be 100 mm.

**2.0. Mode of measurements & payment**

**2.1.** The pipe shall be measured including all fittings along its length in running meter. No allowance shall be made for the portion of pipe length entered into the sockets of the adjacent pipe or fittings.

**2.2.** The rate includes the cost of all materials and labour involved in all the operations including jointing.

**2.3.** The rate shall be for a unit of one running meter.

**15.94.(B) Providing and fixing for A.C. pipe on wall plugs and standard holder bat clamps comprising of two semi circular halves of flat iron and cast iron base screwed on wooden plugs : 80 mm. dia.**

**1.0. Materials and workmanship**

**1.1.** The bat clamps shall consist of a iron base with a projecting 1 shaped lay, teeth web of which the semicircular halves of the flat iron clamps are bolted. The base on the holder bat clamp shall be screwed on a pair of wooden plugs fixed in the wall with screw slotted driven through the holes in the base. The ' screws shall be not less than 75 mm. long-for 80 mm. diameter pipes and 100 mm. diameter pipes. The plugs shall be fixed in the wall to a depth of 150 mm. in cement mortar, 1:2 centrally to the holes in the base of the bat clamps and with their front face projecting to such a length' from the brick face that when the bat clamps is fixed, the outer base of its base shall be flush with the plaster face of the wall. The plugs shall be 110 mm. x 50 mm. wide at face increasing to 160 mm. x 70 mm. width at rear and shall be 70 mm. deep through out.

**2.0. Mode of measurement & payment**

**2.1.** The work shall be measured on number basis of clamps prescribed with accessories including cost of all materials and labour involved in all the operation including jointing etc. complete fixing in position etc. complete.

**2.2.** The rate shall be for a unit of one number.

**15.94 (C) Providing and fixing for A.C. pipe on wall plugs and standard holder bat clamps comprising of two semi circular halves of flat iron and cast iron base screwed on wooden plugs : 100 mm. dia.**

**1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 15.94 (B) shall be followed except that the standard holder bat clamps shall be for A.C. pipe of 100 mm. dia.

**2.0. Mode of measurements and payment**

**2.1.** The work shall be measured on number basis of clamps including cost of all materials and labour involved in all the operation including jointing, fixing in position etc. complete.

**2.2.** The rate shall be for a unit of One Number.

**15.95.(A) Providing and fixing on wall face asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 {1 cement : 2 coarse sand). Bend of required degree. 80 mm. dia without door. 100 mm. dia. without door.**

**1.0. Materials**

**1.1.** The bend of required degree and size as specified in item shall be of best quality and made as approved by the Engineer-in-charge. The fittings shall conform to I.S, 1626-1960.

**2.0. Workmanship**

**2.1.** The fitting (bend of required degree) shall be fixed as per relevant specifications of item No. 15.93 (B), except that the A.C. bends of required degree shall be provided instead of pipe.

**3.0. Mode of measurements and payment.**

**3.1.** The rate shall be for a unit of One Number.

**15.95.(B) Providing and fixing on wall face asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement: 2 coarse sand) off set 50 mm. (2) 80 mm. dia. (3) 100 mm. dia.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specification of item No. 15.95 (A) shall be followed except the off set 50 mm. of specified size of A.C. pipe shall be used instead of bends.

**2.0. Mode of measurements & payment**

**2.1.** The rate shall be for a unit of One Number

**15.95.(C) Providing and fixing on wall face asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement : 2 coarse sand) off set 75 mm. (2) 80 mm. dia (3) 100 mm. dia.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 15.95 (A) shall be followed except that off-set 75 mm. of specified size of A.C. Pipe shall be provided instead of bends.

**2.0. Mode of measurements & payment**

**2.1.** The rate shall be for a unit of One Number.

**15.95.(J) Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 ( 1 cement : 2 coarse sand) junction equal angle. (3) 80 mm. dia without door (5) 100 mm. dia. without-door.**

**1.0. Materials and workmanship**

The relevant specifications of item 15.95 (A) shall be followed that junction of equal of angle of specified size of A.C. pipe shall be provided instead of bends.

**2.0. Mode of measurements & payment**

**2.1.** The rate shall be for a unit of One Number.

**15.95.(K) Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement : 2 coarse sand) : junction of equal double angle. (3) 80 mm. dia. without door (5) 100 mm. dia. without door.**

**1.0. Materials and workmanship**

**1.1.** The relevant specification of item 15.95 (A) shall be followed except that junction of equal double angles of A.C. rain water pipe of specified size shall be provided instead of A.C, Bend.

**2.0. Mode of measurement & payment**

**2.1.** The rate shall be for a unit of One Number.

**15.95.(L) Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement : 2 coarse sand) : Standard shoe. (2) 80 mm. dia. (3) 100 mm. dia.**

**1.0. Materials and workmanship**

**1.1.** The relevant specification of item No. 15.95 (A) shall be followed except that the standard shoe of A.C. pipe of specified size shall be provided instead of bend.

**2.0. Mode of measurement & payment**

**2.1.** The rate shall be for a unit of One number.



**SECTION-16**  
**Ceiling Lining**

**16.3.(A) Providing and fixing wooden planks ceiling with long Lied and grooved jointing and Wood screws (Frame work and cover fillets to be measured and paid separately) : Indian Teak Wood (i) 12 mm. thick (ii) 20 mm. thick (iii) 25 mm. thick.**

**1.0. Materials**

1.1. The Indian Teak wood shall conform to M-29.

**2.0. Workmanship**

**2.1. General**

The planks shall be clean sawn in the direction of the grain, cut square and straight. Each plank shall have tongued and grooved jointing. On exposed faces, it shall be planed for full face.

2.2. The frame for supporting the ceiling may be wooden or metal and the size and the other details of frame work shall be as directed, Suspenders of M.S. angles or other sections may be used for suspending the frame. Use of wooden suspenders shall be permitted. The bottom surface of the frame shall be checked and corrected to true surface and slope.

**2.3. Fixing :**

Planks of a specified timber and thickness shall be used. The width of the planks shall not be more than 100 mm. up to 20 mm. thick planks and 150 mm. for planks above 20 mm. thick and length shall not exceed 3 meters. The planks shall be of uniform width except in the first and last lines of planks adjacent to the two walls where remaining additional odd width shall be adjusted equally on both sides. The minimum, length of planks in finished work shall be such that it will span at least two spacing of the supporting frame work except where shorten lengths are unavoidable. The planks shall be planed true on the exposed sides.

2.4. The longitudinal edges of the planks shall be jointed with tongued and grooved type joints as described in the item.

2.5. The outer lines of planks shall be accurately fixed parallel and close to be wall. Each subsequent plank shall be carefully jointed up. The plank shall be fixed to the frame above with two screws at each and joints of frame and one at every intermediate joint. (The screws shall not be thinner than designations 8 and of a length not less than twice the thickness of the boards). The screws shall be counter sunk and the screw holes filled with putty or-sloping out way. The unexposed face of planks shall be treated with wood preservative before the board is fixed.

**3.0. Mode of measurement & payment**

3.1. The supporting frame, cover fillets, and suspenders shall not be included in rate of ceiling.

3.2. No deductions in measurements shall be made for opening not exceeding 0.46 sq. m. and no extra payment shall be made for forming such openings.

3.3. Each type of work in ceiling shall be measured separately.

3.4. The rate shall be for a unit of One sq. meter.

**16.4. Providing and fixing Fiber insulation board lining with butt jointing and nails (Frame work and cover fillets to be measured and paid separately) (i) 12 mm. thick (ii) 18 mm. thick (iii) 25 mm. thick.**

**1.0. Materials**

1.1. The fiber insulation board of specified thickness shall conform to I.S. 3348-1965.

**2.1. Fixing :**

The work shall be carried out as per detailed drawings for panel arrangements.

2.2. All boards are subject to slight movements due to moisture and temperature changes, and this shall be allowed for in fixing. Preferably the board shall be stored up for at least 24 hours before use in the same environment as the one in which they are to be fixed.

**2.3. Frame work :**

The studs and grounds for fixing the boards shall be spaced at 300 mm. to 450 mm. centers both ways the .actual spacing selected depending on the width of the cut board in the panel arrangements. All edges of the boards shall be supported. Intermediate supports shall be provided at dedo heights for picture rails and cornices etc.

**2.4.** Planked battens 40 mm. x 20 mm. shall toe used for grounds on solid walls. The batten shall be plugged to wall as described-under. The batten snail be fixed on tapering plugs with 50 mm. long wood screws. The tapering plug shall be trapezoidal in shape having base 50 x 50 mm. at bottom 38 x 38 mm. at top with depth of 50 mm. Plugs shall be embedded in C.M. 1 : 3 and shall be placed at 450 x 500 mm. centers. The plugs shall treated with coal tar and battens shall be treated with wood preservative before use. On uneven wall faces the battens shall be plugged and fitted with packing pieces at the back where necessary. The frame shall be treated with wood preservative before boards are nailed on.

Nailing shall be done by nails having a shank diameter of 2.5 mm. and head diameter of about 8 mm. Nails shall have length as per requirements. The nails shall be placed at supports at 100 mm. to 150 mm centre to centre and at edges 75 mm. centers. Minimum clearance for nails from edges shall be 10 mm. The nails shall be rustles where the nail heads are exposed. Where the joints are to be covered with beading, felt headed (clout) nails shall be used instead of lost head nails.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 16.3.(A) shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**16.13(1) Providing and fixing plywood lining with butt jointing and nails (frame work and cover fillets to be measured and paid for separately) 6 mm. thick play.****1.0. Materials :**

6 mm. thick plywood shall conform to M-37.

**2.0. Workmanship**

The relevant specifications of item 16.4 shall be followed except that 6 mm. thick plywood shall be fixed in lining.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item 16.4 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter,

**16.13(11) Providing and fixing plywood lining with but jointing and nails (frame work and cover fillets to be measured and paid for separately) 9 mm. thick ply.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 16 13 (I) shall be followed except that the thickness of plywood to be fixed shall be 9 mm.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 16.4 (I) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**16.21(1) Providing and fixing plain asbestos sheet lining with butt jointing and wood screws (frame work and cover fillets to be paid for separately), Class-A-6.5 mm. thick.****1.0. Materials**

**1.1.** Plain A.C. Sheets 6.5. mm. thick shall be conform to M-24.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 16.4. shall be. followed except that the plain A.C. sheets class A of 6.5 mm. thickness shall be fixed in lining.

**2.2.** In fixing asbestos cement sheets, care shall be taken to avoid rigid fixing as this may cause cracking if the supporting structure expands or shrinks. The sheet shall be fixed with wood screws to wooden ground

and the screw holes shall be drilled slightly longer than the screws. Asbestos sheet may also be advantageously fixed on to walls with cement plaster backing. The screws shall be fixed at 150 mm. to 200 mm. at supports. The boards shall be fitted either with wooden cover fillets or asbestos strips as described in item.

**3.0.** Mode of measurement and payment

**3.1.** The relevant specifications of item No. 16.4 shall be followed.

**3.2.** The rate shall be for a unit One sq. meter.

**18.21 (II) Providing and fixing plain asbestos sheet lining with butt jointing to wood screws (frame work and cover fillets to be paid for separately), Class-B-5 mm. thick.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 16.21 (I) shall be followed except that the plain A.C. sheet of Class-B 5 mm. thick shall be fixing in lining.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 16.21 (I) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**SECTION-17**  
**Plastering and Paints**

**17.58 (I) 10 mm. thick cement plaster in single coat on fair side of brick concrete walls for interior plastering up to floor two level and finished even and smooth in (i) C. M. 1:3.**

**1.0. Materials**

**1.1.** Water shall conform to M-1. The cement mortar of proportion 1:3 shall conform to M-13.

**2.0. Workmanship**

**2.1. Scaffolding:**

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

**2.2. Preparation of back-ground :**

**2.2.1.** The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing if it is not hard and by hacking if it is hard. In case of concrete surface, if a chemical retarded has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the readers if left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.

**2.2.2.** Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

**2.2.3.** The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.

**2.2.4.** For external plaster, the plastering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

**2:3. Application of plaster:**

**2.3.1.** The plaster about 15x15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

**2.3.2.** Cement plaster shall be used within half an hour after addition of water. And mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

**2.3.3.** In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

**2.3.4.** Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags oh the outside of the plaster and keeping them wet.

**3.0. Mode of measurements & payment**

**3.1.** The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.

**3.2.** All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.

**3.3.** Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10 mm. at any point on this surface.

**3.4.** This item includes plastering up to floor two level.

**3.5.** The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

**3.6.** Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.

**3.7.** For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq. mt each in area and for openings exceeding 0.5 sq. mt and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manners.

(a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

**3.8.** For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.

**3.9.** In case of openings of area above 3 sq. mt. each, deduction shall be made for openings but jambs, soffits and sills shall be measured.

**3.10.** The rate shall be for a unit of One sq. meter.

**17.58 (II) 10 mm. cement plaster in single coat on fair side of brick/concrete walls for interior plastering up to floor two level and finished even and smooth in C.M. 1:4.**

**1.0. Materials & workmanship**

**1.1.** The relevant specifications of item No. 17.58 (I) shall be followed except that the proportion of mortar is C.M. 1 : 4 instead of C.M. 1:3.

**2.0. Mode of measurements & payment**

**2.1.** The mode of measurements and payment shall be the same as for item No. 17.58 (I)

**2.2.** The rate shall be for a unit of One sq. meter.

**17.58 (III) 10 mm. cement plaster in single coat on fair side of brick/concrete walls for interior plastering up to floor two level and finished even and smooth in C.M. 1:6.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.58 (I) shall be followed except that the proportion of mortar is cement mortar 1:6.

**2.0. Mode of measurements & payment**

**2.1.** The mode of measurement and payment shall be followed same as item No. 17.58(1)

**2.2.** The rate shall be for a unit of one square meter.

**17.61.(I) 20 mm. thick cement plaster in single coat on rough side of single or half brick wall for interior plastering up to floor two level, finished even and smooth in cement mortar 1:3 (1 cement : 3 sand).**

**1.0. Materials & workmanship**

**1.1.** The relevant specifications of item No. 17.59 (I) shall be followed except that the thickness of cement plaster shall be 20 mm. The plastering work shall be in single coat on rough side of half brick wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:3.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 17.59(1) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.61.(II) 20 mm. thick cement plaster in single coat on rough side of single or half brick wall for interior plastering up to floor two level, finished even and smooth in cement mortar 1:4 (1 cement : 4 sand).**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.59. (II) shall be followed except that the thickness of plastering shall be 20 mm. in C.M 1:4.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 17.59 (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter

**17.61 (III) 20 mm. thick cement plaster in single coat on rough side of single or half brick wall for interior plastering up to floor two level, finished even and smooth in C.M. 1:6 (1 cement : 6 sand).**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.59 (III) shall be followed except that thickness of plaster shall be 20 mm. C.M 1:6.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 17.59 (I) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.69 Extra over items 51 to 65 for finishing with a floating coat of neat cement slurry.**

**1.0. Materials & workmanship**

**1.1.** The relevant specification of item No. 17.58 and 1761 shall be followed for materials and workmanship except that this work is only providing smooth cement finish with floating coat of neat cement slurry

**1.2.** The coat of cement and fine sand mortar of proportion V1 (1 5 mm thick about) shall be applied to the plastered surface with a trowel to provide uniform texture while the base coat is still plastic.

**1.3.** In any continuous face of wall the finishing treatment should be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly Junctions

**1.4.** Curing : All the plaster work shall be kept damp continuously for a period 7 days

**2.0. Mode of measurements and payment**

**2.1.** The payment shall be made for a unit of 1.0 sq. mt of work done over and above the finishing of work of base coat.

**2.2.** The relevant specifications of item of base coat shall be followed for measurements and payment.

**2.3.** The rate shall be for a unit of One sq. meter.

**17.70. Extra over item 17.58 to 17.61 for providing and mixing water proofing materials in cement mortar in proportion recommended by the manufacturers.**

**1.0. Materials and Workmanship**

The relevant specification of item No 17.58 to 1761 shall be followed except that the water proofing materials of approved make shall be added to the cement at the rate specified or as directed by The Engineer-in-charge. The proportion proofing materials of water to be mixed with 50 kg bags shall be as recommended by the manufacturers of the water proofing material

**2.0. Mode of measurements & payment**

**2.1.** The payment shall be made extra for this work over and above the plaster work

**2.2.** The rate shall be for a unit of 1 Kg of water proofing materials used in 1 bag of weighing 50 Kg cement used extra over the rate of plastering work

**17.91. Extra over item No. 17.59 to 17.61 for plastering on ceiling and soffits of stair up to floor two level instead of plastering on walls.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No 17.59 (1) shall be followed except that this work is for ceiling, soffits of stairs up to two floor

**1.2.** The smooth concrete surface shall be suitably roughened to provide bond before plastering.

**2.0. Mode of measurement and payment**

**2.1.** The payment shall be made for a unit of One sq meter of work done extra over and above the payment of plaster work on wall surfaces.

**2.2.** The rate shall be for a unit of one sq. meter.

**17.94(1) Extra over item No. 1 to 69, 71 to 87 and 90 for interior plastering above floor two level for every additional storey height (i) Single coat plaster.**

**1.0 Materials and Workmanship**

**1.1** The relevant specification of Item No. 17.59 (1) shall be followed except that the whole work is to be carried out above floor two level.

**2.0. Mode of measurements and payment**

1.2. The mode of measurement and payment shall be same as item No. 17.59(1).

2.2. The extra payment shall be made over and above the floor two level rate for every additional floor height.

**17.94 (II) Extra over item 1 to 69, 71 to 87 and 90 for interior plastering above floor two level for every additional storey height. Tow coat plaster.**

**1.0. Materials & workmanship**

1.1. The relevant specifications of item No. 17.94 (I) shall be followed except that extra payment for work shall be for a two coat plaster.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 17.94(1) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**17.94(111) Extra over item 1 to 69, 71 to 87 and 90 for interior plastering above floor two level for every additional storey height. Floating coat of neat cement.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 17.94 (I) shall be followed except that the extra payment shall be made for work of floating coat of neat cement slurry.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 17.59 (I) shall be followed.

2.2. The rate shall be for a unit of One sq. meter.

**17.95. 20 mm. thick sand face cement plaster on walls up to height of 10 mm. and above ground level consisting of 12 mm. thick backing coating of C.M. 1:3 (1 cement : 3 sand) and 8 mm. thick finishing coat in C.M. 1:1 (1 cement : 1 sand) etc. complete.**

**1.0. Materials**

1.1. Water shall conform to M-1. Cement mortar shall conform to M-11.

**2.0. Workmanship**

2.1. The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm. thick in C.M. 1:3. The relevant specifications of item No. 17.58(I) shall be followed except that the thickness of back coat shall be 12 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days, depending upon the weather conditions. The surface shall not be allowed to dry during this period.

2.2. The second coat shall be completed to 8 mm. thickness in C.M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.

**2.3. Curing :**

The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

**3.0. Mode of measurement & payment**

3.1. The relevant specifications of item No. 17.58 shall be followed except that the sand face plaster on outside up to 10 m. above ground level shall be measured under this item.

3.2. The rate shall be for a unit of One sq. meter.

**17.116(A) Pointing on brick work with cement mortar 1:3 (1 cement : 3 coarse sand) flush pointing.**

**1.0. Materials**

1.1. Water shall conform to M-1. Cement mortar shall conform to M-11.

**2.0. Workmanship**

2.1. The flush pointing work shall be carried out with cement mortar of proportion 1:3(1 part of cement and 3 part of coarse sand) by volume.

2.2. Preparation of surface.

2.2.1. The joints shall be raked to such a depth that the average of new mortar measured from either the sunk surface to finished pointing or from the -edge of the brick shall be average 10 mm.

**2.3. Application of Mortar and Finishing :**

2.3.1. The mortar shall, be pressed in to the raked out joints with a pointing trowel according to the types of pointing specified in item. The mortar shall not spread over the corner edges or surface of the masonry. The pointing shall then be finished with the pointed tools.

**2.4. Curing :**

**2.4.1.** The pointing shall be kept wet for 7 days. During this period, it shall be suitably protected from all damages.

**3.0. Mode of measurements & payment**

**3.1.** No deductions shall be made end of joints, beams and posts etc. and openings not exceeding 0.5 s. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings.

**3.2.** Deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be paid as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings : (i) When both faces of walls are pointed with same type of pointing, deduction shall be made for one face only, (ii) When two faces of walls are pointed with different type of pointing or if one face is plastered and the other is pointed, deduction shall be made in the plaster or pointing on the side of frame for door, windows etc. on which the width of reveals is less than that on the other side but no deduction shall be made from plaster or pointing on the other side.

(iii) When only one face is treated and the other face is not rested, full deduction shall be made, if the width of the reveals on the treated side is less than on the untreated side, but if the width of the reveal is more then no deduction shall be made nor any addition shall be made for reveals/jambs, soffits, sills etc. **3.3.** In case of openings of area above 3 sq. mt each deduction shall be made for opening but jambs, sills, and soffits, shall be measured.

**3.4.** The rate shall be for a unit of One sq. meter.

**17.116(8) Pointing on brick work with cement mortar 1:3 (1 cement : coarse sand) Ruled pointing.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.116 (A) shall be followed except that the pointing to be done ruled pointing as under:

**1.2.** The joints shall be initially formed as for flush pointing and then while the mortar is still green, a groove of specified shape shall be formed by running forming tool straight along the centre line of joints till a smooth and hard surface is obtained. The vertical joints shall also be finished in a similar way. The pointing lines shall be uniform in width and truly horizontal and parallel in case of floor and ceiling.

**2.0. Mode of measurements & payment**

**2.1.** The mode of measurements and payment shall be the same as per item No. 17.116(A).

**2.2.** The rate shall be for a unit of One sq. meter.

**17.117(A) Pointing on brick work with cement mortar 1:4 (1 cement : 4 sand) Flush pointing.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.116 (A) shall be followed.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item-No. 17.116 (A) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.117(6) Pointing on brick work with cement mortar 1:4 (1 cement : 4 sand) Ruled pointing.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 17.116(6) shall be followed except that the proportion of C.M. 1:4 shall used for ruled pointing.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 17.115 (A) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.140.(A) Pointing on coursed stone masonry with cement mortar 1:3 ( 1 cement : 3 sand) flush pointing.****1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 17.116 (A) shall be followed except that the pointing shall be done on coursed stone masonry with C:M. 1:3 and the mortar shall be simply struck off with a trowel and the work left showing the natural irregularities in line and the surface of the stones themselves.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No.17.116 (A) shall be followed.

**2.2.** The rate shall be favor a unit of One sq. meter.

**17.140(B) Pointing on course stone masonry with cement mortar 1:3 ( 1 cement ; 3 sand) Ruled pointing.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 17.140 (A) and 17.116 (B) shall be followed.



**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 17.116(A) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.44.(A) Pointing on uncoarsed stone masonry with cement mortar 1:3 (1 cement : 3 sand) Flushing pointing.****1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No 17 116(A) shall be followed except that the flush pointing shall be done on uncoarsed rubble masonry work if C.M 1 3 and the mortar shall be simply Struck off with a trowel and the work left showing the natural irregularities in line and the surface of the stone themselves.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 17.116(A) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**17.144.(B) Pointing on uncoarsed stone masonry with cement mortar 1:3 (1 cement : sand) Ruled pointing.****1.0. Materials & Workmanship**

**1.1.** The relevant specification of item No 17 116 (Aj and 17 144 (A) shall be followed except that the ruled pointing work -shall be carried out on uncoarsed rubble masonry work in CM 1.3.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 17.116(A) shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter

**17.0.0.1 Providing cement vata (10 cms x 10 cms) size quarter round in cement mortar 1:1 including neat cement finishing, watering, etc. complete.****1.0. Materials**

**1.1.** Water shall conform to M-1 .Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** The work of cement vata of 10 cms x 10 cms. size shall be earned out at Functions of parapets and terraces as directed. The vata shall be finished in quarter round shape. The work shall be earned out in the best workman like manner. The inter portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured for finished item in running meter.

**3.2.** The rate shall be for a One running meter.

**SECTION-18****White Washing & Distempering**

- 18.11. White washing with lime on undecorated wall surfaces (two coats) to give an even shade including thoroughly brooming the surface to remove alt dirt, dust, mortar drops and other foreign matter.**

**1.1. Materials**

**1.1.1.** The clear Cole shall be made from glue and boiling water by mixing 1 Kg. mixture shall be suitably tinted where required for use under coloured distemper it directed. Glue shall conform to I.S. 352-1959 (Specifications for animal glue)

**1.1.2.** Lime used shall be Freshly burnt class 'C' Lime (fat lime) and white in colour conforming to I S. 712-1973. Water shall conform to M-1. Best quality of gum shall be used in (he preparations of white wash. Ultramarine blue or Indigo : This shall conform to I.S. 55-1970 for points, and shall be used for preparation of white was, Pigments. Mineral colours, not affected by lime shall be used in preparing colour wash.

**2.0. Workmanship**

**2.1.** Preparation of white wash solution Surface already white or colour. The fat lime shall be slaked as site and shall be mixed and stirred with about five liters of water for 1 kg. of unslaked lime to made a trim cream This shall be allowed to stand for d period of 24 hours and then shall be screened through a clean coarse cloth, 4 Kg. of gum dissolves in hot water shall be added to each cubic meter of lime cream Small quantity of ultramarine blue (Up to 3 gins, per kg. of lime) shall also-be added to the last two coats of white wash solution and the whole solution shall be stirred thoroughly before use.

**2.2. Preparation of surface:**

**2.2.1.** The surface shall be thoroughly cleaned of all dust, dirt, mortar cropping and other foreign matter before white wash is to be applied.

**2.2.2.** The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers 01 shall be rubbed with over-burnt surkhi or brick bats. The surface shall be then broomed to remove all dust dirt and shall he washed with clean water.

**2.2.3.** Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubber with wire Crushes.

**2.2.4.** All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portion shall he wetted and allowed to dry. They shall then be given one coat of white wash

**2.2.5.** All unnecessary nails shall be removed the holes, cracks, patches etc. shall be made good with material similar in composition to the surface to be prepared

**2.3. Scaffolding :**

Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

**2.4. Application of white wash :**

**2.4.1.** On the surface so prepared the white wash shall be applied with 'Moon' brush. The first stroke of the brush shall be from top downwards, another from bottom upwards over the first stroke and similarly one stoke from the right another from the left, over the first stroke brush before it dries. This will form one coat each coat shall be allowed to dry before and uniform finish free from brush marks and it should not come oft easily when rubbed with finger

**2.4.2.** Splashing and dropping if any on the doors and windows, ventilators etc shall be removed and the surface cleaned.

**2.4.3.** Priming and Alkali resistant treatments, scraping of surface washing etc. surface spoiled by smoke soot removed of oil and grease spots, treatment for infection with efflorescence moulds moos, fungi, algae and lichen and patch repairs to plaster wherever done shall not be paid extra.

**3.0. Mode of measurement & payment**

**3.1.** All the work shall be measured in the decimal system as under:

- (a) Dimensions shall be measured to the nearest 0.01 m.
- (b) Area in individual item shall be worked out to the nearest 0.01 sq.m.

All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. each in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.0. sq. mt. each in area, deductions and additions shall be made as under.

**3.2.** No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

**3.3.** No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :

- (a) When both the faces of walls are provided with finish, deduction shall be made for one face only.
- (b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of .50% of area of opening on each face shall be made from total area of finish.
- (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

**3.4** In case of area of openings exceeding 3 sq. mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.

**3.5.** No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

**3.6.** Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:

- (a) Corrugated steel sheets..... 14%
- (b) Corrugated A.C. sheets..... 20%
- (c) Semi corrugated A.C. Sheets..... 10%
- (d) Nainital pattern roof (Plain sheeting sheets)..... 10%
- (e) Naintial pattern roof (with corrugated sheets)..... 25%

**3.7.** Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.

**3.8.** The rate shall include the cost of ail materials, labour, scaffolding, protective measures etc. involved in all the operations described above.

**3.9.** The rate shall be for a unit of One sq. meter.

**18.12. White washing with lime on decorated wall surface (One coat) to give an even shade including thoroughly brooming in the surface to remove dust, mortar, drops and loose scales of lime wash and other foreign matter.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.11 shall be followed except that the white washing work shall be carried out on decorated wall surface single coat.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 18.11 shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter

**18.13 Extra over items 18.11 and 18.12 for every subsequent coat of white washing with lime on wall surfaces.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.11 shall be followed except that this work is for extra coat over and above two coats on wall surface.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.11 shall be followed except that the payment of subsequent coat shall be made extra over and above the item No. 18.11 for every subsequent coat applied.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.14. Extra over item 18.11 for white washing with the lime on ceiling and / or sloping roof.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.11 above shall be followed except that this work is for ceiling and / or sloping roof.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.11 shall be followed except that extra payment for white washing on ceiling and/or sloping roof shall be made over and above the payment of item No. 18.11

**2.2.** The rate shall be for a unit of One sq. meter.

**18.15 Extra over 18.12 for white washing with lime on decorated dealings and sloping roofs.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.12 shall be followed except that the white washing work shall be carried out on decorated ceilings and/or sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.52 shall be followed except that extra payment for white washing on ceiling and/or sloping roof shall be made over and above the payment of item No. 18.12.

**2.2.** The rate shall be for a unit of one sq. meter.

**18.16. Extra over the item No. 18.13 for every subsequent coat of white washing with lime on ceiling and /or sloping roofs.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.11 and 18.13 shall be followed except that this work is for extra coat over and above two coats of ceiling and / or sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.11 and 18. 13 shall be followed except that the extra payment for white washing shall be made for sloping roof or/and ceiling for every subsequent coat applied over and above item 18.11 and 18.13.

**2.2.** The rate shall be for a unit of one sq. meter.

**18.17. Colour washing with lime on undecorated wall surfaces (Two coats) over and including priming coat of white washing to give even shade including thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter. The relevant specifications for the materials and workmanship 18.11 shall be followed except that it shall be for colour wash.****1.0. Materials**

**1.1.** Clear-Cole : This shall be made from glue and boiling water by mixing 1 kg. of glue to every 15 liters of water. The mixing shall be suitably tinted to match with colour of colour washing as directed. Glue shall conform to I.S. 852-1969.

**1.2.** Lime : Lime used shall be freshly burnt class 'C' lime (Fat lime) and white in colour conforming to I.S. 712-1973.

**1.3.** Water : Water shall conform to M-1.

**1.4.** Gum ; Best quality of gum shall be used in the preparation of white or colour wash. The colour pigment of required tint and shade shall be mixed in lime cream. The mineral colour not affected by lime shall be used in preparing the colour wash.

**2.0. Workmanship**

**2.1.** Sufficient quantity of colour wash enough for the complete job shall be prepared in one operation to avoid any difference in shade. The basic white wash solution shall be prepared in accordance with item 18.11 Mineral colours not affected by lime shall be added to the white wash solution. No colour wash shall be done until a sample of the colour has been approved. It shall be noted that small samples of colour appears lighter in shade than when the same shades are applied precisely to large surface. The colour shall

be of event, tint, over the colour shall be of event tint, over the whole surface. If it is patchy or otherwise badly applied, it shall be rejected. Preparation of the colour wash with pigment shall be as under:

(a) With Yellow and Red Ocher :

Solid lumps if any in the powder shall be crushed to powder and solution in water prepared and then added to white wash sieving it through a coarse cloth, mixed evenly and thoroughly to white wash in-small quantities till required shade is obtained.

(b) With Blue Vitriol :

Fresh crystals of hydrous copper sulfate (i.e. vitriol) shall be ground to fine power and dissolved in small quantity of water. Sufficient quantity of solution enough to produce the colour wash of required shade shall be strained through a clean cloth, the filtrate being mixed evenly and thoroughly to the white wash.

(c) Colour wash from other colouring pigment shall be prepared in accordance with the instructions of the manufacturer.

## **2.2. Preparation of Surface :**

The surface shall be prepared by removing mortar dropping and foreign matter and thoroughly cleaned with wire of fiber brush or any other suitable means as directed by the Engineer-in-charge. All loose pieces and scales shall be scrapped off and holes filled with mortar.

**2.2.1.** For scaffoldings and application of colour wash, relevant specification of item No. 18.11. above shall be followed. The colour wash shall be applied as under:

The colour wash shall be applied in accordance with the procedure given in item No. 18.11. "Application of white wash for colour washing on undercoated surface after the surface has been prepared. The first primary coat shall be of white wash and subsequent coats (minimum two) shall be colour wash and the entire surface shall represent a smooth and uniform finish. To start with, patch of 0.1 sq. mt. on prepared surface shall be colour washed with first coat of white wash and subsequent coats of colour wash solution entire work of colour washing is taken up in hand, it shall be noted that small areas of colour wash will appear lighter than when the same shade is applied to the large surface.

**2.2.2.** For colour washing on decorated surfaces, after (the surface has been prepared, a coat of white wash shall be applied for the patches and repairs. Then one coat or more of colour wash shall be applied over the entire surface, such that the colour washed surface shall present a uniform colour shade. No primary coat is needed for a decorated surface bearing colour of same shade on surface required change of colour after the surface has been prepared as described above. Two coats of white wash shall be applied before application of specified number (minimum two) of coats of colour wash of the new shade.

## **2.3. Protective measure :**

The surface of doors, windows, floors, articles, of furniture etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

## **3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 18 11 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**18.18. Colour washing with lime on decorated wall surfaces (one coat) to give even shade including thoroughly brooming the surface to remove all dirt, dust, mortar drops and loose scales of lime wash and other foreign matter.**

## **1.0. Materials and Workmanship**

The relevant specifications item No 18.17 shall be followed except that the colour washing shall be carried out on decorated wall surface in one coat

## **2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No 18.7 shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.19. Extra over item No 13.17 and 18.18 for every subsequent coat of colour wash with lime on wall surfaces.**

## **1.0 Materials and Workmanship**

**1.1** The relevant specifications item No. 18.17 shall be followed except that this work is for extra coat of colour wash over and above two coats on wall surface.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item No. 18.17 shall be followed except that the extra payment for every subsequent coat of white wash shall be made over and above the rate of item. 18.17 and 18.18.

**2.2.** The rate shall be for a unit of one sq. meter.

**18.20. Extra over item 18.17 for colour washing on ceilings and /or sloping roofs.****1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 18.17 shall be followed except that this work is for colour washing on ceiling and/or sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.17 shall be followed except that the rate shall be paid extra over and above the rate of item No. 18.17 for providing colour washing on ceiling and /or sloping roof.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.29. Cement washing with port land cement slurry on undecorated wall surfaces, (one coat) to give a smooth finish including thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter.****1.0. Materials**

**1.1.** Water shall conform to M-1. Part land cement shall conform to M-3.

**2.0. Workmanship**

**2.1.** The relevant specification of item No. 18.11 for preparation of surface, scaffolding, application of wash etc. shall be followed except that the cement wash shall be applied, instead of white wash. Cement applied with brushes to form a smooth bodied opaque surface.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 18.11 shall be followed.

**3.2.** The rate shall be for a unit of one sq. meter.

**18.30. Extra over item No. 18.29 for every subsequent coat of cement washing with port land cement slurry.****1.0. Materials Workmanship**

**1.1.** The relevant specifications of item No. 18.29 shall be followed except that the work of cement slurry wash shall be provided for every subsequent coat above item No. 18.29 to be applied.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specification of item No. 18.29 shall be followed except that the extra rate shall be paid for every subsequent coat and above the rate of item No. 18.29.

**2.2.** The rate shall for a unit of One sq. meter.

**18.33. Removing dry or oil bound distemper by washing scraping and sand papering the wall surface smooth including necessary repairs to scratches complete.****1.0. Materials and Workmanship**

**1.1.** All loose places and scaled shall be removed by sand papering and surface shall be cleared of all greasycay, dust, dirt, etc. on decorated wall surfaces. Where heavy scaling has taken place, the entire surface shall be scrapped by means of steel scrappers so as to remove all accumulated distemper, leaving clean surfaces. Necessary repairs to the scratches shall be made as directed.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.11. shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter,

**18.34. Extra over item No. 18.33. for removing dry oil bound distemper on ceiling and sloping and roofs.****1.0. Workmanship**

**1.1.** The relevant specifications of item No. 18.33 shall be followed except that removing dry/oil bound distemper from sloping roof/ceiling is to be carried out.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.33 shall be followed except that the payment shall be made for removing dry/oil bound distemper from ceiling/sloping roof over and above the rate of item No. 18.33.

**2.2.** The rate shall be for unit of one Sq. meter.

**18.38. Distempering with dry (water bound) Distemper of approved brand and manufacture (two coats) and of required shade on undecorated wall surfaces to give an even shade, over and including a priming coat of white washing after thoroughly brooming the surface free from mortar droppings and other foreign matters.**

**1.0. Materials**

**1.1.** The dry distemper and primer shall be of approved brand and manufacture. The dry distemper shall be of required colour and shade and the same shall conform to I.S. 427-1965. Writing shall conform to I.S. 63-1964.

**2.0. Workmanship**

**2.1.** Scaffolding : Where scaffolding is required it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (Joolas) may be used for distempering. Where ladders are used- pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. \For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

**2.2. Preparation of Surface.**

**2.2.1.** The undecorated surface to be distempered shall be thoroughly brushed free from dust, dirt, grease, mortar, droppings and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry at least 2 months before application of distemper.

**2.2.2.** All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster of Paris mixed with dry distemper of the colour to be used. The surface shall then be rubbed down again with a fine grades and paper and made smooth. The surface affected by moulds, moss, fang, algae lichens, efflorescence etc. shall be treated in accordance with I.S. 2395 (Part-I) 1966 before applying distemper. Any unevenness shall be made good by applying putty made of plaster of Paris mixed with water on entire surface including filling up the undulations and then sand papering the same after it is dry.

**2.3. Priming coat :**

**2.3.1.** A priming coat of whitening shall be applied as per item No. 18.11 over the prepared surface in case of new work on undecorated surface. No coat of white washing with lime shall be used as a priming coat for distemper.

**2.3.2.** Application of plaster shall be done as under:

The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical stokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

**2.3.3.** Distemper is not recommended to be applied within six months of the completion of wall plaster.

**2.4. Proportion of Distemper :** The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturers only. Sufficient quantity of distemper required for one day's work shall be prepared.

**2.5. Application of Distemper coat :**

**2.5.1.** For undecorated surfaces after the primer coat is dried for at least 48 hours, the surfaces shall be lightly sand papered to make them smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the proceeding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

**2.5.2.** Sufficient quantity of distemper shall be mixed to finish on room at a time. The application of a coat in each room snail be finished in one operation and no work shall be started in any room which cannot be completed, on the same day.

**2.5.3.** 15 cm. double bristle distemper brush shall be used. After the day's work, brushes shall be thoroughly washed in hot water with soap solution and hang down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

**2.6.** Protective Measures : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be a plashed form being splashed upon. Such surfaces shall be cleaned of distemper a plashes if any.

**3.0. Mode of measurements and payment**

**3.1.** Pruning coal of distemper primer, scraping of surface spoiled by smoke soot, removal of oil and grease spots, treatment for infraction of effloresces, mould moss, fungi, algae and lichens and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

**3.2.** All the work shall be measured net in the decimal system as in places subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be measured in sq. meter. No deductions shall be made for ends of joints, beams, posts, etc. of these openings nor for finish around the ends of joints, beams, posts etc.

**3.3.** Deductions of openings exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and no addition shall be made for reveal, jambs, soffits etc. of these openings:

(a) When both the faces of walls are provided with the same finish deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that of frame for door, windows etc. on which width of reveal is less than that of the other side but no deductions shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that of untreated side neither deductions nor additions to be made for reveals, jambs, sills and soffits shall be measured

**3.4.** In case of openings of area exceeding 3 sq.m. each, deduction shall be made for openings, but jambs, sills and soffits shall be measured.

**3.5.** No deductions shall be made for attachments such as casing, conduits, pipes, electric wiring and the like.

**3.6.** Item includes removing nails, making good holes, cracks, patches with materials similar in composition to the distemper.

**3.7.** The rate includes cost of all materials, labour, scaffolding, protective measures etc. involved in all the operations described above This shall also include conveyance, delivery, bundling, unloading storing etc.

**3.8.** The rate shall be for a unit of One sq. meter.

**18.39.** **Distemping with dry (wafer bound) distemper of approved brand and manufacture (one coat) and of required shade, on decorative wall surface to give an even shade after thoroughly brushing the surface clean of all grease dirt, loose pieces of scales including preparing the surfaces and even sand papered smooth.**

**1.0. Materials and workmanship**

The relevant specifications of Kern No. 18,38 shall be followed except that the dry distemper shall applied on decorative wall surface in on coat.

**2.0. Mode of measurements and payment**

**2.2.** The rate shall be for a unit of One sq. meter.

**18.40.** **Extra over item 38 and 39 for every subsequent coat of distemper with dry distemper of approved brand and manufacture.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.38 shall be followed except that the extra work for applying subsequent coat of dry distemper is to be carried out over and above the work of item No. 18.38 and 18.39.



**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.38 shall be followed except that extra rate shall be paid for every subsequent coat applied over and above the rate of item No. 18.38 and 18.39.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.41. Extra over item 38 for distempering with dry distemper on ceiling and sloping roofs.****1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 18.38 shall be followed except that the dry distempering shall be carried out on ceiling and sloping roofs of undercoats surface.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 18.38 shall be followed except that extra rate shall be paid for carrying outwork on ceiling/sloping roof on undecorated surface over and above the rate of item 18.38.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.42. Extra over item 39 and 40 for distempering with dry distemper on ceiling/sloping roofs.****1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.39 shall be followed except that the work shall be carried out on ceiling/sloping roofs on decorated surfaces.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.39 shall be followed except that the extra rate shall be paid for the distempering work carried out by dry distempered on ceiling/sloping roofs with decorated surfaces over and above the rate of item N. 18.39.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.44. Distempering (two coats) with oil bound distemper of approved brand and manufacture and of required shade on undecorated wall surfaces to give an even shade, over and including a priming coat with distemper primer of approved brand and manufacture after thoroughly brushing the surface free from mortar droppings and other foreign matter and also including preparing the surface even and sand papered smooth.****1.0. Materials**

**1.1.** Oil bound washable distemper and primer shall be of approved brand and manufacture. The distemper shall be of required colour and shade and the same shall conform to I.S. : 428-1969.

**2.0. Workmanship****2.1. Scaffolding**

Where scaffolding is required, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured and well tied suspended platform (Joola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

**2.2. Preparation of surface :**

**2.2.1.** The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.

**2.2.2.** All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

**2.3. Priming coat :**

**2.3.1.** A priming coat of distemper primer of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. If the distemper priming is done after the wall surface dries completely, the distemper primer shall be applied.

**2.3.2.** Application of primer shall be done as under: The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

**2.3.3.** Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

**2.4. Preparation of oil bound distemper :**

**2.4.1.** The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

**2.5. Application of Distemper coat:**

**2.5.1.** For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

**2.5.2.** Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed on the same day.

**2.5.3.** 15 cm. double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

**2.6.** Protective measurements : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.

**3.0. Mode of measurements and payment**

**3.1.** Priming coat of distemper primer, scraping of surface spoiled by struck roots, removal of oil and grease spots, treatment for infestation of effloresces., mould moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

**3.2.** All the work shall be measured net in the decimal system as in place subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be made for ends of joints, beams, posts etc., and openings, not exceeding 0.5 sq.mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

**3.3.** Deductions of opening exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings :

(a) When both the faces of wall are provided with same finish, deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveals is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

**3.4.** In case of opening of area exceeding 3 sq. m. each deduction shall be made for openings but jambs, sills and soffits shall be measured.

- 3.5. No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.
- 3.6. Item includes removing nails, making good holes, patches with materials similar in composition of distemper.
- 3.7. The rate includes cost of all materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handling, unloading, storing work etc
- 2.8. The rate shall be for a unit of one sq. meter
- 18.45. Distemping (two coats) with oil bound washable distemper of approved brand and manufacture and of shade required on undecorated wall surfaces to give an even shade, over and including a priming coat with alkali resistance primer of approved brand and manufacture after thoroughly brushing the surface free from mortar droppings and other foreign matter and also including preparing the surface even and sand papered smooth.**
- 1.0. Materials and Workmanship**
- 1.1. The relevant specifications of item No. 13.44 shall be followed except that the primer of alkali resistance primer of approved brand and manufacture shall be used instead of distemper primer.
- 2.0. Mode of measurements and payment**
- 2.1. The mode of measurements and payment shall be the same as for item No. 18.44 above.
- 2.2. The rate shall be for a unit of One sq. meter.
- 18.46. Distemping (one coat) with oil bound washable distemper of approved brand of required shade on decorated wall surfaces to give an even shade after thoroughly brushing the surfaces clean of all grease, dirt, loose pieces of scales and also including distemping with oil bound washable distemper of preparing the surface even and smooth.**
- 1.0. Materials and Workmanship**
- The relevant specifications of item No. 18.44 shall be followed except that the distemping with oil bound washable distemper shall be carried out on decorated wall surfaces in one coat.
- 2.0. Mode of measurement and payment**
- 2.1. The relevant specification of item No. 18.44 shall be followed.
- 2.2. The rate shall be for a unit of one sq meter.
- 18.47. Extra over item 18.44 to 18.46 for every subsequent coat of distemping with oil bound washable distemper of approved brand and manufacture.**
- 1.0. Materials and Workmanship**
- 1.1. The relevant specifications of item No. 18.44 shall be followed except that this work is for providing extra coat of oil bound distemping over and above two coats of distemping.
- 2.0. Mode of measurements and payment**
- 2.1. The relevant specification of item No. IS K shall be followed except that the extra rate shall be paid over and above the rate for every subsequent coats over two coats of item 18.44 and 18.46.
- 2.2. The rate shall be for a unit of one sq. meter.
- 18.48. Extra over item 18.44. and 18.45 for distemping with oil bound washable distemper on ceiling and sloping roofs.**
- 1.0. Materials and Workmanship**
- The relevant specifications of item No. 18.44 shall be followed except that the distemping shall be carried out on ceiling/sloping roofs.
- 2.0. Mode of measurements and payment**
- 2.1.1. The relevant specifications of item No. 18.44 shall be followed except that the extra rate shall be paid for carrying out distemping work on ceiling/sloping roofs over and above the rate of item No. 18.44 and 18.45.
- 2.2. The rate shall be for a unit of one sq. meter.
- 18.49. Extra over item 18.46 and 18.47 for every subsequent coat of distemping on ceiling and sloping roofs.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.44 shall be followed except that the distempering work shall be carried out for subsequent coats over item No. 18.46 and 18.47.

**2.0. Mode of measurements and payments**

**2.1.** The relevant specifications of item No. 18.46 shall be followed except that the extra rate shall be paid for every subsequent coat of distemper applied over and above the rate of item No. 18.46 and 18.47.

**18.51. Finishing wall with water proofing cement paint of an undecorated wall surfaces (two coats) to give an approved brand and manufacture and of required shape, even shade after thoroughly brushing the surface to remove.**

**1.0. Materials**

**1.1.** The water shall conform to M-1. Cement water proofing paint shall conform to I.S. 5410-1969.

**2.0. Workmanship**

**2.1. Scaffolding :** The relevant, specifications of item No. 18.11 shall be followed.

**2.2. Preparation of surface :**

The relevant specifications of item No. 18.11 shall be followed except that the word white wash colour wash shall be substituted with water proofing cement paint. The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.

**2.3. Preparation of paint:** Portland cement paint shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brush able consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, The manufacture's instructions shall Site followed. The paint shall be mixed in such quantities as can used up within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use.

**2.4. Application of Paint:**

**2.4.1.** No painting shall be done when the paint is-likely to be exposed to a temperature of below 7° c within 48 hours after application.

**2.4.2.** When weather conditions are such as to cause be carried out in the shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

**2.4.3.** To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.

**2.4.4.** For undecorated surfaces, the surface shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started until the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the proceeding coat shall be slightly moistened before applying the subsequent coat.

**2.4.5.** The finished surface shall be even and uniform in shade, without patches, brush marks, paint drops etc.

**2.4.6.** The cement paint shall be applied with a brush with relatively short stiff hog or fiber bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lamps shall be brushed out.

**2.4.7.** Water proof cement paint shall not be applied on surface already treated with white wash, colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.

**2.5. Curing :** Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the point has hardened so as not be damaged by the sprinkling of water say about 12 hours after the application.

**2.6.** Protection measures shall be taken as per item No. 18.11 Para 2.6.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 18.11. shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**18.53. Extra over item 18.51 for every subsequent coat of water proofing cement paint of approved brand and manufacture.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.51 shall be followed except that the work is for applying subsequent coat of cement water proofing paint.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.51 shall be followed except that the extra rate shall be paid for applying every subsequent coat of cement water proofing paint over and above the rate of item No. 18.51.

**2.2.** The rate shall be for a unit of One Sq. meter.

**18.54. Extra over item 18.51 for finishing with cement paint on ceiling/sloping roofs.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.51 shall be followed except that the cement water proofing paint shall applied on ceiling and sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.51 shall be followed except the extra shall be paid for applying cement water proofing paint on ceiling and sloping roofs, over and above the rate of item No. 18.51.

**2.2.** The rate shall be for a unit of One sq. Meter.

**18.56. Extra over 18.53 for every subsequent coat of finishing with cement paint on ceiling and sloping roofs.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specification of item No. 18.51 shall be followed except that the work shall be carried out for subsequent coat on ceiling and sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.53. shall be followed except that extra rate shall be paid for every subsequent coat applied with cement water proofing paint over and above the rate of item No. 18.53.

**18.57. Wall painting (two coats) with plastic emulsion paint of approved brand of manufacture on undecorated wall surfaces to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand paper smooth.**

**1.0. Materials**

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-I).

**2.0. Workmanship**

**2.1. Scaffolding :** The relevant specifications of item-No. 18.11 Para 2.1 shall be followed.

**2.2. Preparation of surface :** The relevant specification of item No. 18.44 Para 2.2 shall be followed.

**2.3. Preparation of Mix :**

This shall be done as per manufacture's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

**2.4. Application :**

**2.4.1.** Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

**2.4.2.** The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and consist of covering the area over with paint, brushing the surface hard for the first time over and then, brushing alternately in opposite direction two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush Marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.

**2.4.3.** The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum two coats of cement water proofing paint. The second or subsequent coat shall not

be started until the proceeding coat as become sufficiently hard to resist marking by brushing being used.

**2.4.4.** The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

**2.5. Precautions :**

(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.

(b) In the preparation of wall for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.

(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application

**2.6. Protective payment :** The relevant specifications of item No. 18.11 shall be followed.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 18.11 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**18.59. Extra over item No. 18.57 for every subsequent coat of wall painting with plastic emulsion paint of approved brand.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.57 shall be followed except that the painting work shall be for subsequent coat of plastic emulsion paint.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra payment shall be done on ceiling and sloping roofs.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.60. Extra over item 18.57 for painting with plastic emulsion paint of approved brand on ceiling and sloping roofs.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.57 shall be followed except that the painting shall be done on ceiling and sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra payment shall be made for applying plastic emulsion paint on ceiling and sloping roofs over and the rate of item No. 18.57.

**2.2.** The rate shall be for a unit of One sq. meter.

**18.62. Extra over item 18.59 for paint ceiling and sloping roofs.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 18.57 shall be followed except that the work for subsequent coat of plastic emulsion paint shall be carried out on ceiling and sloping roofs.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra rate shall be paid for carrying out painting on sloping roofs and ceiling with plastic emulsion paint over and above the rate of item No. 18.59

**2.2.** The rate shall be a unit of One sq. meter.

**SECTION-19**  
**Paintings & Polishing**

- 19.7.           Painting two coats (excluding priming coat) on new steel and other metal surfaces with enamel paint, brushing, interior to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.**

**1.0.       Materials**

The enamel paint shall conform to M-44 B.

**2.0.       Workmanship**

**2.1.**       General : The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums; kegs. etc. with seal unbroken.

**2.1.2.**   All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become state or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use the containers shall be kept properly closed.

**2.1.3.**   If for any reasons, things is necessary, the brand of thinner recommended by the manufacturer shall be used.

**2.1.4.**   The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed part of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

**2.2.       Application of paint:**

**2.2.1.**   Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the -laying off is finished. The full process of crossing and laying off will constitute one coat.

**2.2.2.**   Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand-paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat is started.

**2.2.3.**   Each coat the last shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.

**2.2.4.**   Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall be used.

**3.0.       Mode of measurements and payment**

**3.1.**       The relevant specifications of item No. 19.12 shall be followed for mode of measurements and payment. The rate is excluding priming coat.

**3.4.**       The rate shall be for a unit of One sq. meter.

**19.15.           Extra over item No. 19.7 and 19.11 for every subsequent coat of paint.**

**1.0.       Materials and Workmanship**

**1.1.**       The relevant specifications of item No. 19.7 shall be followed except that the work of painting shall be carried out for subsequent coat.

**2.0.       Mode of measurements and payment**

**2.1.**       The relevant specifications of item No. 19.7 shall be followed except that the extra rate shall be paid for every subsequent coat of paints applied over and above the rate of item No. 19.7 and 19.11.

**2.2.**       The rate shall be for a unit of One sq. meter.

**19.11. Painting one coats Excluding priming coat) on previously painted steel and other metal surface with enamel paint, brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.**

**1.0. Materials and Workmanship'**

**1.1.** The relevant specification of item No 19.7 shall be followed except that painting shall be carried out in one coat with enamel paint on previously painted steel and metal surface.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No, 19.7 shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**19.12. Applying priming coat over new steel and other metal surfaces after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter and secured with brushes, fine steel, wool scrapers and sand paper, with ready mixed priming paint, brushing red lead.**

**1.0. Materials**

**1.1.** The ready mixed primer, brushing red shall conform to I.S. 102-1962.

**1.2.** The thinner (linseed oil) shall conform to I.S. 75-1973. If for any reason, thinning is necessary in case of ready mix paint the brand of thinner recommended by manufacture shall be used.

**2.0. Workmanship**

**2.1. Preparation of surfaces :** The surfaces painting shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also remove grease and perspiration of hand marks. The surface shall then be allowed to dry.

**2.2. Application of primer :**

**2.2.1.** After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

**2.2.2.** During painting, every time, after the priming coat has been worked out of the brush bristles or after the brush has been unloaded, the bristles of the brush shall be opened up by striking the brush against portion of the unpainted surface with the end of the bristles, held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again in to a paint container. The prima/y coat shall be allowed to dry completely before painting is started.

**2.2.3.** No hair marks from the brush or clogging at paint puddles in the corner of panels angles of molding etc. shall be left on the work

**2.2.4.** Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

**2.2.5.** The container when not in use shall be kept close and free from air so that paint does not thicken and also shall be kept guarded from dust.

**3.0. Mode of measurements & payment**

**3.1.** The new steel and other metal surface shall be measured under this item.

**3.2.** All the work shall be measured net in the decimal system, as executed subject to the following limits unless otherwise stated hereinafter.

(a) Dimensions shall be measured to the nearest 0.01 meter.

(b) Areas shall be worked out to the nearest 0.01 sq. meter.

**3.3.** No deductions shall be made for openings not exceeding 0.5 sq. mt. each and no addition shall be made for painting to beddings, moldings, edges, jambs, soffits, sills etc. of such opening.

**3.4.** In case of fabricated structural steel and iron work, priming coat of paint shall be included with



frabation. In case of trusses if measured in sq. m. compound girders, stanchions, lattices, grader and similar work, actual area shall be measured in sq. m. and no extra shall be paid for painting on bolts heads, nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

**3.5.** The different surfaces shall be grouped into one general item, areas of uneven surfaces being converted into equivalent plain areas in accordance with the table given as per Annexure-II for payment.

**3.6.** The rate shall be for a unit of One sq. meter.

**19.19. Painting two coats (excluding priming coat) on new steel and other metal surfaces with synthetic enamel paints, brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.**

**1.0. Materials**

Synthetic enamel paint shall conform to I.S. 1932-1964.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 19.7 shall be followed except that the painting shall be carried out with synthetic enamel paint.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 19.7 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**19.21. Painting one coat (excluding priming coat) on previously painted steel and other metal surfaces with synthetic enamel paint brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.**

**1.0. Materials and Workmanship**

**2.1.** The relevant specifications of item No. 19.19 shall be followed except that the painting shall be carried out on previously painted steel and other metal surfaces using synthetic enamel paint in one coat.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 19.19 shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.13. Extra over item No. 19.19 and 19.21 for every subsequent coat of paint.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 19.19 shall be followed except that the extra rate shall be paid for out for subsequent coat of paint.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 19.19 shall be followed except that the work shall be paid for applying subsequent coat of oil paint over and above the item No. 19.19 and 19.21.

**19.50.(B) Painting two coat (excluding priming coat) on external of new rain water, soil, waste and vent pipe and fittings with ready mixed bituminous paint, brushing, black anticorrosive to give an even shade including cleaning of all dirt, dust and other foreign matter (75 mm. dia.)**

**1.0. Materials**

**1.1.** Ready mixed bituminous paint shall conform to I.S. 158 : 1968.

**2.0. Workmanship**

**2.1.** The relevant specifications of item No. 19.7 shall be followed except that the painting work of external surfaces of 75 mm. dia rain water pipe, soil, waste, and vent pipe and fittings with ready mixed bituminous paint shall be earned out.

**3.0. Mode of measurements and payment**

**3.1.** The rate is excluding the cost of priming coat but including painting of all fittings coming in line.

**3.2.** The rate shall be for a unit of one running meter,

**19.50.(C) Painting two coats (excluding priming coat) on external of rain water, soil, waste and vent pipe and fittings with ready mixed bituminous paint brushing black anticorrosive to give an even shade including cleaning off all dirt, dust and other foreign matter : 100 mm. dia.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 19.50 (B) shall be followed except that the pipes to be painted on is 100 mm. dia. meter.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 19.50(B) shall be followed. The rate is excluding the cost of priming coat but including cost of painting all fittings coming in line.

2.2. The rate shall be for a unit of one running meter.

**19.59.(B) Applying priming coat over wood and wood based surfaces after and including preparing the surface by thoroughly oil, grease, dirt and other foreign matter, sand papering and knotting : Ready mixed paint, brushing wood primer pink.**

**1.0. Materials**

1.1. The ready mixed paint, brushing, wood primer pink shall conform to I.S. 3536-1966

**2.0. Workmanship****2.1. Preparation of Surfaces :**

2.2.1. AH wood work shall be dry and free from any foreign matter incidental to building operations. Nails shall be punched well below the surface to provide a film key for stopping. Moldings shall be carefully smoothened with abrasive paper and projecting fibers shall be removed. Flat portions shall be smoothened off with abrasive paper used across the grain prior to painting and with the grain prior to staining or if the wood is to be left in its natural colour, wood work which is to be stained may be smoothened by scraping instead of by glass papering if so required.

2.2.2. Any knots, resinous, streaks or bluefish sap wood that are not large enough to justify cutting out shall be treated with two coats of pure shellac knotting applied thinly and extended about 25 mm. beyond the actual area requiring treatment.

**2.2. Application of primer :**

2.2.1. The relevant specifications of item No. 19.12(A) shall be followed for application of primer.

**3.0. Mode of measurements & payment**

3.1. The relevant specifications of item No. 19.12 shall be followed except that work done on wood and wood based surfaces shall be paid under this item.

3.2. The rate shall be for a unit of One sq. meter.

**19.59.(D) Applying priming coat over new wood and wood based surface after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other forging matter sand papering and knotting : Ready mixed paint brushing priming, for enamel.**

**1.0. Materials**

1.1. The ready mixed paint for brushing priming for enamels wood shall conform to I.S. 106-1962.

**2.0. Workmanship**

2.1. The relevant specifications of item No. 19.59 (B) shall be followed except that ready mixed paint brushing priming for enamel shall be used instead of ready mixed paint brushing wood primer pink.

**3.0. Mode of measurements and payment**

3.1. The relevant specifications of item No. 19.12 shall be followed.

3.2. The rate shall be for a unit of One sq. meter.

**19.62.(B) Extra over item 59.59 (B) for every subsequent coat of priming coat. Ready mix paint, brushing wood primer work.**

**1.0. Materials and workmanship**

1.1. The relevant specifications of item No. 19.59 (B) shall be followed except that the painting work shall be carried out with ready mix paint instead of wood primer pink for subsequent coat.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 19.59 (B) shall be followed except that the extra rate shall be paid for every subsequent coat applied with Ready mix paint, brushing wood primer pink over and above the rate of item No. 19.59 (B).

**19.62.(D) Extra over item No. 19.59 for every subsequent coat of priming coat ready mix paint brushing priming for enamel.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 19.59(D) shall be followed except that the painting work shall be carried out with ready mix paint brushing priming for enamel.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 19.59(D) shall be followed except that the extra rate shall be paid for every subsequent coats of priming coat with ready mixed paint, brushing priming for enamel.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.71. Painting two coats (excluding priming coat) on new wood and wood based surfaces with enamel paint interior to give an even shade including the surface off all dist, dust and other foreign matter and papering and stopping.**

**1.0. Materials**

**1.1.** The enamel paint shall conform to I.S. 133-1975.

**2.0. Workmanship**

**2.1.** The relevant specifications of 19.7 shall be followed for general and application of paint, except that the enamel paint shall be used for painting on new wood/wood based surfaces.

**2.2.** In painting doors and windows, the putty, round the glass panes also be painted but care shall be taken to see that no paint, stain etc. are left on the glass. Top of shutters and surfaces in similar hidden locations shall not be left out in painting.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No. 19.12 shall be followed, for mode of measurements and payments. The rate excludes cost of priming coat.

**3.2.** The rate shall be for a unit One sq. meter.

**19.73. Painting one coat (excluding priming coat) on previously painted wood and wood based surfaces with enamel paint to give even shade including cleaning of all dirt, dust and other foreign matter.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No. 19.71 shall be followed except that the painting work shall be carried out on previously painted wood and wood based surfaces with enamel paint to give even shade in one coat.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 19.7t shall be followed

**2.2.** The rate shall be for a unit of One sq meter.

**19.75. Extra over item 19.71 arid 19.73 for every subsequent coat of paint.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item 19.71 shall be followed except that painting work shall be for subsequent coat with paint.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 13.71 shall be followed except that the extra rate shall be paid.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.77. Painting two coats (excluding priming coat) on new wood and wood based surfaces with ready mixed paint brushing, oil gloss, semi-gloss, to give an even shade including cleaning of all dust, dirt and other foreign matter sand papering and stopping.**

**1.0. Materials**

The ready mixed paint shall conform to M-44. The ready mixed paint brushing gloss, semi-gloss shall conform to KS. 129-1962 and I.S. 117-1364.

**2.0. Workmanship**

**2.1.** The relevant specification of item 19.71 shall be followed for general and application of paint, except that ready mixed paint brushing, oil gloss and semi-gloss shall be used of approved colour and shade instead of enamel paint.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item 19.12 shall be followed for measurements and payment. The rate excludes cost of priming coat.

**3.2.** The rate shall be for a unit of One sq. meter.

**19.84. Varnishing two coats (excluding priming coat) on new wood and wood based surfaces undercoating with flattening varnish and finishing coat with varnish to give an even surface cleared of all dirt, dust and sand papering so as to produce a smooth dry surface.**

**1.0. Materials**

The varnish shall conform to I.S. 338-1962.

**2.0. Mode of measurements & payment**

**2.1.1.** The surface to be varnished shall be prepared to produce a smooth, dry neat surface. The previous coat of paint, if any shall be allowed to dry and rubbed down slightly whipped off and allowed to dry.

**2.1.2.** The operation of varnishing calls for careful attention to cleanliness. All dust and dirt shall be removed from the surface to be varnished and also from the neighborhood. If surfaces are dampened to avoid raising of dust, they shall be allowed to dry thoroughly before varnishing is commenced. Damp Exposure to extreme of heat or cold, or to a damp atmosphere will spoil the work.

**2.1.3.** In handling and applying varnish care should be taken to avoid forming forth or air bubbles. Brushes and containers shall be kept scrupulously clean.

**2.2. Application**

**2.2.1.** The varnish shall be applied liberally with a brush and spread evenly over a portion of the surface with a short light strokes to avoid froth in. It shall be allowed to flow out while the next section is being laid in. Excess varnish then be scrapped out of the brush and the first section be crossed, re crossed and the laid off lightly. Too much or too little varnish left on the surface will mar the appearance of the finish. The varnish, once it has begun to set, shall not be retouched. If a mistake is made, the varnish shall be removed and the work started afresh.

**2.2.2.** In case of two coats of varnish work, the first shall be hard drying, under coating or flattening varnish, this shall be allowed to dry hard and then be flattened down before applying the finishing coat. If two coats are applied, sufficient time shall be allowed between two coats.

**2.2.3.** When flat varnish is used for finishing a preparatory coat of hard drying under coating or flattening varnish shall be first applied and shall be allowed to harden thoroughly, It shall then be lightly rubbed down before the flat varnish is applied. Section of the work such as panels, shall be cut in clearly, so as to avoid any overlapping during applications, as this is likely to impart some measure, of gloss to partially dried area, worked up in lapping. On larger area the flat varnish shall be applied rapidly and the edges of each patch applied shall not be allowed to set but shall be followed up whilst in free working conditions-

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item 19.71 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**13.86. Extra over item No. 19.84 for every subsequent coat of varnish.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specifications of item No.19.84 shall be followed except that the work shall be for subsequent coat of varnishing.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item 19.84 shall be followed except that the extra rate shall be paid for every subsequent coat of varnishing done over and above the rate of item No. 19.84.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.87. Polishing with polish on new wood and wood based surface to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth and including a coat of wood filler**

**1.0. Materials**

**1.1.** The French polish required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials : (i) Chandra (ii) Shellac (ic) Pigment. The French polish so prepared shall conform to I.S. 348-1968.

**2.0. Workmanship****2.1. Preparation of surface :**

**2.1.1.** All unevenness shall be rubbed down to smoothness with sand paper and the surface shall be well dusted. The proper in the wood shall be filled up with a filler made of a paste of whiting in water or methylated spirit (with a suitable pigment like burnt sienna or umber if required) : otherwise the French polish will get absorbed and a good gloss will be difficult to obtain.

**2.2. Application**

**2.2.1.** A pad of wooden cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with polish and rubbed hard on the surface in a series of overlapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil on the face of the pad may be added which shall facilitate this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cloth, slightly dampened with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall present a uniform texture and high gloss.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specification of item 19.12 shall be followed for mode of measurements and payment.

**3.2.** The rate includes cost of wood filler etc. complete.

**3.3.** The rate shall be for a unit of One sq. meter.

**19.88. Polishing with French polish on previously polished wood and wood based surface to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth including a coat of wood filler.**

**1.0. Materials & Workmanship**

**1.1.** The relevant specifications of item No. 19.87 shall be followed that the French polish shall be applied on previously polished wood and wood based surface.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 19.87 shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.91. Applying wax polish on new Wood work and wood based surfaces with bees wax polish in proportion 2 : 1.5 : 1 : 0.5 (2 Bees Wax : 1.5 linseed oil: 1 Turpentine oil : 0.5 Varnish by weight) by give an surface including cleaning the surface of all dist, dust and sand papered smooth.**

**1.0. Materials**

Bee's Wax shall conform to I.S. : 1504-1968. Linseed oil shall conform to I.S. : 75-1967. Turpentine shall conform to I.S. 83-1950. Varnish shall conform in I.S. 337-1952.

**2.0. Workmanship****2.1. Preparation of bees wax :**

**2.1.1.** In case of, bees wax it shall be prepared locally with following specification.

**2.1.2.** Pure bees wax free from paraffin on strain adulterants shall be used. The polish shall be prepared from mixture of bees wax, linseed oil, turpentine, and varnish in proportion 2:1.5:1:0.5 by weight. The bees wax and boiled linseed oil shall be heated of a slow fire, when the wax is completely dissolved the mixture shall be cooled till it is just warm and turpentine and varnish added to it in the required proportions and entire mixture shall be well stirred.

**2.2. Preparation of surfaces .**

**2.2.1.** The surface to be waxed shall be prepared to produce a smooth, dry, matt surface. Previous coat of paint or stain if any shall be allowed to dry and be rubbed down lightly wiped off and allowed to dry all dust and dirt shall be removed from the surface to waxed and also from the neighborhood. Damp atmosphere and draughts shall be avoided, for waxing, normal dry day shall be chosen.

**2.3. Application :**

**2.3.1.** The polish shall be applied evenly with clean soft pad of cotton cloth in such a way that the surface is completely and fully covered. The surface shall then be rubbed continuously for half an hour After well rubbing in one coat of wax polish, the work shall be covered with dust proof sheet. (Cloth for preventing dust falling on the work). Subsequent coat shall be applied after the surface is quite dry and shall be rubbed off with soft flannel until the surface has assumed a uniform gloss and in dry showing no sign of Stickiness.

**2.3.2.** The final polish depends on the amount of rubbing which shall be continuous and with uniform pressure with frequent changes in the direction.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 19.12 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**19.92.** **Applying wax polish on previous wax polished wood and wood based surfaces with bees wax polish in proportion of 2:1.5;1:0.5 (2 Bees wax 1.5 linseed oil : 1 Turpentine : 0.5 Varnish by weight) to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth.**

**1.0. Materials and workmanship**

**1.1.** The relevant specifications of item No. 19.91 shall be followed except that the wax polishing shall be carried out on previously wax polished wood and wood based surfaces with bees wax polish.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 19.91 shall be followed.

**2.2.** The rate shall be for a unit of One sq. meter.

**19.98.** **Coat tarring two coats on new wood and wood based surfaces using 0.15 and 0.12 liters of coal tar per sq. m. in the first and second coat respectively to give an even shade including cleaning of all dirt, dust and other foreign matter ;**

**1.0. Material :** The coal tar shall conform to I.S. 290-1961.

**2.0. Workmanship**

**2.1.** 200 cms. of unslaked lime shall be added to every liter of coal tar and heated till it begins to boil. It shall then be taken off the fire and kerosene oil added to it slowly the rate of 1 part kerosene oil and 6 parts or more parts of coal tar by volume and stirred thoroughly. The addition of lime is for preventing the tar from running.

**2.2. Preparation of Surface :**

**2.2.1.** The surface to be painted shall be allowed to dry sufficiently. Any existing fungus or mould growth shall be completely removed. All major cracks or defects in the plaster shall be cut out and made good. Before primer is applied holes and undulations shall be filled up with plaster of paris and rubbed smooth.

**2.3. Application of paint:**

**2.3.1.** The coal tar shall be applied as per relevant specifications of applying mixed paint item No. 19.7 except coal tarring is used instead of enamel paint.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 19.12 shall be followed.

**3.2.** The rate shall be for a unit of One sq. meter.

**19.119.(I)** **Writing letter of figures on any surface with black Japan paint (stops, commas, hyphens and the like not to be measured and paid for separately) : block (Letters/figures).**

**1.0. Materials**

**1.1.** Ready mixed the black Japan paint shall conform to I.S. 341-1952.

**2.0. Workmanship**

**2.1.** The letters and figures shall be to the heights and widths as per approved drawings or as directed. These shall be stenciled or drawn in pencil and got approved before painting. They shall be of uniform size and finished neatly. The edges shall be straight or in pleasant smooth curves,

**3.0. Mode of measurements and payment**

**3.1.** Letters, figures and similar items etc. stops, commas, hyphens and the like shall be deemed to be included in the item. 9

**3.2.** The rate per cm. height of letter shall hold good irrespective of width of the letters of figures or the thickness of the lettering.

**3.3.** The rate shall be for a unit of per letter cm. height.

**19.119(II)** **Writing letter of figure? on any surface with black Japan paint (stops, commas, hyphens and the like not to be measured and paid for separately ; Indian (Letters/figures).**

**1.0. Materials and Workmanship**

The relevant specifications of item No. 19.119 (I) shall be followed except the writing of letter shall be Indian letters/figures.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 19.119 (I) shall be followed.

2.2. The rate shall be for a unit of per letter per cm. height.

**19.126(1) Painting lines, dashes, arrows, letters etc. on roads, airfields and like in two coats with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter : Over 10 cms. in width.**

**1.0. Materials**

1.1. The road marking paint shall conform to. I.S. 164-1951.

**2.0. Workmanship**

2.1. The relevant specifications item No. 19.119(1) shall be followed except that the painting lines, dashes, arrows and letters on roads, air fields and like shall be carried out with road marking paint in two coats : over 10 cms. in width.

**3.0. Mode of measurements and payment**

3.1. The relevant specifications of item No. 19.119 (I) shall be followed.

3.2. The rate shall be for a unit of One sq. meter.

**19.126.(II) Painting lines, dashes, arrows, letters etc. on roads, fields and like in two coats with road marking paint brushing including cleaning the surface of all dirt, dust and other foreign matter: Up to 10 cms. in width.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 19.126 (I) shall be followed except that painting work shall be up to 10 cms. width.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 19.119 (I) shall be followed.

2.2. The rate shall be for a unit of one running meter.

**19.127.(A) Painting lines, dashes, arrows letters etc. on roads, airfields, and like in one coat with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter : over 10 cms. in width.**

**1.0. Materials and workmanship**

The relevant specifications of item No. 19.126(1) shall be followed except that the painting shall be done in one coat over 10 cms. in width.

**2.0. Mode of measurement and payment**

2.1. The relevant specifications of item No. 19.126 (I) shall be followed.

2.2. The rate shall be for a unit of One Sq. meter.

**19.127. (B) Painting lines, dashes, arrows, letters etc. on roads, air fields and like in one coat with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter : Up to 10 cms. in width.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 19.126 (I) shall be followed except that the painting shall be done in one coat upon 10 cms. in width.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 19.126 (I) shall be followed.

2.2. The rate shall be for a unit of one running meter.

**SECTION-20**  
**Demolition & Dismantling**

**20.1.(i) Demolition and disposal of unserviceable materials with all leads and lifts : Lime Concrete.**

**1.0. Workmanship**

1.1. The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown in the drawings.

1.2. The demolition shall always be planned before hand shall be done in reverse order to the one in which the structure was constructed. This scheme shall be got approved from the Engineer-in-charge before starting the work. This however will not absolve the contractor from the responsibility of proper and safe demolition.

1.3. Necessary propping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining property.

1.4. Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

1.5. Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

1.6. All materials obtained from demolition shall be the property of Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

1.7. Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed with all lead and lift. All unserviceable materials, rubbish etc., shall be stacked as directed by the Engineer-in-charge.

1.8. On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

**2.0. Mode of measurements and payment**

2.1. Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

2.2. All work shall be measured in decimal system as fixed in its place subject to the following limits; unless otherwise stated hereinafter : (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq. mt. (c) Cubical contents shall be worked out to the nearest 0.01 Cu.m.

2.3. The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary shoring for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or portions where considered necessary.

2.4. The rate shall be for a unit of one cubic meter.

**20.1.(ii) Demolition and disposal of unserviceable materials with all leads and lifts : Un reinforced cement concrete.**

**1.0. Workmanship**

The relevant specifications of item 20.1.(i) shall be followed except that the un reinforced cement concrete work is to be demolished instead of lime concrete.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item 20.1(i) shall be followed.

2.2. The rate shall be for a unit of one cubic meter.

**20.3. Demolition including of serviceable materials and disposal of unserviceable materials with all leads and lifts : R.C.C. work.**

**1.0. Workmanship**

1.1. The relevant specifications of item 20.1 (i) shall be followed except that demolition of R.C.C. work is to be done.



**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item 20.(i) shall be followed except that the demolition of reinforced concrete structure is to be done. The unserviceable materials shall be disposed of at all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.

**2.2.** The rate shall be for a unit of one cubic meter.

**20.11 (ii) Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all leads and lift : in lime mortar.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item No. 20.1.(i) shall be followed except that demolition of brick or stone masonry in lime mortar is to be done.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 20.1(i) shall be followed except that the wall and independent piers or columns of brick or stone masonry shall be measured in cubic meters. All copings, corbels, combs and other projections shall be included with the wall measurements.

**2.2.** In measuring thickness of plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlars face stones dressed stone etc., if required to be taken down intact shall be dismantled and measured separately in cubic meters.

**2.3.** The rate is exclusive of cleaning of bricks or stones. Honey comb works or hollow block walling shall be measured as solid.

**2.4.** The rate shall be for a unit of one cubic meter.

**20.11. (iii) Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all leads and lift : in cement mortar.**

**1.0. Workmanship**

**1.1.** The relevant specifications of item 20.1.(i) shall be followed except demolition of brick or stone masonry in cement mortar is to be done.

**2.0. Mode measurements and payment**

**2.1.** The relevant specifications of item 20.11 (ii) shall be followed. The unserviceable materials shall be stacked as directed by Engineer-in-charge with all leads and lifts.

**20.22. Demolition in terrace including stacking or serviceable materials and disposal of unserviceable materials with all lead and lift : Brick tiles covering.**

**1.0. Materials**

**1.1.** The relevant specifications of item No. 20.1 (i) shall be followed except that the demolition of terrace brick tiles is to be done.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 20.1(i) shall be followed except that the brick tiles covering of terrace shall be measured in sq. mt. The unserviceable materials shall be stacked as directed at all leads and lifts.

**2.2.** The rate shall be for a unit of one sq. meter.

**20.23. Dismantling tiled or stone floors laid in mortar including stacking of serviceable materials and disposal of unserviceable materials with all lead and lifts.**

**1.0. Workmanship**

**1.1.** The relevant specification of item 20.1 (i) shall be followed except the dismantling of tiled or stone floors laid on mortar shall be done. Dismantling implies carefully taking up or down or removing without damage. The articles shall be passed by hand where necessary and lowered and where these are fixed by nail, screws, bolts etc., these shall be taken out with proper tools.

**2.0. Mode of measurements and payment**

**2.1.** The supporting materials such as joints, beams if any etc. shall be measured separately. The relevant specifications of item No. 20.1 (i) shall be followed, The rate shall include staking the unserviceable materials as directed with all lead and lift.

**2.2.** The rate shall be for a unit of one sq. meter.

**20.25. Dismantling of wooden floors, including, stacking of serviceable materials and disposal of unserviceable materials with all lead and lifts.**

**1.0. Materials**

1.1. The specifications of item 20.1 (i) shall be followed except that wooden floors shall be dismantled.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item 20.1 (i) same shall be followed. The supporting members such as joints, beams etc. shall be measured separately. The rate shall include disposal of unserviceable materials as directed for and with all lead and lift.

2.2. The rate shall be for a unit of one sq. meter.

**20.27.(i) Dismantling of sheet including ridges, hips, valleys gutters etc. stacking of serviceable materials and disposal of unserviceable materials with leads with lifts : G.I. sheet roofing.****1.0. Materials**

1.1. The relevant specifications of item 20.1.(i) shall be followed except that G.I. sheet roofing shall be dismantled instead of concrete work.

**2.0. Mode of measurements and payment**

2.1. The area of G.I. sheets roofing shall be measured in sq. meter. Ridges, hips and valleys shall be girded and included with roof area. Corrugated and semi-corrugated surfaces shall be measured flat and not girthed.

2.2. Supporting members such as rafters, purlins, beams, joints, trusses etc. shall be measured separately.

2.3. The rate shall include disposal of unserviceable materials with all leads and lifts and stacking the serviceable materials as directed.

2.4. The rate shall be for a unit of one sq. meter.

**20.27 (ii) Dismantling of sheet roofing including ridges, hips, valleys gutters etc. stacking of serviceable materials and disposal of unserviceable materials with all leads and lifts : A.C. Sheet roofing.****1.0. Workmanship**

1.1. The relevant specifications of item 20.27 (i) shall be followed except that dismantling work of A.C. sheet roofing is to be done.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item 20.27 (i) shall be followed except that the A.C. sheets .roofing shall be measured in this item.

2.2. The rate shall be for a unit of one sq. meter.

**20.28. Dismantling Manglore or country tile roofing with battens, boarding etc. including stacking of serviceable materials and disposal of unserviceable materials with all lead and lifts.****1.0. Workmanship**

1.1. The relevant specifications of item 20.1 (i) shall be followed except that the country tile roof or Mangalore roof shall be dismantled.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item 20.1 (1) shall be followed.

2.2. The supporting members shall be measured separate item.

2.3. The rate includes labour required for disposal of unserviceable item with ail leads and lifts.

2.4. The rate shall be for a unit of one sq. meter.

**20.30. Dismantling cement asbestos/hard board in ceiling or partition walls, wooden trellis work including frames, stacking of to serviceable material and disposal of unserviceable materials with all leads and lifts.****1.0. Workmanship**

1.1. The relevant specifications of item 20.1 (i) shall be followed except that the cement asbestos hard board in ceiling or partition walls, wooden trellis, work etc. shall be dismantled.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item 20.1 (i) shall be followed. The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed off with leads and lifts.

2.2. The rate shall be for a unit of one sq. meter.

**20.35 Dismantling wood wrought, framed and fixed in frames, trusses including stacking the materials with all lead and lift.**

**1.0. Workmanship**

1.1. The relevant specifications of item No. 20.1 (i) shall be followed except that the wood work, wrought framed and fixed in frames, trusses etc. shall be dismantled.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 20.1 (i) shall be followed.

2.2. The materials shall be stacked as and where directed with all leads and lifts.

2.3. The rate shall be for a unit of one cubic meter.

**20.39. Dismantling expanded metal or I.R.C. fabric with necessary battens and beading including frame work and stacking the serviceable materials with all lead and lift.****1.0. Workmanship**

The relevant specifications of item No. 20.1 (i) shall be followed except that the dismantling of expanded metal or I.R.C. fabric shall be done

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of in item No. 20.1 (i) shall be followed.

2.2. The rate shall be for a unit of one sq. meter.

**20.43. Dismantling steel work including dismembering and stacking the materials with air leads and lifts.****1.0. Materials**

1.1. The relevant specifications of item No. 20.1 (i) shall be followed except that the dismantling of steel work shall be carried out.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of item No. 20.1 (i) shall be followed.

2.2. The weight of the member shall be computed from standard table unless the actual weight can be readily determined.

2.3. Riveted works where rivets are required to be cut. the same shall be carried out under this item and nothing extra shall be paid.

2.4. In framed still gate, the weight of any covering material or filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.

2.5. The rate includes stacking the materials as and where directed with all leads and lifts.

2.6. The rate shall be for a unit of one Kg.

**20.49.(i) Dismantling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, Architraves, hold fasts and other attachments etc. complete and stacking them within all leads & lift. No exceeding 3 sq. meters in area.****1.0. Workmanship**

The relevant specifications of item No. 20.1 (i) shall be followed except that the door, windows, ventilators etc. (wood or steel) shutters including chowkhats, architraves, hold fasts and other attachments etc. are to be dismantled.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 20.1 (i) shall be followed.

2.2. The doors, windows, ventilator etc. not exceeding 3 sq. mt. in area (each) including shutters and chowkhats. Architraves, hold fasts and other attachments to frames etc. will be dismantled and measured under this item.

2.3. The rate includes stacking the serviceable materials as and where directed with all leads and lifts.

2.4. The rate shall be for a unit of One number.

**20.49.(II) Dismantling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats. Architraves, hold fasts and other attachments etc. complete and stacking them within all leads and lift : Exceeding 3 sq. meters in area.****1.0. Workmanship**

The relevant specifications of item No. 20.49(I) shall be followed except that the area of doors, windows, ventilators, exceeding 3 sq. meters are to be dismantled under this item.

**2.0. Mode of measurements of payment**

2.1. The relevant specifications of item No. 20.49 (I) above shall be followed.

2.2. The rate shall be for a unit of One number.

**20.51. Dismantling barber wire fencing including making rolls and also including dismantling facing posts including all earth work, concrete in the base and making good the disturbed ground stacking useful materials as directed and disposing all the unserviceable materials with all leads and lifts.**

**1.0. Workmanship**

The relevant specifications of item No. 20.1 (i) shall be followed, except that the dismantling of barbed wire fencing shall be carried out.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 20.1. (i) shall be followed.

2.2. The rate includes making rolls of dismantled wires and including dismantling fencing posts, concrete work, in base and making good the disturbed ground etc. complete.

2.3. The serviceable materials shall be stacked as and where directed and end unserviceable materials shall be disposed with all leads and lifts.

2.4. The rate shall be for a unit of One running meter.

**20.56. Dismantling (C.I. Pipes, G.S.W. Pipes and A.C. rain water pipes with fittings and clamps, including stacking the materials with all lead and lift, (for any dia. of pipe).**

**1.0. Workmanship**

The relevant specifications of item No. 20.23 shall be followed except that the dismantling work of pipes lines of C.I., G.S.W. & A.C. Pipes with fitting shall be carried out.

**2.0. Mode of measurements and payment**

2.1. The relevant specifications of No. 20.1 (i) shall be followed.

2.2. Water pipe lines, including rain water pipes, with clamps and specials, swear pipe lines, (Salt glazed ware or concrete) etc. shall be measured in running meter inclusive of joints. (The measurements shall be taken along the centre line of pipe and fittings).

2.3. The rate shall be for a unit of One running meter.

**20.00.1. Dismantling sanitary fittings like wash basin, W.C. Pan, Indian & European Type flushing tank, etc. including stacking the materials with all lead lift.**

**1.0. Workmanship**

The relevant specifications of item No. 23.23 shall be followed except that the dismantling work of sanitary fittings such as wash basin, W.C. Pan (all type of pans), Flushing tanks etc. shall be carried out.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item No. 20.1 (i) shall be followed.

2.2. The rate shall be for a unit of one number.

**20.00.2. Scraping oil paint steel and other metal surfaces and making the surface even (with hand scraping).**

**1.0. Workmanship**

The old paint from steel and other surface shall be scraped thoroughly with hand scraper followed by wire brushing (first with coarse and then with fine brushes) and finally sand papering with coarse and paper (No.3) steel wood (No.2) or emery paper (No.3) or with emery clothes. This shall then be wiped finally with mineral turpentine to remove grease and perspiration of hand marks etc. and allowed to dry. The surface shall be made even and smooth.

**2.0. Mode of measurements and payment**

2.1. The work shall be measured in actual area of work done.

2.2. The rate shall be for a unit of one sq. meter.

## SECTION-21

### Repairs to Buildings

**21.8. Providing and fixing M.S. fan clamps of shape and size as specified in existing R.C.C. slab including cutting chase and making good.**

**1.0. Materials**

1.1. M.S. Bar shall conform to M-18.

**2.0. Workmanship**

2.1. The shape and size of fan clamp shall be directed!

2.2. The fixing M.S. fan clamp in existing R.C.C. slab a chase of size 150 mm. x 75 mm. shall be cut from the ceiling so as to expose the reinforcement and up to 25 mm. clear round the reinforcement bar. This shall be done without any damage to adjoining portion of ceiling. The two arms of the ends of the clamp shall be passed through the space over reinforcement bar from the bottom of the slab. Then the two arms shall be bent down about 15 mm. by means of crow bar. The clamp shall be held in position and the chase in ceiling filled with cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size). The ceiling shall be then finished to match the existing surface and properly cured.

**3.0. Mode of measurements and payment**

3.1. The rate includes cost of all materials and labour required for satisfactory completion of this item as described above.

3.2. The rate shall be for a unit of One number.

**21.23. Cutting our cracks, of roof terrace to V. section, Cleaning out, wetting, grouting with cement and sand slurry 1:3 (1 cement : 3 sand)**

**1.0. Materials**

(1) Water shall conform to M-1. (2) Cement shall conform to M-3. (3) Sand shall conform to M-6.

**2.0. Workmanship**

2.1. The cracks shall be cleaned out and trimmed to V shaped cuts at least 6 mm wide on top. The cracks shall be cleaned off and then cracks shall be thoroughly flooded with water, water allowed to a soak in cracks, and then grouted with cement and sand slurry in proportion 1:3. The required cracks shall be cured at least 7 days.

**3.0. Mode of measurements and payment**

3.1. The rate shall includes cost of all materials and labour required for satisfactory completion of item as described above.

3.2. The rate shall be for a unit of One running meter.

**21.24. Cutting out cracks of roof terrace to V-Section out, and filling solidly with a hot mixtures of bitumen and clean dry sand (1:1 weight).**

**1.0. Materials**

(1) Bitumen shall be 85/25 penetration (2) Sand shall conform to M-6.

**2.0. Workmanship**

2.1. The relevant specifications of item No. 21.23 shall be followed for opening cracks and cleaning.

2.2. The cracks shall be absolutely dried and cleaned and filled solidly with a hot mixtures of 85/25 penetration and sand in ratio of 1; 1 by weight. The filler shall be well filled into cracks with the edges of a trowel and left flush with surface of roof. Repaired cracks shall cause no ridges the direction of the slope of roof.

**3.0. Mode of measurements & payment**

3.1. The relevant specifications of item No. 21.23 shall be followed.

3.2. The rate shall be for a unit of One running meter.

## SECTION-22

### Misc. Building Items

- 22.20. Providing and fixing 1.20 meter fencing with 2 meter long M.S. angle posts 40 mm. x 40 mm. x 6 mm. and oil painting 3 coats fixed at 2.5 M C/C with five horizontal lines, and two diagonals of galvanised steel barbed wire weighing 9.38 Kg. per 100 meter. (Min.) stained and fixed to posts with G.I. staples including fixing the posts in ground with 0.5 x 0.5 x 0.5 M block in C.C. 1:5:10 (cement : 5 sand : 10 graded brick aggregate 40 mm. nominal size) etc. complete.**

**1.0. Materials**

(1) Water shall conform to M-1. (2) Cement shall conform to M-3. (3) Sand shall conform to M-6. (4) Brick bats aggregate shall conform to M-14, (5) Oil paint shall conform to M-44. (6) Barbed wire shall conform to M-78.

**2.0. Workmanship**

**2.1.** The pits of the size 0.5 x 0.5 m. x 0.5 shall first be excavated, true to line and level to receive the post at 2.5 C/ C. The relevant specifications of item 4.00.1 shall be followed for excavation work.

**2.2.** The pits shall be filled with a layer 0.15 m. thick with lean concrete 1:5:10 (1 cement: 5 sand : 10 graded brick bat aggregate 40 mm. nominal size). The M.S. angles 40 mm. x 40 mm. x6 mm shall be filled in with lean concrete 1:5:10 and rammed properly so as to form total 0.5 m. x 0.5 m. x 0.5 m, concrete block. The concrete shall be cured for 7 days to allow it to set.

**2.3.** The barbed wire shall be stretched and fixed in 5 horizontal rows and two diagonals. The bottom row shall be 140 mm. above ground and the rest at 125 mm. centre to centre. The diagonal shall be stretched between adjacent post from top wire of one post to the bottom wire of 2nd post. The wires shall be fixed to posts by means of staples. The M.S. Angle posts shall be painted with 3 coats of old paint of approved tint and shade.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured for the finished work from centre to centre of the posts.

**3.2.** The rate shall include the cost of labour and materials involved in the operations described above.

**3.3.** The rate shall be for a unit of One running meter.

- 22.00.1. Construction of B.B. masonry paniara 23 cm x 75 mm wall including fixing pre cast R.C.C. marble Mosaic (Terrazzo) slab of 75 mm. thickness on top and smooth finishing to walls in cement plaster in C.M. 1:3 curing etc. complete including drainage out, waste water arrangements.**

**1.0. Materials**

(1) Water shall conform to M-1. (2) Cement shall conform to M-3. (3) Sand shall conform to M-6. (4) Burnt bricks shall conform to M-15. (5) Pre cast marble mosaic terrazzo paniara of 75 mm thickness shall be of best quality. The width of paniara shall be directed.

**2.0. Workmanship**

**2.1.** The brick masonry shall be constructed for paniara for the size as directed in C.M. 1 :6. The thickness of wall shall be 23 cms. thick and height shall be 75 cms. The relevant specifications of B.B. masonry at item 6.13 (b) shall be followed for B.B. masonry work.

**2.2.** The B.B. masonry shall be covered with pre cast marble terrazzo paniara at top, of width and length as specified or as directed. The terrazzo mosaic paniara shall be T'S mm, thickness.

**2.3.** The whole masonry work shall be finished smooth with C.M. 1:3 on both sides the relevant specifications of item No. 1.7.59 (I) shall be followed.

**2.4.** The drainage outlet and water arrangement shall be made as directed.

**3.0. Mod& of measurements and payment**

**3.1.** The work shall be measured for the finished work.

**3.2.** The rate shall include the cost of labour and materials involved in the operations described above.

**3.3.** The rate shall be for a unit of One Running meter.

- 22.00.2. Constructing a chowkadi with C.Q. over 12 cm. thick B.B. masonry in front and dwarf wall 1 M high and 23 cms. thick cement plaster to masonry in C.M. (1:3) and cement concrete flooring in 1:2:4 with 5 cm. dia. A.C. Drain pipe etc. complete**

**1.0. Materials**

**1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Burnt bricks shall conform to M-15. Stone aggregate 20 mm. nominal size shall conform to M-2. (a) A.C. Drain pipe of 5 cms. dia shall conform to M-74.

**2.0. Workmanship**

**2.1.** The chowkadi shall be constructed of specified size and as directed. The slab shall be cast on B.B. masonry wall 12 cms. thick and dwarf wall 1 M high and 23 cms, thick shall be constructed in proportion of C.M. 1:6. The relevant specifications of item 6.3. (I) shall be followed for masonry partition work and 5.4.1. (c) shall be followed for reinforced concrete work.

**2.2.** The whole masonry work shall be finished with cement mortar 1:3 and finished smooth. The relevant specifications of item No. 17.59 (I) shall be followed for plastering work,.

**2.3.** The A.C. pipe of 5 cms. dia shall be fixed as drainage pipe. The bottom shall be finished with C.C. 1:2:4 finished with cement slurry.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured for finished work.

**3.2.** The rate includes cost of all materials, labour etc. required for carrying out satisfactory completion of work.

**3.3.** The rate shall be for a unit of one square meter.

**22.00.3.(I) Constructing cooking platform 60 cm. width and 70 cm. height resting on B.B. Masonry wall 23 cms. thick in C.M. 1:6 with fixing of pre cast 1:2:4. R.C.C. 0.0 M. thick slab with marble mosaic chips set in GM. (Terrazzo) with plastering on exposed faces to wall in C.M. 1:4 etc. complete.**

**1.0. Materials**

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Burnt brick shall conform to M-15. Marble Mosaic chips shall conform to M-46. Stone aggregate 20 mm. nominal size shall conform to M-12. (a) M.S. Bars shall conform to M-18.

**2.0. Workmanship**

**2.1.** The cooking platform of size as directed shall be constructed in 60 cms. width and 70 cms. height. The brick masonry wall, in C.M. 1 :6 shall be constructed in 23 cms. thickness up to full depth. The relevant specifications of item 6.13 (B) shall be followed for masonry work.

**2.2.** The R.C.C. slab of 8 cms. thickness and of adequate design and size shall be precast and the same shall be put up on the B.B. masonry work.

**2.3.** The top and exposed sides of the R.C.C. slab shall be finished with marble mosaic terrazzo 8 mm. thick with required colour pigment. The work of terrazzo shall be carried out as per relevant specifications of item 14.4 (E).

**2.4.** The whole masonry work shall be finished with cement mortar in C.M. 1 :4. The relevant specification of item 17.59 (II) shall be followed.

**3.0. Mode of measurements and payments**

**3.1.** The work of cooking platform shall be measured for finished work.

**3.2.** The rate includes cost of all labour and materials, etc. required for satisfactory completion of this item as described above.

**3.3.** The rate shall be for a unit of One running meter.

**22.00.3.(II) Constructing cooking platform of 60 cm. width and 70 cms. height resting on B.B. masonry walls 23 cm thick in C.M. 1:1 with fixing black kadapa stone surface laid on pre cast R.C.C. slab 1:2:4 with plastering on exposed faces to wall in C.M. 1:4 etc. complete.**

**1.0. Materials and Workmanship**

**1.1.** The relevant specification of item No. 22.00.3 (I) shall be followed except that the cooking platform shall be constructed by providing black kadapa stone of 25 mm. to 30 mm. thickness on pre cast R.C.C. 1:2:4 slab 8 cms. thick. The black stone shall be provided in single piece up to 1.8 M in length and specified width. All the exposed edges of stone shall be machine cut.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item 22.00.3.(I) shall be followed.

**2.2.** The rate includes providing machine cut edges on exposed face of kadapa stone.

**2.3.** The rate shall be for a unit of One running meter.

**22.00.4. Providing and fixing Rajula stone 75 mm. thick 60 cm x 45 cms. size including fixing in cement mortar as directed.**

**1.0. Materials**

Water shall conform to M-1. Cement mortar shall conform to M-11. Rajula stone of specified, size shall be of best quality and free from any defects. The stone shall not be less than 75 mm in thickness.

**2.0. Workmanship**

**2.1.** The Rajula stone of size 60 x 45 cms. size shall be fixed as and where directed in cement mortar in 1:3. All the edges of the stone shall be fixed with cement mortar in C.M. 1:3 and sloped at 45° and finished smooth. The work shall be cured for 7 days after fixing.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured for finished work.

**3.2.** The rate includes cost of all labour and materials required for satisfactory completion of this item.

**3.3.** The rate shall be for a unit of one number.

**22.00.5. Providing and laying Bilimora type brick facing in C.M. 1:1 laid over bedding of cement mortar 1:3 (13 mm. thickness) including cleaning, watering, scaffolding etc. complete.****1.0. Materials**

**1.1.** Water shall conform to M-1. Cement mortar of specified proportion shall conform to M-11. Bilimora type bricks shall be approved before collection the same on site.

**2.0. Workmanship**

**2.1.** The surface on which the Bilimora type bricks is to be provided shall be cleaned of all dust, dirt, etc. and finished with CM 1:3 in 13 mm, thickness. The relevant specifications of item 17.59 (I) shall be followed except that the thickness of finishing shall be 13 mm. The top surface shall be roughened by wire brushes to give proper grip to the tiles to be fixed.

**2.2.** The Bilimora type bricks shall be fixed with CM 1:1. The tiles shall be properly wetted before fixing. The horizontal and vertical joints shall be maintained in true line and level by providing 12 mm or 20 mm. sq. bars as directed. The tiles shall be tamped by trowel so that there shall not be any hollows left behind the tiles.

**2.3.** The tiles shall be cut to the required size on ends of at top bottom of beams in best workman like manner.

**2.4.** The whole work shall be cured for 7 days.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured as per relevant specification of item No. 17.58(1)

**3.2.** The rate includes cost of all materials, wastage etc. occurring due to cutting of tiles and ends as top and bottom of beams etc. including base coat.

**3.3.** The rate shall be for unit of One sq. meter.

**22.00.6. Providing and fixing teakwood rail of 60 mm. x 20 mm. size and 50 cms. length incl. 3 coats of oil paint to wood work with set of 3 pegs.**

**1.0. Materials :** Teak wood battens of specified size shall conform to M-29. Oil paint shall conform to M-44. Wall pegs of aluminum 3 Nos. of approved quality and make shall be provided.

**2.0. Workmanship**

**2.1.** The teakwood battens of size 60 mm. x 20 mm. and 50 cms. long be planed on all sides. The anodized aluminum wall pegs of approved 'make shall be fixed on wooden batten prepared with screws as directed. The wall pegs unit shall be fixed on wall with wooden gut ties and screws as directed. The wooden battens shall be painted with 3 coats of ready mix paint of approved colour and shade.

**3.0. Mode of measurements and payment**

**3.1.** The work shall be measured for finished work.

**3.2.** The rate shall be for a unit of one number.

**22.00.7. Treating the bottom and sides (up to a height of 300 mm.) of the excavations made for the masonry foundations and basement with chemical emulsion at the rate of 5 liters per Sq. meter of the surface area.**

**1.0. Materials :** The chemicals used for the soil treatment shall be only one of the following with concentration shown against each in aqueous emulsion.

Chemicals	Concentration
1. Aldrin	0.50% (by weight)
2. Heptachlor	0.50% (by weight)
3. Chlordane	1.00% (by weight)



**2.0. Workmanship**

- 2.1.** The chemicals barrier shall be complete and continuous under whole of the structure to be protected.
- 2.2.** The bottom and the sides of foundations up to a height of 30 cms. from the bottom of excavation made for masonry foundation and for basement column pits shall be treated with the chemical emulsion at the rate 5 liters/ sq. meter of the surface area.
- 2.3.** The chemical treatment shall be-carried out when the surfaces is quite dry. Chemical treatment shall not be carried out when it is raining or when the soil wet with rain or sub soil water.
- 2.4.** Once formed, treated soil berries shall be not disturbed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuaiting and compactness of the barrier system
- 2.5.** The treatment against termite infection shall remain fully effective for a period not less than 10 years from date of issue of the final certificate to completion of work. If at any time during this period, any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the contractor shall be rectify the concerned defects within 14 days on receipt of notice from Engineer-in-charge. On contractor's failure to do so, the Engineer-in-charge may get the same rectified through any other agency at contractor's risk and cost, and decision of Engineer-in-charge as to the cost payable by contractor for the same shall be final and binding to the contractor.
- 2.6.** A guarantee bond on appropriately stamped paper shall be given by the contractor to the department in the manner and form prescribed below:

**FORM OF GUARANTEE BOND**

I/We..... ( Contractor) hereby guarantee that work will remain unaffected and will not be any way damaged by termite or any other germs of similar types, for a period for 10 years after completion of the work of anti-termite as per the terms and conditions of the contract and or damage that might be caused on account of termite and or other similar type of germs and hereby Guarantees to make good any loss of damages suffered by the Government of Gujarat and further guarantee to redo effective work without claiming any extra cost.

- 2.7.** This guarantee shall remain in force for the period of 10 years from the completion of the work under the contract and it shall remain binding to the contractor for period of 10 years.
- 2.8.** The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of the work and 10% shall be retained for the balance of guarantee period and shall be refunded only after the completion of the guarantee period.

**3.0. Mode of measurements & payment**

- 3.1.** The length and breadth shall be measured correct to a cm. as per the dimensions of sanctioned plans. No deduction shall be made nor extra paid for any opening for pipes etc. up to 0.1.sq. mt. The rate shall include the cost of all labour and materials required for the operation involved for satisfactory completion of this item. The sides of the trenches 30 cms, each side and bottom shall be measured under this item.

- 3.2.** The rate shall be for a unit of One sq. meter.

**22.00.8.** **Treating the backfill immediately in contact with foundation structure with chemical emulsion at the rate 7.5 liters per sq. mt. of vertical surface of the sub structure of each side (In case of R.C.C. columns, breams and R.C.C. basement walls, treating the sides of 50 cms. from ground level with chemical emulsion at the rate of 7.5 Liters/sq. meter).**

**1.0. Materials**

- 1.1.** The specifications of the item 22.00.7. shall be followed.

**2.0. Workmanship**

- 2.1.** After masonry foundations and retaining walls of basement come up , the backfill immediate in contact with foundation shall be treated with the chemical emulsion at the rate of 7.5 liters per sq. m. of the vertical surface of the sub structure for each side. The filling of earth is usually carried out in layers and the treatment shall be directed towards the concrete or masonry surfaces of the columns and walls so that the earth contact with these surfaces is well treated with chemical.

- 2.2.** In case of R.C.C. framed structure with columns and plinth beams and R.C.C. basements the treatments shall start at the depth of 50 cms. below ground level from this depth backfill around the columns, beams, and R.C.C. basement walls shall be treated at 7.5 lit/sq. m. of vertical surface. The relevant specifications shall be followed same as item 22.00.7.

**3.0. Mode of measurements and payment**

- 3.1.** The area of substructure in contact with backfill to be measured. The length and breadth shall be measured correct to a cm. dimension of sanctioned plans for the surfaces in contact with backfill.

- 3.2. No deduction shall be made nor extra paid for any opening for pipes, etc. up to 0.1 sq. m.
- 3.3. The rate includes cost of all labour, materials required for satisfactory completion of this item.
- 3.4. The rate shall be for a unit of One sq. meter.
- 22.00.9. Treating the top surface of the plinth filling with chemical emulsion at rate of 5 liters sq. meter, before the sand bed or sub grade is laid.**
- 1.0. **Materials** : The relevant specifications of item 22.00.7. shall be followed.
- 2.0. **Workmanship**
- 2.1. The relevant specifications of item 22.00.7 shall be followed that the top surface of the consolidated earth within the walls, shall be treated with the chemical emulsion at the rate of 5 liters/sq. metre of the surface before the sand bed or sub-grade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes up to 50 to 75 mm. deep at 150 mm. centers both ways may be made with 12 mm. dia. M.S. rod on the surface to facilitate absorption of the emulsion.
- 3.0. **Mode of measurements & payment**
- 3.1. The length and breadth shall be measured clean for the area actually treated.
- 3.2. No deduction shall be made nor extra paid for any opening for pipes, etc. up to 0.1 sq. m.
- 3.2. The rate shall be for a unit of One sq. meter.
- 22.00.10. Treating the junctions of wall and floor area with chemical emulsion at the rate of 7.5 liter/sq. mt. by making holes at junction of walls, and columns, with the floor before laying sub grade to a depth to 15 cms. by making holes.**
- 1.0. **Materials** : The relevant specifications of item 22.00.7 shall be followed,
- 2.0. **Workmanship**
- 2.1. The relevant specifications of item 22.00.7 shall be followed except that the junction of walls columns with floor shall be treated with the chemical emulsion at the rate 7.5 liters/sq. meter. Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surface from the ground level be taken to establish continuity of the vertical chemical barriers on inner wall surfaces from the ground level up to the level of filled earth surface. To achieve this, a small channel 3x3 cm. shall be made at the junctions of the wall and columns with floor (before laying the sub 2 grade) and road holes made in the channels up to the ground level 15 cms. apart and the rod moved back ward and forward to breakup the earth an chemical emulsion poured along the channel at the rate of 7.5 liters per sq. m, of the vertical wall or column surfaces of sub-structures so as to soak the soil right to the bottom. The soil should be tamped back into place after this operation.
- 3.0. **Mode of measurements and payment**
- 3.1. The relevant specifications of the item 22,00.7. shall be followed.
- 3.2. The vertical area of sub-structure in contact with filled up earth above ground level to top filled up earth shall be measured for payment.
- 3.3. The rate shall be for a unit of One sq. meter.
- 22.00.11. Treating the earth along the external perimeter of the building by making holes 15 cms., apart up to a depth of 30 cms. with chemical emulsion at the rate of 7.5 liters per sq. meter along the wall.**
- 1.0. **Materials** : The relevant specification of item 22.00.7 shall be followed.
- 2.0. **Workmanship**
- 2.1. The relevant specifications of the item 22.00.7. shall be followed except that the external perimeter of the building shall be treated with chemical emulsions. After building is complete, the earth along the . external perimeter of the building should be treated at intervals of 15 cms. and to a depth of 30 cms. The rods shall be moved backward and forward parallel to the wall to breakup the earth and chemical emulsion poured along the wall at the rate of 7.5 liters per sq. meter of vertical surfaces. After the treatment the earth shall be tamped back into place the earth out side of the building should be graded on compaction of building, this treatment shall be carried out on the completion of such grading. In event of filling being more than 30 cms. the external perimeter and treatment shall be extended to the full depth of filling up to ground level so as to ensure continuity of the chemical barrier.
- 3.0. **Mode of measurements and payment**
- 3.1. The relevant specifications of item No. 22.00.7 shall be followed.
- 3.2. The vertical surfaces area so sub-structure 30 cms. in depth from finished ground level in external periphery only shall be measured and paid under this item. The depth of wall treated under back filled shall not be included in this item.

3.3. The rate shall be for a unit of One sq. meter.

**22.0.12. Providing treatment along outside of foundation using chemical emulsion at 7.5 liters per sq. m. of vertical surface (for each side) of sub-structure.**

1.0. **Materials :** The chemical used for the soil treatment shall be any one of the following with concentration shown against each in aqueous emulsion :

	<b>Chemicals</b>	<b>Concentration</b>
1.	Aldrin	0.50% (by weight)
2.	Heptachlor	0.50% (by weight)
3.	Chlordane	1.00% (by weight)

**2.0. Workmanship**

2.1. The surface of consolidated earth around the existing building shall be treated with chemical emulsion at the rate 7.5 liters/sq. m. of vertical surface of sub-structure. The minimum height to substructure shall be considered 60 cms. for treatment. If the earth along the perimeter does not allow emulsion to seep through, holes up to 300 mm. deep at 150 mm. centers both ways be made by 12 mm. dia. mild steel rod on the surface to facilitate saturation of the soil with chemical emulsion.

2.2. The chemical barrier shall be complete and continuous under whole on the structure to be protected.

2.3. The chemical treatment shall be carried out when the surface quite dry. Chemical treatment shall not be carried out when it is raining or when the soil is wet with rain or sub soil water.

**3.0. Mode of measurements and payment**

3.1. The length shall be measured along the periphery of the sub-structure. The depth shall be taken 0.60 m.

3.2. No deduction shall be made not extra paid for any opening for pipes etc. up to 0.1 sq. m.

3.3. The rate includes cost of all labour and material required for the operations involved for satisfactory completion of this item.

3.4. The rate shall be for a unit of One sq. meter.

**22.0.13. Providing treatment along external wall perimeter below concrete or masonry apron using chemical at 5. lit/linear including drilling and plugging etc.**

1.0. **Materials :** The relevant specifications of item No. 22.0.12 shall be followed.

**2.0. Workmanship**

2.1. The relevant specification of item No. 22.0.12 shall be followed except that the treatment shall be carried out along external wall perimeter below concrete or masonry apron, using chemical at rate of 5 lit/ running meter.

**3.0. Mode of measurements and payment**

3.1. The relevant specifications of item No. 22.0,12 shall be followed.

3.2. The rate including drilling and plugging holes in apron etc. complete.

3.3. The rate shall be for a unit of One running meter.

**22.0.14. Treatment of soil below existing floor using chemical at 1 liter per hole at 300 mm. a part including drilling plugging holes etc.**

1.0. **Materials :** The relevant specifications of item No. 22.0.12. shall be followed.

**2.0. Workmanship**

2.1. The relevant specifications of item No. 22.00.9. shall be followed except that the termite control treatment shall be carried out in soil below existing floors.

2.2. The holes of 12 mm. dia rod shall be drilled in floor up to 150 mm. depth at 300 mm. part both ways. The chemical shall be then injected with pressure at the rate of 1 liters/hole of the surface area.

**3.0. Mode of measurements & payment**

3.1. The relevant specifications of item 22.0.9 shall be followed.

3.2. The rate shall includes cost of drilling holes and plugging.

3.3. The rate shall be for a unit of One sq. meter.

**22,0.15. Treatment of voids in masonry using chemical at 1 Lit/hole at 300 mm. apart including drilling holes and plugging.**

1.0. **Materials :** The relevant specifications of item 22.0.12 shall be followed.

**2.0. Workmanship**

2.1. The walls affected by termite shall be cleaned off all live forms binding inside and the holes of voids in masonry wall surface shall be treated by chemical emulsion at rat 1 Lit. hole. The holes in cracks in surface of wall shall be drilled at 300 mm. apart.

**3.0. Mode of measurement & payment**

3.1. The rate shall be for a unit of One number of voids treated.

**22.0.16. Treatment to wood work by chemical emulsion in oil or kerosene based including 6 mm. dia downward slanted holes 150 mm. C/C. and plugging the same with cement mortar.**

1.0. **Materials** : The relevant specifications of item No. 22. 00.7 shall be followed.

**2.0. Workmanship**

2.1. The wood work effected by Ants shall be cleaned of lives form hiding inside. The whole wood surface shall be then treated with oil or kerosene based chemical emulsion. The holes in 6 mm. dia. shall be drilled slanted downwards at 150 mm. centers to centers and chemical emulsion shall be poured into holes by means of funnels specifically prepared for the same and allowed to seep. After finales become emptily, another dose of chemicals shall be poured in them. This process shall be done repeatedly till the whole wood work is fully saturated with chemical.

2.2. The holes drilled in wood work shall be filled in with putty and other similar materials as directed and the whole wooden surface shall be made good as before.

**3.0. Mode of measurements & payment**

3.1. The work shall be measured for the finished work in sq. meter, including frame.

3.2. The out of frame shall be measured as width ad form top of flooring to top of frame shall be as height. This area includes for treating frame and shutters both.

3.3. The rate includes cost of all labours and materials, required for satisfactory completion of this item.

3.4. The rate includes drilling holes plugging the same after treatment completed and making good as before.

3.5. The rate shall be for a unit One sq. meter.

## SECTION-23

### Water Supply, Plumbing and Sanitary Fittings

- 23.2. Providing and fixing to wall, ceiling and floor galvanised mild steel tube (Medium grade) of the following nominal bore, tube fittings and clamps including making good the wall ceiling and floor (A) 15 mm. dia (B) 20 mm. dia (C) 25 mm. (D) 32 mm. (E) 40mm. (F) 50 mm.**

**1.0. Materials**

- 1.1.** Galvanised mild steel tubes of specified dia nominal bore shall conform to I.S. 1239-1968.  
**1.2.** The galvanised fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and makes as approved by the Engineer-in-charge.

**2.0. Workmanship**

**2.1. Cutting, Laying & Jointing**

**2.1.1.** When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded conforming to the requirements of I.S. 554-1955 with pipe dies and taps carefully in such a manner that it will not result in slackness of joints when the two pieces are screwed together.

**2.1.2.** The taps and dies shall be used only for straightening screw threads which have becoming bent or damaged and shall not be used for turning of the threads so as to make them slack as the latter procedure may not result in the watertight joint. The screw threads for tube and fitting shall be protected from edge until they are fitted.

**2.1.3.** In jointing the tubes, the inside of the socket and the screwed end of the tubes shall be oiled and smeared with white or red lead and wrapping around with a few turns of fine spun yarn round the screwed end of the tube. The end shall then be tightly screwed in the socket, tees, etc. with a pipe wrench. Care shall be taken that all times free from dust, and dirt during fixing. Burr from the joints shall be removed after screwing. After laying the open ends of the pipes shall be temperately plugged to prevent access of water, soil, or any other foreign matter.

**2.1.4.** Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anti-corrosive paint to prevent corrosion.

**2.2. Fixing of tube fittings to wall ceiling & floors.**

**2.2.1.** In case of fixing of tubes and fittings to the walls or ceilings, these shall run on the surface of the wall, or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in ducts or recesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable, pipe may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeve shall be fixed at a place a pipe is passed through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.

**2.2.2.** All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1:3 (1 cement : 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight lengths at 2 MC/C interval in horizontal run and 2.5 m. interval in vertical run. For pipe of 15 mm. dia. up to 25 mm. dia the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However for bigger diameter pipes the holes shall be carefully made cement : 3 coarse sand), and properly finished to match the adjacent surface.

**2.3. Testing of joints :**

**2.3.1.** After laying and jointing, the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joints found leaky shall be redone, and all leaking pipes removed and replaced without extra cost.

**2.3.2.** The pipes and fittings after they are laid shall be tested to hydraulic pressure of 6 Kg./Sq cm. The pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all shocks and water hammer. The draw off takes and stop cock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fittings shall be tested in sections as the work laying proceeds, keeping the joints exposed for inspection during the testing.

**3.0. Mode of measurements and payment**

**3.1.** The description of e, item shall, unless otherwise stated be held to include where necessary, conveyance, and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position straight, cutting and waste return of packing etc.

**3.2.** The length shall be measured on running meter basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to wall, ceiling, floors etc shall be measured and paid under this item.

**3.3.** All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.

(i) Dimension shall be measured to the nearest 0.01 meter. (ii) Area shall be worked out to the nearest 0.01 sq. meter.

**3.4.** All measurements of cutting shall unless otherwise stated be held to include the consequent waste

**3.5.** In case of fitting of unequal bore, the targets bore shall be measured for the test.

**3.6.** Testing of pipe lines fittings, and joints include for providing all plant appliances necessary for obtaining access to the work to be tested and carrying out the tests

**3.7.** The rate includes galvanised steel tubing with screwed socket joints, to gather with all fittings (such as bends, sockets springs, elbows, test, crosses, short pieces, clamps and plugs, unions etc.) and fixing complete with clamping wall hooks, wooden plug etc. and also curing, screwing and waste and for making forged (or hand made) bends on piping as required. Connector shall be inserted where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing where tubes are to be fixed to wall ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.

**3.8.** The rate shall be for a unit of one running meter.

**23.4. Providing and laying in trenches galvanised mild steel tubes (Medium grade) of the following nominal bore and tube fittings-earth work in trenches to be measured and paid for separately ; (A) 15 mm. dia. (B) 20 mm. (C) 25 mm. (D) 40 mm. (E) 60 mm. (F) 80 mm.**

**1.0. Materials**

**1.1.** Galvanised mild steel tube of specified dia. nominal bore and fittings shall conform to I.S. 1239-1968

**2.0. Workmanship**

**2.1.** The relevant specifications of Item 23.2 (A) shall be followed for cutting laying and jointing testing of joints except that the fixing of tube shall be done in trenches,

**2.2.** The width and depth of the trenches for different diameters of the tubes shall be as under, For 15 to 80 mm. dia tube width of trenches shall be 30 cms. and depth of trenches 60 cms,

**2.3.** All joints, the trench width, shall be widened where necessary. The work of excavation and refilling shall be done true to line, and gradient in accordance with general specifications of earth work in trenches

**2.4.** The pipes shall be painted with two coats of anti-corrosive bitumastic paint of approved quality. The pipe shall be laid on a layer of 75 mm. sand filled upto 150 mm. above the pipe of so specified. The remaining portion of trench shall be then filled with excavated earth. The surplus shall be disposed off as directed.

**2.5.** When the excavation is done in rock the bottom shall be cut deep enough to permit the pipe to be laid and cushion of sand 75 mm. in case of bigger diameter of tube where the pressure is very high thrust block of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 grade stone aggregates of 20 mm nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area if so specified.

**3.0. Mode of measurement**

**3.1.** The relevant specifications of item No. 23.2 (A) shall be followed. The authorised quantities shall be

**3.2.** For purpose of calculating cubic content cross section shall normally be taken at suitable intervals i.e. at manhole or wall chamber intervals except in abnormal cases like sudden change in strata or undulating ground etc., when they may be taken at closer intervals as approved by the Engineer-in charge whose decision shall be final, conclusive and binding.

**3.3. Authorised width :**

(a) Up to the meter depth, the width of the trenches for the purpose of measurements of excavation shall be arrived at by adding 40 cms. to the external diameter of the tube ( not the socket) where a pipe is laid on concrete bed/ Cushing layer, the authorised width shall be the external diameter of tube plus 40 cms. or the width of the concrete bed cushioning layer whichever is more.

(b) For depths exceeding one meter an allowance of 5 cms. per meter of depth for each side of the trench shall be added to the authorised width (i.e. external diameter of pipe of plus 40 cms) This allowance shall apply to the entire depth of the trench. The authorised width in such cases shall therefore be, equal to the depth of trench, plus external diameter or tube plus 40 cms.

(c) Where more than one tube is laid, the diameter shall be reckoned as the horizontal distance of outside to outside of the outermost pipes.

(d) Where sheeting etc. has been provided the authorised width of the trenches at bottom shall be increased to accommodate for sheeting etc. so that the clear width available between faces of sheeting is as per previous ness of (a), (b) & (c) above.

(e) If the sides of the trench are not vertical, the tones of side slopes shall end at the top of the pipe and vertical sided trench of authorised width as per (a), (b), (c) and (d) above shall be excavated from these down to the bed of trenches.

**3.4.** Where the tubes are laid in trenches, the work of excavation and refilling and round tubes for which separate payment shall be made, the length shall be measured on running meter, basis.

**3.5.** The rate shall be-for a unit of One running meter.

**23.6. Marking connection of galvanised M/S. distribution branch with galvanised mild steel main 80 mm. nominal bore by providing and fixing tee including, cutting and threading the pipes etc. complete.**

**1.0. Materials** The fittings required of specified dia. of pipe shall conform to I.S. 1237-1986.

**2.0. Workmanship**

**2.1.** A pit of suitable dimensions shall be dug at the point where the connection is to be made with the main and earth removed up to 150 mm. below the main. The flow of water in water main shall also be disconnected by closing the sluice or wheel valves on the main. The main shall first be cut. Water if any, collected in the pit shall be bailed out and ends of the pipe threaded.

**2.2.** The connections of distribution pipe shall be made by fixing malleable galvanised mild steel tee of the required size and fitting such as jam nut, socket, connecting piece etc,

**2.3.** The testing of the joints shall be done as per relevant specifications of item No. 23.2 (A).

**3.0. Mode of measurements and payment**

**3.1.** The rate includes cost of all labour, materials, tool and plant required for satisfactory completion of 'this item.

**3.2.** The rate shall be for a unit of One number.

**23.8. Providing and fixing to wall ceiling and floor 6 Kgs/Sq. Cm. working pressure polythene pipes of the following outside diameter, low density complete with special flag compression type fittings wall clips etc. including making good the wall/ceiling and floor. (A) 20 mm. dia. (B) 25 mm. dia (C) 32 mm. dia. (D) 40 mm. dia. (E) 50 mm. dia.**

**1.0. Materials**

**1.1.** The low density polythene pipe of specified diameter with 6 Kg/Sq. Cm, working pressure shall conform to I.S. 3076-1968. The specials and fittings required shall be of best quality.

**2.0. Workmanship**

**2.1.** The P.V.C. pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid ' P.V.D. pipes, due allowance shall be made particularly in over ground pipe lines for any change in length of pipe line which may occur during installation or when pipe line which may occur during installation or when pipe line is in service.

**2.2.** Above ground installation of rigid P.V.C. pipe should be under taken after preparations are observed for their protection against direct sun rays and mechanical damage.

**2.3.** The rigid P.V.C. pipe lines should not be kept exposed above ground when it passes through public places, railway lines, road side and foot paths.

- 2.4. P.V.C. pipes shall be supported at the following intervals :  
 -20 mm. dia 500 mm. -25 mm. dia 750 mm. -32 mm. dia.900 mm.
- 2.5. Closer support spacing shall be provided if recommended by the manufacture.
- 2.6. The guide lines indicated by the manufacturer regarding handling, transportation, storing, laying and jointing of pipes shall be kept in view during execution.
- 2.7. P.V.C. pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.
- 2.8. Jointing the pipes :**
- 2.8.1. The pipes and sockets shall be accurately cut. The ends of the pipes and fittings should be absolutely free from dirt and dust. The outside surface of the pipes and the inside of the fittings shall then be roughened with emery paper, and then solvent cement joint. Since solvent cement is aggressive to P V.C. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Empty solvent cement tins, brushes, rags, or paper impregnated with cement should not be buried in the trenches. They should be gathered not left scattered about, as they can prove to be a hazard to animals, which may chew them.
- 2.8.2. If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge.
- 2.9. Laying pipes in Trenches :**
- 2.9.1. The pipes shall be laid over uniform relatively soft fine trained soil found to be free of presence of hard object such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.
- 2.9.2. The pipes laid underground shall not be less than one meter from the ground level. The pipe shall be positioned in the trenches so as to avoid any induced stress due to deflection. Any deviation required shall be obtained by using proper type of rubber ring joints.
- 3.0. Mode of measurements & payment**
- 3.1. The relevant specifications of item 23.2. (A) shall be followed except that the P.V.C. pipes of specified dia. shall be paid under this item.
- 3.2. The unit rate shall be for a unit of One running meter.
- 23.111.(A)(I) Providing and fixing water closet squatting pan (Indian type W.C. Pan) size 580 mm. (Earth work, bed concrete, foot-rests and trap to be measured and paid for separately). Vitreous china. Long pattern white colour.**
- 1.0. Materials**
- 1.1. Water closet squatting pan ( Indian type W.C. Pan) shall conform to M-62. Cement mortar shall conform to M-11
- 2.0. Workmanship**
- 2.1. The pan shall be sunk into the floor and embedded in a cushion of average 15 cm. cement concrete 1:5:10 (1 cement : 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or and its bed concrete, the floor should be left 115 mm.-below the top level of the pan so as to allow for flooring and its bed concrete. The floor should be suitably stopped so that the waste water is drained into the pan. The shall be provided with 100 mm. 'P' or 'S' trap as specified in the item No. 23.113 with approximately 50 mm seal-The joints between the pan and the trap shall be made leak-proof with cement mortar 1:1 (1 cement : 1 fine sand).
- 3.0. Mode of measurements and payment**
- 3.1. The rate shall include the cost of all materials and labours involved in the operations described under workmanship.
- 3.2. The rate shall be for a unit of One number.
- 3.3. The 'P' or S<sup>1</sup> trap unit of One number.
- 23.79. Providing and fixing cast spigot and sockets soil, waste, and ventilating pipes of the following normal size (B) 75 mm. dia. (C) 100 mm. dia.**
- 1.0. Materials**
- 1.1. The specified dia. C.I. Spigot and socket soil or waste pipe shall conform M-68.



## **2.0. Workmanship**

**2.1.** The fixing of C.f. spigot and sockets soil, waste and ventilating pipe shall be carried out as per relevant specifications of item 15.93 (B) except the C.I. spigot and socket shall be fixed. The joints shall be filled with cement mortar 1:2 (1 cement : 2 sand) span spun yarn. The joints shall be filled with cement mortar 1.2 (1 cement : 2 sand) and spurn yarn. The pipes without care shall be fixed to wall with M.S. clamps The pipes will earn shall be secured with 40 mm before steel or iron barrel distance pieces or boils and stout galvanised iron nails 10 cms long into hand wool plug fixed in walls. Access doors to fittings shall be provided with 3 mm. rubber insertion packing and secured without screws to made air and water tight

**2.2.** All soil pipes shall be earned up above the roof and shall have a wire ball on guarded or a cowl.

**2.3.** The ventilating pipe or shaft shall be carried out to a height of at least one meter above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall t carried up to a ridge of the roof or at least tow meters above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out up to a height of at least on meter above the parapet or two meters measured vertically from the top of any windows or opening which any exist up to a horizontal distance of five meters from the vent pipe into such building and in no case shall be carried out to a height less then three meters.

**2.4.** Where ventilating pipes are carried in pipe shafts, the shaft shall be of a minimum size of one meter. If !he shells are also used to give fight and air to rooms, the ventilating pipes must be carried out to a horizontal distance at root level not loss than five meter from the site of the shaft.

**2.5.** The sand cast iron pipes above parapet shall be fixed with M.S. clamps and stays. The clamps shall be made from 1.5 mm. thick MS flat or 3 mm. width band to the required shape and size to fit tightly one the sockets when tightened with screw bolts. It shall be formed of two semi circular pieces with flanged ends on both sides, with holes to fit in the screw bolts and nuts 40 mm. dia. M.S. Bars, One end of the stay shall be bent to form a hook to be fixed with clamps by means of bolts and the other end shall be bent for embedding in wall in cement concrete block of size 200 mm. x 100 mm. x 100 mm. in 1:2:4 mix. The concrete shall be finished to match the surrounding surfaces.

**2.6.** The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning

**2.7.** The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floor. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gulley trap.

## **3.0. Mode of measurements and payment**

**3.1.** The length of pipe shall be measured including all fittings along its length in running meters correct to a centimeter. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe of fittings.

**3.2.** The rate includes all labour, and materials, tools and plant etc. required for satisfactory completion of this item.

**3.3.** The rate shall be for a unit of One running meter.

**23.87. Providing and fixing cast iron (spun) Nahni trap of the following nominal diameter of self cleaning design with C.I. Screwed down or hinged grating including cost of cutting and making good the waifs and floors : 100 mm. Inlet and 50 mm. outlet.**

## **1.0. Materials**

**1.1.** The cast iron (spun) Nahni trap shall conform to M-69. The C.I. hinged or screwed down cover shall be of best quality

## **2.0. Workmanship**

**2.1.** The Nahni trap with 100 mm. dia inlet and 50 mm. dia. outlet shall be fixed as per drawing or as directed.

**2.2.** The Nahni trap shall be jointed with C.I. Pipe, 75 mm. dia. with lead joints. The lead joints shall be done in conformation with I.S. 782.-1976.

## **3.0. Mode of measurements and payment**

**3.1.** The rate includes cost of all labour, materials, tools and plants etc. required for satisfactory completion of this item including lead, jointing and testing.

**3.2.** The rate shall be for a unit of one number.

**23.112.(A)(I) Providing and fixing wash down water closet (European type W.C. Pan) with integral 'P' or 'S' trap including jointing the trap with soil pipe in C.M. 1:1 ( 1 cement : < fine sand) (seat and cover to be measured and paid for separately) ; Vitreous china pattern : In white colour,.**

**1.0. Materials**

Wash down water closet (European type W.C. Pan) shall conform to M-60. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** The closet shall be fixed to the floor by means of 75 mm. long 6.5 mm. diameter counter sunk bolts and nuts embedded in the floor concrete using rubber or before washers so as not to allow any lateral displacement. The joint between the trap of W.C. and soil pipe shall be made with C.M. 1:1 (1 cement : 1 fine sand).

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described under workmanship.

**3.2.** The rate includes cost of all labour for fixing pans and seat and cover, inlet, connections etc. complete including testing the same. The payment of seat and cover shall be made separately.

**3.3.** The rate shall be for a unit of One number.

**23.113.(A) Providing and fixing 100 mm. size 'P' or 'S' trap for water closet squatting pan including jointing the trap with the pan and soil pipe in cement mortar 1:1 (1 cement : 1 fine sand) Vitreous China.**

**1.0. Materials :** The 100 mm. size 'P' or 'S' trap for water closet shall conform to M-62. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** The 'P' or 'S' trap shall be fixed with pan cast iron pipe with C.M. 1:1. The pan shall be provided with a 100 mm. 'P' or 'S' trap as specified in the item with an approximately 50 mm. seal. The joint between the pan and the trap shall be made leak-proof with cement mortar 1:1 (1 cement : 1 fine sand).

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all materials and labour involved in the operations described under workmanship including testing.

**3.2.** The rate shall be for a unit of one number.

**23.114. Providing and fixing in C.M. 1:3 ( 1 cement : coarse sand) a pair of white vitreous china 250 mm. x 130 mm. 30 mm. foot rest for long pattern squatting pan water closet.**

**1.0. Materials**

**1.1.** The pair of white vitreous china foot-rests shall conform to M-62. Cement mortar shall conform to M-11.

**2.0. Workmanship**

**2.1.** After laying the floor, the floor shall be suitably sloped so that the waste water is drained into the pan. A pair of foot-rests of size 250 mm. x 130 mm. x 30 mm. of white vitreous china shall be set in cement mortar 1:3 (1 cement ; 3 coarse sand). The foot-rests shall be fixed at a distance of 175 mm. from the inner edge of the back side of the pan and shall be fixed at convenient angle.

**3.0. Mode of measurements & payment**

**3.1.** The rate shall include the cost of all materials and labours involved in all the operations described under workmanship.

**3.2.** The rate shall be for a unit of One pair.

**23.115.(A)(I) Providing and fixing 12.5 liters low level flushing cistern with a pair of C.I. or mild steel brackets complete with fittings such as lead valve less syphon, 15 mm. nominal size brass ball valve with polythene float, C.P. brass ball handle, unions and couplings for connections with inlet, outlet and overflow pipes, 40 mm. dia. porcelain enameled flush bend including cutting holes in walls and making good the same and connecting the flush bend with cistern and closet (overflow pipe to be measured and paid for separately) : Vitreous China. In white colour.**

**1.0. Materials**

**1.1.** The low level vitreous china (Enamel) flushing tank shall conform to M-65 except that the flushing cistern shall be 12.5 liters low level type as mentioned in the item.

**2.0. Workmanship**

2.1. The low level cistern shall be firmly fixed on two C.I. or mild steel, brackets which shall be firmly embedded in the wall in C.M. 1:4 ( 1 cement : 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be 30 cms of low level flushing cistern shall be connected to the closet by means of 40 mm. dia, white porcelain enameled flush bend using Indian rubber adapts joints. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials, non-ferrous metal or galvanised steel. The flush pipe from the cistern shall be connected to the closet by means of cement of red-lead.

**3.0. Mode of measurements & payment**

3.1. The rate shall include the cost of all materials fitting and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of One number.

**23.116. Providing and fixing 12.5 liters level C.I. flushing with a pair C.I. or mild steel brackets, complete with fittings such as syphonic arrangement, 15 mm. nominal size brass ball valve with polythene flat, lever. G.I. China (60 cms.) and pull unions and couplings for connections with inlet, outlet and overflow pipes etc. including cutting holes in walls and making good the same (overflow pipe to be measured and paid for separately).**

**1.0. Materials**

1.1. The high level C.I. flushing cistern shall conform to M-66, except that the flushing cistern shall be of 12.5 liters high level C.I. cistern as mentioned in the item.

**2.0. Workmanship**

2.1. The cistern shall be fixed on two C.I. or mild steel brackets which shall be firmly embedded in the wall in cement mortar 1:4 ( 1 cement : 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be two meters.

2.3. The W.C. Pan shall be connected to the cistern by galvanised steel flush pipes of 32 mm. nominal internal diameter. The flush pipe shall be fixed to wall by using clamps. The flush pipe from the cistern shall be connected to the closet by means of cement of red-lead. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials non-ferrous metal or galvanised steel.

2.4. The chain and the pull union shall be fixed to the protruding level arm of the flushing cistern.

2.5. The whole installation shall be tested for leak-proof joints and satisfactory functioning.

**3.0. Mode of measurements & payment**

3.1. The rate shall include the cost of all materials, fittings, and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of One number.

**23.117. Providing and fixing in position with clamps etc. 32 mm. nominal internal dia. galvanised steel tube flush pipe for high level flushing cistern including connecting the flush pipe with cistern and closet and making good the walls and floors.**

**1.0. Materials**

1.1. The 32 mm. nominal internal dia, galvanised steel tube flush pipe shall conform to M-56.

**2.0. Workmanship**

2.1. The W.C. pan shall be connected to the cistern by galvanised steel flush pipe of 32 mm nominal internal diameter. The flush pipe shall be fixed to wall by using clamps.

2.2. The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

2.3. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials, non-ferrous metal or galvanised steel.

**3.0. Mode of measurements and payment**

3.1. The rate shall include the cost of all materials, fittings and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of One running meter.

**23.120. Providing and fixing G.I. inlet connection for flush pipe with W.C. Pan.**

**1.0. Materials**

1.1. The G.I. inlet connection for flush pipe shall conform to M-56.

**2.0. Workmanship**

2.1. The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

**3.0. Mode of measurements & payment**

3.1. The rate shall include the cost of all materials, fittings and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of One number.

**23.127. Providing and fixing wash basin with single hole for pillar top white C.I. or M.S, brackets painted white including cutting holes, and making good the same but excluding fittings, vitreous china flat back wash basin 550 mm. x 400 mm. in white colour.**

**1.0. Materials**

1.1. The white glazed earthenware wash basin shall be 550 mm. x 400mm. of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall conform to M-59.

**2.0. Workmanship**

2.1. The washbasin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of M.S. or C.I. brackets fixed in C.M. 1:3 (1 cement : 3 sand). The bracket shall conform to I.S. : 775-1962. The wall plaster on the rear shall be cut to rest the top edge of the washbasin. After fixing the basing, plaster shall be made good and surface finished to match the existing one.

2.2. The brackets shall be painted white with ready-mixed paint.

2.3. The C.I. brass trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct in to gully-trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged in to vertically.

2.4. The height of the front edge to the wash basin from the floor level shall be 80 cms.

2.5. The necessary inlet, outlet connections and fittings such as pillar cocks, CP dress waste trap waste pipe, stop cock, chain wish rubber plug etc. shall be fixed.

2.6. The payment of fittings shall be made separately under separate items.

**3.0. Mode of measurements & payment**

3.1. The rate includes cost of all labour, materials, tool3 and plant etc. required for satisfactory completion of this item as specified in workmanship.

3.2. The rate shall be for a unit of One number.

**23.130.(C) Providing and fixing kitchen sink with C.I. or M.S. brackets painted white including cutting holes in walls and making good the same of but excluding fittings. Vitreous china sink 600 mm. x 450 mm. x 150 mm. size.**

**1.0. Materials**

1.1. White glazed vitreous china sink 600 mm. x 450 mm. x 150 mm. size shall conform to M-63.

**2.0. Workmanship**

2.1. The kitchen sink shall be supported on a pair of M.S. or C.I. brackets fixed in cement mortar 1:3 (1 cement : 3 coarse sand). The M.S. or C.I. brackets shall conform to I.S. 775-1962. The wall plaster on the rear shall be cut to rest over the top edge of the sink. After fixing the sink, plaster shall be made good and he surface finished to match with the existing one.

2.2. The C.P. brass trap and union shall be connected to 40 mm. nominal bore galvanised mild steel waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to gully-trap or direct into the gully-trap on the ground on floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where surface drain or a floor trap is placed directly under the sink and the waste is discharged to it vertically.

2.3. The height of front edge of the wash basin from the floor, level shall be 80 cms.

**3.0. Mode of measurements & payment**

3.1. The rate includes cost of all labour, materials, tools and plant and other equipment required for satisfactory completion of this item as described in workmanship.

3.2. The rate shall be for a unit of One number.

**23.135 (A) Providing and fixing 32 mm, dia. C.P. brass waste for wash basin or sink.**

**1.0. Materials**

1.1. The C.P. brass trap and unions shall be of 32 mm. dia. and of best quality and make as approved by the Engineer-in-charge

**2.0. Workmanship**

2.1. C.P. brass waste trap and union shall be connected to 32 mm dia waste pipe which shall be suitably bent towards the wall which shall discharge into drain through a floor trap The C.P brass waste trap shall be provided for wash basin or sink as the case may be.

**3.0. Mode of measurement & payment**

3.1. The rate includes all labours and providing C.P. brass waste trap and union including waste couplings of 32 mm fin. The rate excludes the cost of waste pipe of 32 mm. dia.

3.2. The rate shall be for a unit of One number.

**23.135.(B) Providing and fixing 40 mm dia. C.P. Brass waste for wash basin or sink.**

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item 23.135 (A) shall be followed except that the diameter of C.P. brass waste is 40 mm dia.

**2.0. Mode of measurements & payment**

2.1. The rate shall be for a unit of One number.

**23.136.(A) Providing and fixing 32 mm. dia. M.I. union for wash basin or sink.**

**1.0. Materials**

1.1. The 32 mm dia M.I. Fisher union shall be of best quality and made as approved by the Engineer-in-charge.

**2.0. Workmanship** 2.1. The 32mm dia M I. Fisher union shall be fixed to wash basin or sink in best workman like manner.

**3.0. Mode of measurements and payment**

3.1. The rate includes all labours and materials, tools and plants etc. required for satisfactory completion of the item.

**23.136.(B) Providing and fixing 40 mm, dia. M.I. fisher union for wash basin or sink.**

**1.0. Materials and Workmanship**

1.1. The relevant specifications of item No. 23, 136 (A) shall be followed except that the diameter of M I fisher union shall be 40 mm. dia.

**2.0. Mode of measurements of payment**

2.1. The rate shall be for a unit of One number

**23.139. Providing and fixing 100 mm. dia, sand cast iron grating for gulley floor or Nahni tarp.**

**1.0. Materials**

1.1. The- 100 mm. dia. sand cast iron gratings for gulley, floor or Nahni trap shall be of best quality and make as approved.

**2.0. Workmanship**

2.1. The CAST IRON grating shall be provided to gulley trap floor or Nahni trap as the case may be in best workmen like manner.

**3.0. Mode of measurements and payment**

3.1. The rate shall include cost of all labour, materials, tools and plants, etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23 :141.(A) Providing and fixing 100 mm. dia, C.P, brass shower rose with 15 mm or 20 mm. inlet.**

**1.0. Materials**

1.1. 100 mm. dia C P. brass shower rose shall conform to I S. 2556-1972 part - XI and of best quality and makes as approved by engineer-in-charge. The inlet of shower rose shall be 15 mm dia. or 20 mm dia. as directed.

**2.0. Workmanship**

**2.1.** The C.P. brass shower rose shall be fixed as directed with 15 mm. dia. or 20 mm. dia. G.I. inlet pipe as the case may be.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes all labours and materials, tools and plant etc. required for satisfactory completion of this item

**3.2.** The rate shall be for a one number.

**23.143. Providing and fixing 600 mm. x 450 mm. beveled edge mirror of superior glass mounted on 6 mm. thick A.C. Sheet or plywood sheet and fixed to wooden plugs with C.P. brass screws and washers,**

**1.0. Materials**

**1.1.** The 600 mm. x 450 mm. size mirror shall be of superior glass with edge rounded over beveled as specified. It shall be free from flaws specks, or bubbles and its thickness shall not be less than 6 mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects Silvering shall have a protective uniform covering of red lead paint. The 6 mm thick plywood shall conform to M-37. The 6 mm. thick A.C. sheets shall conform to M-24.

**2.0. Workmanship**

**2.1.** The mirror of 600 mm. x 450 mm. size mounted on A.C. Sheet or plywood 6 mm thick with C.P. brass clips shall be fixed as directed, by fixing wooden plugs in wall and C.P. brass screws and washers. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements & payment**

**3.1.** The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of One number.

**23.144.(B) Providing and fixing 600 x 20 mm. C.P. brass towel rail complete with C.P. brass brackets fixed to wooden plugs with and C.P. brass screws.**

**1.0. Materials**

**1.1.** The C.P. brass towel rail shall be 600 x 20 mm. of best quality as approved by the Engineer-in-charge The brackets shall be of C.P. brass. The rail shall conform to I.S. 1068-1958.

**2.0. Workmanship**

**2.1.** The brackets of the towel rail shall be fixed by means of C.P. brass screws to wooden plugs firmly embedded in the wall with C.M. 1:3 (1 cement : 3 coarse sand). The towel rail shall be fixed as and where directed.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

**3.2.** The rate shall be for a unit of One number.

**23.145. Providing and fixing 600 mm. x 120 mm. glass shelf with C.P. brass brackets and guard rail complete, fixed to wooden plugs with C.P. brass screws.**

**1.0. Materials :** The glass shelf of 600 mm. x 120 mm. size shall be of 5 mm. thick plate glass. The edge of the glass shall be ground. The C.P. over brass guard rail shall be best quality and make.

**2.0. Workmanship**

**2.1.** The C.P. brass brackets of the glass shelf shall be fixed with C.P. screws to wooden plugs firmly embedded in the wall C.M. 1:3 (1 cement : 3 coarse sand). The C.P. guard rail shall be fixed to glass shelf as directed.

**3.0. Mode of measurement and payment**

**3.1.** The rate includes all labour and materials tools and plant etc. required for satisfactory completion of this item,

**3.2.** The rate shall be for a unit of One number.

**23.146.(A) Providing and fixing C.P. brass toilet paper holder.**

**1.0. Materials :** The toilet paper holder shall be of best quality and make, chromium plating shall be of grade 'B' type conforming to I.S. 1068-2958.

**2.0. Workmanship**

**2.1.** The toilet paper holder shall be fixed in position by means of screws and wooden plugs embedded in wall with cement 1:3 (1 cement : 3 coarse sand).

**3.0. Mode of measurements and payment**

3.1. The rate includes cost of all labour and material, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23.92.(A)(I) Providing and fixing brass screw down bib taps of following size. Polished bright : 14 mm. dia.**

1.0. **Materials** : 15 mm. dia. brass screw down with bright polished finished shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

**2.0. Workmanship**

2.1. The screw down bib cock 15 mm. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine spun yarn round the screwed end of the pipe. The bib cock shall be then screwed and fixed to water tight position.

**3.0. Mode of measurements and payment**

3.1. The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One Number.

**23.92.(A)(II) Providing and fixing brass screw down bib taps of following size : Polished bright: 20 mm. dia.****1.0. Materials and Workmanship**

The relevant specifications of item 23.92 (A) (i) shall be followed except that the bib taps of 20 mm. dia shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item 23.92 A(i) shall be followed.

2.2. The rate shall be for a unit of One number.

**23.92.(B)(I) Providing and fixing chromium plated brass screw down bib taps of the following size : 15 mm. dia.****1.0. Materials and workmanship**

The relevant specification of item No. 23.92 (A) (I) shall be followed except that the brass chromium plated screw down tap of 20 mm. dia. shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The rate of shall be for a unit of One number.

**23.92.(B)(II) Providing and laying chromium plated brass screw down bib taps of following size : 20 mm. dia.****1.0. Materials and workmanship**

The relevant specifications of item No. 23.92 (A) shall be followed except that the brass chromium plated screw down tap of 20 mm. dia. shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The rate shall be for a unit of One number

**23.92.(C)(I) Providing and fixing gun metal screw down bib taps of the following size : 15 mm. dia.****1.0. Materials and workmanship**

1.1. The relevant specification of item No. 23.9\*3 (A) (I) shall be followed except that the 15 mm. dia. gun metal screw down bib tap shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The rate shall be for a unit of One number,

**23.92.(C)(II) Providing and fixing gun metal screw down bib taps of following size : 20 mm. dia.****1.0. Materials & Workmanship**

1.1. The relevant specifications of item 23.92 (A) (i) shall be followed except that the 20 mm. dia. gun screw down bib tap shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The rate shall be for a unit of One number.

**23.95(A) Providing and fixing pillar tap capstan head screw down high pressure with screw shank and back nuts : (A) 14 mm. dia. (B) 20 mm. dia.**

1.0. **Materials** : The capstan head pillar tap of specified dia. of C.R over brass shall be best quality and shall conform to I.S. : 1975 - 1961. The pillar taps shall be tested quality.

**2.0. Workmanship**

**2.1.** The capstan head pillar tap of specified dia. shall be fixed as directed with required washers of selected leather or rubber asbestos composition or of plastic as directed. The cock shall fixed with pipe line white Zink end spun yarn, to make joint water tight. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements and payment**

**3.1.** The rate shall be for a unit of one number.

**23.96(A) Providing and fixing brass screw down stop cock (A) 15 mm. dia. (B) 20 mm. dia. (C) 25 mm. dia.**

**1.0. Materials :** The brass screw down stop cock of specified dia shall conform to IS. : 781 -1977 The stop cock shall be of tested quality.

**2.0 Workmanship**

The stop cock shall be fixed in position by means of Jam nut and socket. The stop cock shall be fixed near the inlet of the water meter or as directed. The joints shall be done with white zinc and spun yarn. The joint shall be tested for leak proofing.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes cost of all labours, materials, tools and plant etc. required for satisfactory completion of this item.

**23.99. Providing and fixing gunmetal check or non-return valve. (A) 15 mm. dia. (B) 20 mm. dia. (C) 25 mm. dia. (D) 32 mm. dia. (E) 40 mm. dia.**

**1.0. Materials :** The gun metal check or not return full way wheel valve or specified dial, shall conform to I.S. : 778-1964. The non-return valve shall be of tested quality.

**2.0. Workmanship**

**2.1.** The gun metal check or non return valve shall be fully cleared of all foreign matter before fixing. The fixing of shall be done by means of bolts nuts and 3 mm. rubber insertions with flags of spigot and socketed tail pieces, drilled to the same specifications as in case of socket and spigot flanges in case of flanged pipes. The joining shall be done leak proof.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.

**3.2.** The rate shall be for a unit of One number.

**23.00. Providing and fixing chromium plated brass half turn flush cock of approved quality including fixing in pipe line etc. complete (I) 20 mm. dia. (II) 25 mm. dia. (III) 32 mm. dia.**

**1.0. Materials :** Chromium plated brass half turn flush cock shall conform to M-67.

**2.0. Workmanship**

The half turn flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in G.I. pipe line with necessary fittings. The joints shall be made leak proof by using spun yarn and white Zink. The fixing work shall be carried out as per relevant specifications of item No. 23.2(4).

**3.0. Mode of measurements and payment**

**3.1.** The rate includes cost of all materials and labour required for satisfactory completion of this item including fittings.

**3.2.** The rate shall be for a unit of One number.

**23.00.4. Providing and fixing chromium plated bottle trap with necessary coupling of approved quality for wash basin.**

**1.0. Materials :** The chromium plated bottle trap shall be approved make and of best quality. The bottle trap shall be provided with coupling.

**2.0. Workmanship**

The bottle trap shall be fixed on wash hand basin with wooden gullies and screws as directed. The work shall be carried out in best workman like manner.



**3.0. Mode of measurements and payment**

3.1. The rate includes cost of all materials and labour involved for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23.122.(A) Providing and fixing urinal of approved quality including connecting the urinal with waste pipe trap etc. complete : whit earthenware flat back or corner type size 430 mm. x 260 mm. x 350 mm.**

1.0. **Materials:** The white earthenware flat back or corner type urinal of size 430 mm. x 260 mm. x 350 mm. shall conform to M-64.

**2.0. Workmanship**

2.1. The urinals shall be fixed in position by using wooden plugs and screws and shall be at a height 65 cms. from the Moor level to the top of the lip of urinal, unless otherwise directed. The wooden plugs shall be of 50 mm. x 50 mm. at base tapering to 38 mm. x 38 mm. at top 50 mm. in length shall be fixed in wall in steel waste pipe which shall discharge in the channel or floor a tap. The connection between the urinal and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp.

**3.0. Mode of measurements and payment**

3.1. The rate shall includes cost all labours, materials, tools and plants etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23.124.(A) Providing and fixing urinal of approved quality including connection with trap and with integral longitudinal flush pipe squatting plate pattern white earthenware 550 mm. x 300 mm.**

1.0. **Materials :** The squatting plate pattern, white glazed earthenware urinal of 550 mm x 300 mm shall conform to I.S. 771-1063. It shall be test India make.

**2.0. Workmanship**

2.1. The squatting plate urinal shall be fixed as directed.

2.2. The top edge of the squatting plate shall be flush with the finished floor level adjacent to it. It shall be embedded on a layer of 25 mm. thick cement mortar 1:8 (1 cement: 8 fine sand) laid over a bed of burnt brickbat cement 1:5 :10( 1 cement: 5 fine sand, 10 graded brick aggregate 20 mm. nominal size). There shall be 100 mm. dia. glazed earthenware or vitreous china channel as specified with stop and outlet pieces suitably fixed in floor in cement mortar 1:3 (1 cement: 3 coarse sand) and joint finished with white cement. The earthenware vitreous china shall discharge into 65 mm. C.P. brass outlet grating. The trap and fitting shall be fixed as directed.

**3.0. Mode or measurements and payment**

3.1. The rate includes .cost of all materials, tools and plants and labour required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number

**23.134 Providing and fixing rubber plug for sink or wash basin.**

1.0. **Material:** The rubber plug for sink or wash hand, basin shall be best quality and make as approved by the Engineer-in-charge.

**2.0. Workmanship -**

2.1. The rubber plug with plain shall be fixed in wash basin or sink as directed.

**3.0. Mode of measurements and payment**

3.1. The rate shall be for a unit of One number.

**23.00.5.(A) Providing and fixing ball cock of approved quality as directed {Copper metal} : (I) 25 'mm. dia. (II) 50 mm. dia;****1.0. Materials :**

The ball cock of specified diameter shall conform to M-75

**2.0. Workmanship**

The ball cock of specified diameter shall be fixed as directed. The fixing of ball cock shall be carried out as per relevant specification of item No. 23 (A) for joints etc.

**3.0. Mode of measurement & payment**

3.1. The rate includes cost of all materials and labour involved for carrying out satisfactory work.

3.2. The rate shall be for a unit of One number.

**23.00.5.(B) Providing and fixing ball cock of approved quality as directed : Ebonite. (I) 25 mm. dia. (II) 50 mm. dia.)**

1.0. **Materials & Workmanship** : The relevant specifications of item No. 23.00.5 (A) shall be followed except that the ball cock of specified dia of Ebonite shall be fixed.

**2.0. Mode of measurements & payment**

2.1. The relevant specifications of item NO. 23.00.5 (A) shall be followed.

2.2. The rate shall be for a unit of One number.

**23.00.6. Providing and fixing C.I. Manhole cover 0.60 C.M. x 0.45 C.M. size having weight not less than 35 kg.****1.0. Materials**

C. I. Manhole cover of 0.60 x 0.45 Cms. size shall be of best quality. The height of C.I. cover and frame shall not be less than 35 Kg. The C.I. manhole cover shall be of light duty and conform relevant I.S.

**2.0. Workmanship**

2.1. The C.I. Manhole cover shall be fixed as per relevant specifications of item No. 24.44 except that the C.I. cover shall be fixed as and where directed.

**3.0. Mode of measurements and payment**

3.1. The rate includes cost of all labour and materials required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23.00.7. Providing and fixing G.I. water spout of 50 mm. dia. and 30 cms length.**

1.0. **Materials** : G.I.M.S. type of 50 mm. dia. shall conform to M-56.

**2.0. Workmanship**

2.1. The G.I. pipe of 30 cms. fixed as rain water pipe as directed. The pipe shall be fixed about 1/4 dia. below the floor level so as to make approach of water easy. The inlet of pipe shall be rounded off for easy entry of rain water pipe. The pipe shall be fixed in C.M. 1:3.

**3.0. Mode of measurements & payment**

3.1. The rate includes of all labour and materials required for satisfactory completion of this item.

3.2. The rate shall be for a unit of One number.

**23.8. Providing and fixing to wall ceiling and floor 6 Kg/ Sq. cm, working pressure outside diameter, low density completion with special flange compression type fittings wall clips etc. including making good the wall, ceiling and floor. (A) 20 mm. dia. (B) 25 mm. dia. (C) 32 mm. dia. (D) 40 mm. dia. (E) 50 mm. dia.**

1.0. **Materials** : The low density polythene pipe of specified diameter with 56 Kg/f. Sq. Cm. working pressure shall conform to I.S. 3076-1968. The specials and fittings required shall be of best quality.

**2.0. Workmanship**

2.1. The P.V.C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P-V.C. Pipes, due allowances shall be made particularly in over-ground pipe line for any change in length of pipe line which may occur during installation or when pipe line is in service.

2.2. Above ground installation of rigid P.V.C. pipe should be undertaken after precautions are observed for their protection against dirt, sun rays and mechanical damage.

2.3. The rigid P.V.C. lines should not be kept exposed above ground when it passes through public places, railway lines, roads, road side and foot paths.

2.4. P.V.C. pipe shall be supported at the following intervals ;  
 -20 mm dia 500 mm.      -25 mm. dia. 750 mm.      -32 mm. dia. 900 mm.

2.5. Close support spacing shall be provided if recommended by the manufacturer.

2.6. The guide lines indicated by the manufacturer regarding handling, transportation, storing, laying and jointing of pipes shall be kept in view during execution.

**2.7.** P.V.C. pipes shall be fixed on wall with wooden plugs suitable plastic clamps.

**2.8. Jointing the pipes :**

**2.8.1.** The pipes and socket s shall be accurately cut. The ends of the pipes and fittings should be absolutely free from dirt and dust. The outside surface of the pipes and the inside of the fittings shall then be roughened with emery paper, and then solvent cement shall be applied to the matching surface and pushed home and joint. Since solvent cement is aggressive to P.V.C. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Empty solvent cement tins, brushes, rags of paper impregnated with cement should not be buried in the trenches. They should be gathered, not left scattered about, as they can prove to be a hazard to animals, which may chew them.

**2.8.2.** If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge.

**2.9. Laying pipes in trenches:**

**2.9.1.** The pipes shall be laid over uniform relatively soft fine grained solid found to be free of presence of hard object such as large feints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.

**2.9.2.** The pipes laid underground shall not be less than one meter from the ground level. The pipe shall be positioned in the trenches so as to avoid any inducted stresses due to retraction. Any deviation required shall be obtained by using proper type of rubber ring joints.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item No. 23.2. (A) shall be followed except that the P.V.C. pipes of specified dia. shall be paid under this item.

**3.2.** The unit rate shall be for a unit of One running meter.

## SECTION-24

**24.1.(A) Providing any laying (two level or slopes) and jointing with stiff mixture of cement mortar in proportion 1:1 salt glazed stone-ware pipes, following nominal internal diameters including testing of pipes and joints complete : 100 mm. dia.**

**1.0. Materials**

(I) Water shall conform to M-1(2) Cement mortar of proportion 1:1 shall conform to M-11. (3) 100 mm. dia. glazed stoneware pipe shall conform to M-71.

**2.0. Workmanship**

**2.1.** The trenches for stoneware pipe drains shall be carried out as per relevant specifications of item No. 23.4 (A) except that the work is for stoneware pipes of 100 mm. dia.

**2.2. Laying:**

**2.2.1.** The pipes shall be laid accurately and perfectly true to line, levels and gradients, Great care shall be taken to prevent sand etc. from entering the pipes. The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. All junctions and changes in direction and diameter shall be made inside manholes by means of curved tapered channels formed in Cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for its entire length, on a even level bed grips being made or left on the bed to receive the sockets of the pipes.

**2.3. Jointing:**

**2.3.1.** Tarred gask in or yarn soaked in neat cement slurry shall first be placed around the spigot to each pipe and the spigot shall then be placed well home into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and gaskin caulked home so as to fill not more than 1/4th of the total depth or (13 mm. in depth) of the socket.

**2.3.2.** The remainder of the sockets shall be filled with stiff mixture of cement mortar in proportion of one part of cement and one part of sharp sand. When the socket is fillet, a filled shall be formed round the joints with a trowel, forming an angle of 45° with the barrel of the pipe.

**2.3.3.** The mortar shall be mixed as necessary for immediate use.

**2.3.4.** After the joint is made, any extraneous materials shall be removed from the inside of the joints with a suitable scraper or "badger". The newly made joints shall be protected, until set, from the sun, dry winds, rain or frost, sacking or other suitable materials which shall be used for the purpose.

**2.3.5.** The mortar shall be cured for 10 days.

**2.4. Testing of Joints:**

**2.4.1.** If any leakage is visible the defective part of the work shall be made good at no extra cost. The pipe line shall be tested as directed.

**2.4.2.** A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joints shall be watched for and taken as indicating a defect to be made good.

**3.0. Mode of measurements and payment**

**3.1.** Pounding or buttering of the fit trenches bed to the lower part of the pipe and "Grips" dug to take socket, collars etc. are included in the rate of laying the pipes.

**3.2.** The measurements shall be net without any allowance for cutting, and waste. The length of bends, junctions, and other connections shall be included in the total length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete,

**3.3.** The rate shall be for a unit of One running meter.

**24.1.(B) Providing and laying and jointing salt glazed stoneware pipes with lime concrete 1:2:4 (1 lime :2 fine sand : 4 graded brick aggregate 40 mm, nominal size)bedding with necessary form work and curing etc. complete : 150 mm. dia.**

**1.0. Materials & Workmanship :** The relevant specifications of item 24.1.(A) shall be followed except that the diameter of pipe shall be 150 mm. dia.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No, 24.1. (A) shall be followed.

**2.2.** The rate shall be for a unit of One running meter.

**24.2.(A) Providing and laying cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone : aggregate 40 mm. nominal size) bedding for stoneware pipe of following internal diameter with necessary form work and curing complete : 100 mm. dia. 300 mm. width (112 mm. average bed thickness).**

**1.0. Materials :** (1) Water shall conform to M-1 (2) Cement shall conform to M-3. (3) Sand shall conform to M-6 (4) Stone aggregate 40 mm nominal size shall conform to M-12.

**2.0. Workmanship**

**2.1.** The relevant specifications of item 5.3.4. shall be followed except that the concrete work shall be carried out in trenches as bedding for stoneware pipes. The width of concrete shall be 300 mm. and average thickness of bedding shall be 112 mm. The concrete shall be brought up at least to the invert level of the pipe to form a cradle and to avoid line contact between the pipe and the bed.

**3.0. Mode of measurements & payment**

**3.1.** The rate includes cost of all labour and materials required for satisfactory completion of this item.

**3.2.** The rate includes cost of necessary form work required if any

**3.3.** The rate shall be for a unit of One running meter.

**24.2.(B) Providing and laying cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm. nominal size) bedding for stoneware pipe of following internal diameter with necessary form work and curing complete : 150 mm. dia. 450 mm. width (166 mm. average bed thickness),**

**1.1. Materials & Workmanship :** The relevant specifications of item 24.2 (A) shall be followed except that the cement concrete work shall be carried out for bedding of stoneware pipe of 150 mm. dia. The average thickness of bedding shall be- 166 mm. and width shall be 450 mm.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item 24.2 (A) shall be followed.

**2.2.** The rate shall be for a unit of One running meter.

**24.19(1) Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and watertight C.I. cover with frame of 300 mm. x 300 mm. size (Inside) with standard weight : (A) square mount taps 100 mm. x 100 mm. size P. type**

**1.0. Materials :** (1) Water shall conform to M-1. (2) Cement mortar of proportion 1:5 shall conform to M-11. (3) Burnt brick shall conform to M-15. (4) The S.W. Gully trap of 100 mm. x 100 mm. size shall conform to M-70.

**2.0. Workmanship**

**2.1.** Excavation for gully trap shall be done true to dimensions and levels as indicated on plans or as directed. The excavation work shall generally be done as per relevant specifications of item 4.0.0. of earth work.

**2.2. Fixing:**

**2.2.1.** The gully trap shall be fixed over cement concrete 1:5:10 (1 cement : 5 sand : 10 graded brick bats aggregate 40 mm nominal size) foundation. 650 square and 100 mm. thick. The depth of top of concrete below the ground level shall be 675 mm. The jointing of gully outlet to the branch drain shall be done similar to jointing of S.W. pipe as described in item No. 24.1 (A).

**2.3. Brick masonry chamber :** After fixing and testing gully and branch drain, a brick masonry 300 x 330 mm. inside with bricks in CM 1:5 (1 cement : 5 sand) shall be built with a 100 mm. brick work round off; gully trap from the top of bed concrete up to ground level. The space between the chamber walls and

the trap shall be filled with cement concrete 1:5:10. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating.

**2.4.** C.I. cover with frame 300 mm. x 300 mm. (inside) size shall then be fixed on the top of the brick masonry with C.c. 1:2:4 (1 cement : 2 coarse sand : 4 graded aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from entering the gulley trap.

### **3.0. Mode of measurements & payment**

**3.1.** The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above.

**3.2.** The rate shall be for a unit of one number basis.

**24.22. Providing and laying (to level or slopes) and jointing reinforced concrete light duty non-pressure pipes I.S. class N.P. 2 of the following internal diameters with collars and butt ends prepared for collar joints including testing of joints etc. complete. (B) 150mm. (C) 250 mm. (D) 300 mm. (E) 450 mm. (F) 500 mm. (G) 600 mm. (H) 900 mm. (K) 1000mm. (M) 1200 mm.**

**1.0. Materials :** The reinforced concrete light duty non-pressure pipes of specified diameter shall conform to I.S. 458-1971.

### **2.0. Workmanship**

**2.1.** The relevant specifications of item No. 24.1. A shall be followed for work of trenches except that the excavation in trenches shall be for reinforced concrete pipes of specified diameter.

### **2.2. Laying**

**2.2.1.** The pipes shall be lowered into the trenches carefully. Mechanical appliances may be used. Where necessary pipe shall be laid in straight lines or with easy curves and true to line and gradient as specified. The laying of pipe shall proceed upgrade of a slope. In the pipe spigot and socket joints, the socket ends shall face upstream. In case of pipes with joints to be made with loose collars, the collars shall be slipped on before the next pipe is laid.

**2.2.2.** In case where the foundation conditions are unusual such as the proximity of trees or holes, under existing or proposed all round in 150 mm. thick cement concrete 1:5; 10 (1 cement: 5 fine sand : 10 graded stone aggregate 40 mm. nominal size) or compacted sand or gravel:

**2.2.3.** In case where the natural foundation is inadequate the pipes shall be laid either in concrete cradle, supported on proper foundations or on any other suitably designed structure. If concrete bedding is used, the depth of concrete below bottom of the pipe shall be at least 1/4th of the internal diameter of the pipe subject to a minimum of 100 mm. and a maximum 300 mm. The concrete shall be extended up the sides of the pipe at least to a distance of 1/4th of the outside diameter for pipes 300 mm. and over in diameter.

**2.2.4.** The pipes shall be laid in the concrete bedding before the concrete has set. Pipes laid in trenches in earth shall be bedded evenly and firmly and as far as up to the haunches of the pipe as to safely transmit the load expected from the back fill through the pipe to the bed. This shall be done either by excavating the bottom of the trenches to fit the curve of the pipe or by compacting the earth under a round curve of the pipe to form an even bed, Necessary provision shall be made for joints wherever required.

### **2.3. Jointing**

**2.3.1.** The joints shall be done by slipping the collar over and clear of the end of the pipe. The recess of the end of the pipe shall be filled with jute braiding in hot bitumen. The new pipe shall then be brought forward until the bitumen ring in recess of first pipe is set into the recess of the second pipe. The process shall be repeated for two or three pipes which shall then jacked up so as to thoroughly compress the bitumen. The quantity of jute and bitumen shall be just enough to fill the recess when pressed hard by jacking, care being taken that no offset of the jute braiding shall be visible either outside or inside of pipe. The collar shall then be set up over the joints covering equally both the pipe and leaving, an even caulking space all round. Cement and sand mortar: 1: 1.1/2 shall then be well punched or pressed home with a caulking tool within this caulking space. Care shall be taken that the underside of the joints is properly filled with mortar.

### **2.4. Curing**

**2.4.1.** Every joints shall be kept wet for about 10 days for maturing. The section of the pipe line laid and jointed shall be covered immediately to protect from weather effects. Minimum bore of 100 mm. is considered adequate.

**2.4.2.** The joints shall be left exposed for observation.

**2.5. Testing of Joints :**

**2.5.1.** The testing of joints shall be done as per relevant specifications of item No. 24.1 (A) **except that** the testing of reinforced concrete pipes shall be done.

**3.0. Mode of measurements & payment**

**3.1.** The relevant specifications of item 24.1 (A) shall be followed except that the rate includes for laying to level or slope in trenches etc. (measured separately), making the joints a; Seated and testing to stand the water test.

**3.2.** The measurements shall be net without any allowance for cutting and waste. The length of bends, junctions and other connections (measured along the centre line) shall be included in the total length of the pipes, the connections being numbered afterwards and paid for extra over pipes.

**3.3.** The size of bend, junctions, etc, shall suit the size of pipe. The bore (internal diameter of pipe) shall be the criterion for payment.)

**3.4.** Nothing extra shall be paid separately for the use of mechanical appliances, where necessary, as described above.

**3.5.** The rate shall be for a unit of One running meter.

**2.4.27. Costing Manhole with R.C.C. Top slab in 1:2:4 mix (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) foundation concrete 1:3:6 (1 cement : 3 coarse sand : 6 bricks bats 40 to 50 mm. size) inside plastering 15 mm. thick with C.M. 1:5 (1 cement : 5 coarse sand) finished with floating coat of neat cement and making channels in C.C. 1:2:4 mix (1 cement : 2 coarse sand : 4 stone aggregate 20 mm. nominal size) finished smooth complete including curing and testing (I) inside size 900 mm. x 120 mm. and 1.5 mm. deep, including C1 cover with frame size 560 mm. diameter, total weight of cover and frame to be not less than 128 Kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) With 230 mm. thick walls of brick masonry using bricks having crushing strength not less than 35 kg/sq. cm. in C.M. 1:5 (1 cement : 5 coarse sand)**

i.	A type depth	0.90 meter for	150 mm. sewer
ii.	B type depth	1.50 meter for	150 mm. sewer
iii.	C type depth	2.25 meter for	150 mm. sewer
iv.	D type depth	3.15 meter for	150 mm. sewer

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-6. Burnt bricks shall conform to M-15. Brick bats of 40 to 50 mm. size shall conform to M-14. Stone coarse aggregate of 20 mm. nominal size shall conform to M-12. Grit shall conform to M-8. Cement mortar of specified proportion shall conform to M-11. The cast iron manhole cover of 560 mm. dia. with frame shall conform to I.S. 1726-1966.

**2.0. Workmanship**

**2.1.** The manholes of different types and sizes as specified shall be constructed in sewer line at such places and to such levels and dimension as shown in drawings of as directed.

**2.2.** The manholes shall be built on a bed of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 brick bats) (40 to 50 mm. nominal size) to the thickness of the bed concrete shall be 15 cms. for manhole up to 1. M. depth and 20 cms. for manholes over meter and up to over meter and up to 2 meters, depth and 30 cms. for manholes o greater depth.

**2.2.2.** Projection of bed concrete beyond the masonry wall shall be 15 cms.

**2.3. Walls**

**2.3.1.** The walls of manhole shall be carried out with burnt bricks using having bricks. crushing strength not less than 35 Kg/Cms in C.M. 2 in C.M. 1:5 (1 cement : 5 coarse sand). The thickness of brick masonry wall shall be 230 mm. The jointing face of such .brick shall be well buttered with cement mortar before laying so as to ensure a full joints.

**2.4. Plaster**

**2.4.1.** The inside of waits shall be plastered 15 mm. thick with C.M. 1:5 (1 cement : 5 coarse sand) and finished with floating coat of neat cement. All angles shall be rounded to 7.50 cms. radius and all rendered internal surfaces shall have hard impervious finish obtained by using a steel trowel. The external joints of masonry shall be finished smooth.

**2.5. Channels & Benching :**

**2.5.1.** Channels shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the out going pipe and the top edge shall be suitably rounded off. The branch channels shall also be similarly constructed with respect to the benching but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow. The main channel shall be given.

**2.5.2.** The channel and benching shall be done in C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) rising at a slope in line from edges of channel. The channels of the bottom of the chamber shall be plastered with C.M. 1:2 (1 cement : 2 coarse sand) and steel troweled smooth.

**2.6. Cover slab:**

**2.6.1.** The cover slab of R.C.C. 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) 15 cms. thick reinforced with 10 mm. bars at 15 cms. C/C both ways, surface and edges finished fair. Full bearing equal to the width of wall shall be given to the slab on all sides. The frame of manhole cover shall be embedded firmly in R.C.C. slab so that the top of the frame remains flush with the top of R.C.C. slab.

**2.7. Testing:**

**2.7.1.** Manhole shall be tested by filling with water to a depth not exceeding 1.2 M. as directed.

**2.7.2.** After completion of work, manhole cover shall be sealed by means of thick grease.

**3.0. Mode of measurements and payment**

**3.1.** The depth of manholes shall be distance between the top of the manhole cover and the invert level of the main drain. The rate includes all labours, materials, tools, and plant etc. required for satisfactory completion of this item as directed above.

**3.2.** The rate shall be for a unit of the One number.

**24.28.(I) Extra rate for constructing B.B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27 (I) for depth from 0.90 to 1.5 M.**

**1.0. Materials and Workmanship**

The relevant specifications of item No. 24.27 (I) shall be followed for excavation same, except that the depth of manhole shall be done 0.1 M. or part thereof more than 0.90 meter up to 1.5 M. The extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above the depth 0.90 meter.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 24.27 (I) shall be followed except that the extra rate shall be paid for every additional depth of 0.1 M. and part thereof shall be paid over and above the rate of item No. 24.27 (I)

**2.2.** The rate shall be for a unit of One number.

**24.28.(II) Extra rate for constructing B.B. masonry for every additional depth of 0.1 M. and Part thereof over item 24.27 (II) for depth from 1.5 M. to 2.25 M.**

**1.0. Materials and Workmanship :** The relevant specifications of item No. 24.27 (II) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 1.5 M. up to 2.25 M. The extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above the depth 1.50 M. up to 2.25 M.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 24.27 (II) shall be followed except that the extra rate shall be paid for 0.1 M. or part thereof additional depth of manhole provided over and above item 24.27 (II).

**2.2.** The rate shall be for a unit of One number.

**24.28.(III) Extra rate for constructing B.B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27 (III) for depth from 2.25 to 3.15 M.**



**1.0. Materials and Workmanship :** The relevant specifications of item No. 24.27 (III) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 2.25 M. up to 3.15 M. Extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above depth 2.25 M. up to 3.15 M.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No. 24.27 (III) shall be followed except that the extra rate shall be paid for every addition 0.1 M. or part thereof depth provided over and above it -m 24.27 (III).

**2.2.** The rate shall be for a unit of One number.

**24.28.(IV) Extra rate for constructing B.B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27 (IV) for depth above 3.15 M.**

**1.0. Materials and Workmanship :** The relevant specifications of item No. 24. 27 (IV) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 3.15 M above. **1.2.** Extra payment shall be made for additional depth of manhole 0.1 M. or part thereof done above 3.15 M. and above depth.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item 24.27 (IV) shall be followed except that extra rate shall be paid for every additional 0.1 M. or part thereof depth provided for an above item 24.27 (IV).

**2.2.** The rate shall be for a unit of One number.

**24.33. Providing and fixing C.I. steps of sizes 500 x 150 mm. 22.5 mm. and painting with two coats of anti-corrosive paint etc. complete.**

**1.0. Materials :** The C.I. steps of size 500 x 150 x 22.5 mm. size shall conform J.S. 5455-1969. Paint shall conform to M-44.

**2.0. Workmanship**

**2.1.** The C.I. steps of size 500 x 150 x 22.5 mm. size shall be fixed in manhole as and where directed. The steps shall be staggered in vertical runs 380 mm. apart horizontally. The top step shall be 450 mm. below the manhole cover and lowest not more than 300 mm. above the benching. The steps shall be embedded in wall of manhole with C.C. : 1:3:6 up to 200 m. depth and the surface finished with cement plaster 15 mm. thick in C.M. 1:5. The steps shall be painted with two coats of anti-corrosive paint.

**3.0. Mode of measurements & payment**

**3.1.** The rate includes all labour, materials, tools and plants etc. required for satisfactory completion of this item.

**3.2.** The rate shall be for a unit of One number.

**24.39. Providing and erecting at the site of work steel ventilating column of 150 mm. internal dia. and 12.20 M. high from G.L. to bottom of top grill, including C.I. grill and base plate, bolts and nuts etc. and excavation in foundation of size 120 x 120 x 165 cms. and filling the pit with 1st layer of cement concrete 1:3:6 mix (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) of size 120 x 120 x 90 cm. and remaining pit with B.B,C.C. 1:3:6 mix ( 1 cement : 3 coarse sand : 6 brick bats 40 to 50 mm. size) and providing filled in cement concrete : 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) at G.L. and 3 coats of silver paint etc. complete.**

**1.0. Materials :**

The steel ventilating column internal dia. 150 mm. 12.20 m. high shall be of standard many and best quality as approved. Stone aggregate of 20 mm. nominal size shall conform to M-12. Brick-bats-40 to 50 mm. nominal size shall conform to M-4. Cement shall conform to M-3. Water shall conform to M-1. Silver (Aluminum) paint shall conform to I.S. 2339-1963.

**2.0. Workmanship**

**2.1.** The vent shaft shall be provided at the starting point of main sewer and at such points where the flow of sewerage is disturbed i.e. at falls, siphons etc. As far as possible, the location shall be at such a place where it receive Sundays for the maximum period of the day.

**2.2.** A pit of 120 x 120 x 165 ms. size shall be dug The cement concrete of 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) shall be first laid in the pit to form 90 cms. thick

concrete foundation which shall be allowed to set for 24 hours. The vent shaft shall then be erected at the centre of the pit truly in plumb by means of such as shear legs, pullies, backless and rope etc.

**2.3.** The connection with sewer man-hole shall be made using 150 mm. diameter cement concrete pipe. After the connection is completed, the pit shall be filled with cement concrete : 1:3:6 (1 cement: 3 coarse sand : 6 brick bats 40 to 50 mm. nominal size) round the vent shaft up to ground level except top 150 mm. which shall be filled with C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and rendered smooth. The junction of vent shaft with cement concrete shall be grouted with cement mortar 1:1 (1 cement : 1 sand). The concrete work shall be cured for 7 days.

**2.4.** The steel shaft shall be painted with silver paint (aluminum paint) 3 coats. The relevant specifications of item of painting shall be followed for painting.

**3.0. Mode of measurements and payment**

**3.1.** The rate shall include the cost of all labours and materials, tools and plant etc. required for satisfactory completion of this item as directed above.

**3.2.** The rate shall be for a unit of One number.

**24.00.1.(A) Providing and laying lime concrete 1:2:4 (1 Lime Putty : 2 fine sand : 4 graded brick aggregate 40 mm. nominal size) bedding for stoneware pipes of following internal diameters with necessary form work and curing complete : 100 mm. dia (112 mm. average, bed thickness).**

**1.0. Materials :** Water shall conform M-1. Lime mortar shall conform to M-10. Brick aggregate 40 mm. nominal size shall conform to M-14.

**2.0. Workmanship**

The relevant specifications of item No 5.1.8 shall be followed except that the proportion of mix shall be 1:2:4 (1 Lime Putty : 2 fine sand : 4 graded brick bats aggregate 40 mm. nominal size) and the concrete work shall be done in trenches for bedding of stoneware pipes of 100 mm. dia. The width of concrete shall be 300 mm. and the thickness of bedding shall be 112 mm. average.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item 24.2 (A) shall be followed.

**3.2.** The rate shall be for a unit of One running meter.

**24.00.1(B) Providing and laying lime concrete 1:2:4 (1 Lime Putty : 2 fine sand : 4 graded brick aggregate 40 mm. nominal size) bedding for stoneware pipes of following internal diameters with necessary form work and curing complete : 150 mm. dia. (166 mm. average bed thickness).**

**1.0. Materials and workmanship :** The relevant specifications of 24.00.1 (A) shall be followed except that the concrete bedding shall be carried out for 150 mm. dia. stoneware pipe. The width of concrete bedding shall be 450 mm. and the average thickness shall be 166 mm.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 24.2 (A) shall be followed.

**2.2.** The rate shall be for a unit of One running meter.

**24.27(1) Extra over item 24.1 for providing salt glazed stoneware fittings : Bends of required degree (Any Radius) of following internal diameters : A-100 mm. dia. B-150 mm. dia.**

**1.0. Materials & Workmanship**

The relevant specifications of item 24.1 (A) shall be followed that the salt glazed stoneware bends of any degree of specified diameter shall be provided.

**2.0. Mode of measurement & payment**

**2.1.** The relevant specifications of item No. 24.1 (A) shall be followed except that extra payment shall be made for providing salt glazed stoneware bend of specified diameter or required degree of any radius over above the of item No. 24.1.

**2.2.** The rate shall be for a unit of One number.

**24.17.(I)(A) Extra over item 24.1 for providing salt glazed stoneware fittings : Taper bend of required degree of following internal diameter. 100 mm. x 150 mm.**

**1.0. Materials & Workmanship :** The relevant specifications of item 24.1 (A) shall be followed except that the salt glazed stoneware taper bend of required degree of 100 mm. x 150 mm. shall be fixed.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item No, 24.1 (A) shall be followed except that extra payment shall be made for providing salt stoneware taper bend of required degree of 100 mm. x 150 mm. size over and above the rate of item No. 24.1.

**2.2.** The rate shall be for a unit of One number.

**24.17.(III) Extra over item 24.1 for providing salt glazed stoneware fittings : Single junction of required angle of following internal diameter (A) 100 mm. dia. (B) 150 mm. dia.**

**1.0. Materials & Workmanship**

The relevant specification of item 24.1 (A) shall be followed except that the salt glazed stoneware single of junction required angle of specified diameter shall be fixed.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item 24.1 (A) shall be followed except that the extra rate shall be paid for providing salt glazed stoneware single junction of required angle for specified diameters over and above the rate of item 24.1.

**2.2.** The rate shall be for a unit of One number.

**24.18. Providing and laying, jointing and jointing and pointing with stiff mixture of C.M. 1 : 1 (1 cement : 1 fine sand) 150 mm. internal diameter salt glazed stoneware half round channels.**

**1.0. Materials and Workmanship :** The relevant specifications of item 24.1 shall be followed except that the half round channels of 150 mm. internal diameters shall be fixed in cement mortar 1:1.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item 24.1 (A) shall be followed.

**2.2.** The rate shall be for a unit of One running meter.

**24.35. Supplying and fixing C.I. cover 300 x 300 mm. without frame for gully trap (Standard pattern), weight of cover shall not be less than 4.53 Kg.**

**2.0. Workmanship**

The C.I. cover 300 x 300 mm. size without frame shall be fixed on top of the brick masonry with cement concrete : 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from entering the gully trap.

**3.0. Mode of measurements and payment**

**3.1.** The relevant specifications of item No, 24.19 shall be followed.

**3.2.** The rate shall be for a unit of One number.

**24.40. Constructing brick masonry road gully chamber 500 mm. x 450 mm. x 600 mm. including 500 mm. x 450 mm C.I. horizontal grating with frame complete.**

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Brick shall conform to M-15. C.I. Grating of 500 x 450 mm. size of standard make shall be of approved quality. Stone aggregate 40 mm. nominal size shall conform to M-12. coal tar shall conform to relevant M-5.

**2.0. Workmanship**

**2.1.** The chamber shall be of size 500 mm. x 450 mm. internal clear dimensions between the masonry wall faces. The height of 500 mm. shall be measured from the top of the bed concrete to the top of the C.I.

frame. The size of grating indicate the clear internal dimensions of the C.I. frame of the grating.

**2.2.** The excavation shall be done to true dimensions and levels.

**2.3.** The foundation concrete shall consist of 150 Cms x 100 Cms x 15 cms thick C.C. 1:5:10(1 cement : 5 sand : 10 graded stone aggregate 40 mm. nominal size).

**2.4.** The wall of the chamber shall be constructed in brick work C.M. 1:5 and 23 Cms. thick as per relevant specifications of item 6.12(8).

**2.5.** The walls and the bed concrete of chamber shall be plastered inside with 12 mm. thick cement plaster 1 : 3 (1 cement : 3 coarse sand) finished smooth.

**2.6.** The gully grating cover shall be hinged to frame to facilitate its opening for cleaning and repairs. The frames of the gully grating g shall be fixed on the top of masonry wall of the chamber in 15 cms. thick C.C. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) laid over the full thickness of walls..

**2.7.** The chamber shall have connection pipe, the length of which in meter between the road gully chamber and the manhole of the drain shall not be less than 1/40 times the nominal diameter of the pipe in MM. i.e. for 150 mm\* connection pipe the length shall not be cement plaster on the bed concrete.

**2.8. Painting :** After the completion of the work of exposed surface of the grating of the frame shall be painted with a thick coat of coal tar.

**3.0. Mode of measurements and payment**

**3.1.** The cost of connection pipes is not included in the item and shall be paid separately. However, fixing the connection pipes in the walls of gully chamber is included in the rate for gully chambers and nothing extra shall be paid for this separately.

**3.2.** The rate shall be for a unit of One number.

**24.41. Constructing brick masonry road gully chamber 450 mm. x 450 mm. x 775 mm. with vertical grating complete.**

**1.0. Materials and Workmanship :** The relevant specifications of item 24.40 shall be followed except size of road gully chamber is 450 mm x 775 mm. with vertical grating complete.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item 24.40 shall be followed.

**2.2.** The rate shall be for a unit of one number.

**24.42. Constructing brick masonry road gully chamber 1100 mm. x 500 mm. x 775 mm. including 500 mm. x 450 mm. C.I. horizontal grating with frame and vertical grating complete.**

**1.0. Materials and Workmanship :** The relevant specifications of item 24.40 shall be followed except that the size of road gully chamber shall be 1100 mm. x 500 mm. x 775 mm. including 500 mm. x 450 mm. C.I. horizontal grating with frame and vertical grating complete.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item No. 24.40 shall be followed.

**2.2.** The rate shall be for a unit of one sq. meter.

**24.44(1) Constructing brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg/ Cm. 2 in C.M/ 1:5 C.I. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt of cover 23 Kg. and Wt of frame 15 Kg. ) R.C.C. top slab C.C. 1:2:4 mix (1 cement : 2 coarse sand : 4 graded aggregate 20 mm. size) foundation concrete 1:5:10, inside plaster 15 mm. thick with C.M. 1:3 finished smooth with a finishing coat of neat cement on walls and bed concrete etc. complete : Inside dimensions 455 mm. x 610 mm. and 450 mm. deep for single pipe-line.**

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Coarse sand shall conform to M-5. Brick shall conform to M-15. Stone aggregate shall conform to M-12. Brick bat shall conform to M-14. M.S. bar shall conform to M-18.

**2.0. Workmanship**

**2.1.** C.I. inspection chamber with provision of C.I. bends of specified size with bolts, nuts and felt washers for underground drain shall be enclosed in masonry chamber which shall be constructed as under:

**2.2.** The excavation shall be done true to dimensions and level shown in one of the plans or as directed.

**2.3.** Bed concrete shall be 15 Cms, thick C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bat aggregates). The projection of bed concrete beyond the masonry walls shall be 7.5 cms.

**2.4.** Masonry walls and plaster work shall be carried out as per relevant specifications of item 24.40.

**2.5.** The cover slab shall be constructed as per relevant specifications of 24.27 (I).

**3.0. Mode of measurements and payment**

**3.1.** The earth work in excavation, providing and laying C.I. inspection chamber and bends shall be measured and paid for separately.

**3.2.** The rate shall be for a unit of One number.

**24.44.(II) Constructing brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg/ Cm. 2 in C.M/ 1:5 C. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt of cover 23 Kg. and Wt of frame 15 Kg. ) R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm size) foundation concrete 1:5:10, inside plaster 15 mm. thick with C.M. 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete : Inside dimensions 500 mm. x 700 mm. and 450 mm. deep for pipe the with one or two inlets.**

**1.0. Materials and Workmanship :** The relevant specifications of item 24.44 (I) shall be followed except that the inside dimension of brick masonry chamber shall be 500 mm. x 700 mm. and 450 mm. deep for pipe the with on two inlets.

**2.0. Mode of measurement and payment**

**2.1.** The relevant specifications of item 24.44 (I) shall be followed. **2.2** The rate shall be for a unit of one number.

**24.44.(III) Constructing brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg/ Cm. 2 in C.M/ 1:5 C.I. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt of cover 23 Kg. and Wt of frame 15 Kg. ) R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm. size) foundation concrete 1:5:10, inside plaster 15 mm. thick with C.M. 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete : Inside dimensions 600 mm. x 850 mm. and 450 mm. deep for pipes line with three or more inlets.**

**1.0. Materials and workmanship :** The relevant specifications of item No. 24 .44 (I) shall be followed except that the inside dimensions of chamber shall be 600 mm, x 850 mm. and depth 450 mm. for pipe lines with three or more inlets.

**2.0. Mode of measurements & payments**

**2.1.** The relevant specifications of item 24.44(1) shall be followed.

**2.2.** The rate shall be for a unit One number.

**24.46. Extra over item 24.44 for every additional depth of 1 M. or part thereof beyond 450 mm. depth for brick masonry chamber, (i) For 455 mm. x 610 mm. size (ii) For 500 mm. x 700 mm. size (iii) For 600 mm. x 850 mm. size.**

**1.0. Materials & Workmanship :** The relevant specifications of item 24.44 (i),(ii) (iii) shall **be followed** same except that **extra** depth of 0.1 M. or part thereof shall be constructed over and above the depth of respective items.

**2.0. Mode of measurements & payment**

**2.1.** The relevant specifications of item 24.44 (I) shall be followed except that the extra shall be paid for, providing additional depth of 0.1 M. or M. or part thereof over and above the item No 24.44. (I) 24.44 (II) 24.44 (III) as the case may be.

**2.2.** The rate shall be for a unit of One number.

**24.00.2.(A) Providing soak pit of 2 cum. volume including excavating and filling brick bats with dry masonry work at top for 450 cms. height including covering, the top with stone including providing Vatas in C.M. 1:3 with finishing curing etc. complete as directed.**

**1.0. Materials :** Water shall conform to M-1. Cement mortar con form to M-11. Burnt Bricks shall conform to M-15. Rough stone slab 40 x 50 mm. thick shall conform to M-48. Brick bat shall conform to M-14.

**2.0. Workmanship**

**2.1.** The excavation for soak pit shall be carried out as. per relevant specifications of item. 4.G0.1 (A) except that the size of soak pit such that the cleat volume 'Shall\* remain 2 cum. The diameter and depth shall be as directed.

**2.2.** The periphery of the sock pit shall be provided with dry masonry wall with burnt bricks in 23 cms. thick. The masonry wall shall be done with best workman like manner in true line and plumb.

**2.3.** The soak pit shall be filled in with brick bats of burn brick 40 mm. nominal size in 45 cms. height. The work of filling brick-bats shall be done in such a way that no dry masonry shall be damaged during filling of brick bats.

**2.4.** The top of the soak pit shall be covered with rough kotah stone slab 40 to 50 mm. thickness. The length of the stone shall be in single piece in length.

**2.5.** The cement mortar 1:3 shall be used to fill up the joints and preparing vata as directed.

**2.6.** The cement work shall be cured for 4 days.

**3.0. Mode of measurements and payment**

**3.1.** The rate includes costs of all labour and material required for satisfactory completion o this item as described above.

**24.00.2.(B) Providing soak-pit of 5 cum. Volume inc. excavating and filling brick bats with dry masonry work at top for 45 cms. height including covering the top with stone including providing vatas in C.M. 1:3 with finishing curing etc. complete as directed.**

**1.0. Materials and workmanship :** The relevant specifications of item 24.00.2 (A) shall be followed except that the volume of soak pit shall be 5 cum. clear.

**2.0. Mode of measurements and payment**

**2.1.** The relevant specifications of item 24.00.2 (A) shall be followed.

**2.2.** The rate shall be for a unit of One number.

**EQUIVALENT PLAIN AREAS OF UNEVEN SURFACES**  
**(Vide specifications for items relating to : Painting & Polishing)**

Sr. No.	Description of work	How measured	Multiplying Factor
1.	Paneled or framed and braced on ledged and battened or ledged and braced joinery.	Measured flat (not girthed) including chowkhat or frame edges, chocks clients etc. shall be deemed to be included in item.	1.30 (For each said)
2.	Flush joinery	Measured flat (not girthed) including chowkhat or frame. Edges, Chocks, cleats, etc. shall be deemed to be included in the item.	1.20 (For each side)
3.	Fully glazed or gauzed joinery	Measured flat (not girthed) including chowkhat or frame. Edges, Chocks, cleats, etc. shall be deemed to be included in the item.	0.80 (For each side)
4.	Partly paneled and partly glazed or gauzed joinery	Measured flat (not girthed) including chowkhat or frame. Edges, Chocks, cleats, etc. shall be deemed to be included in the item.	1.00 (For each side)
5.	Fully venetioned or louvered joinery.	Measured flat (not girthed) including chowkhat or frame. Edges, Chocks, cleats, etc. shall be deemed to be included in the item.	1.80 (For each side)
6.	Weather boarding	Measured flat (not girthed) supporting frame work shall not be measured separately.	1.20.(For each side)
7.	Wood single roofing	Measured flat (not girthed)	1.10(For each side)
8.	Boarding with cover fillets at match boarding	Measured flat (not girthed)	1.05 (For each side)
9.	Tile and Slate battening	Measured flat, overall, no deduction shall be made for open space over	0.80 (For painting all over)
10.	Trellis (or Jafri) work one way or two way	Measured flat, over all, no deduction shall be made for the open spaces supporting members shall not be measured separately)	1.00 (For painting all over)

11.	Guard, bars, balustrades, gates, graying, grills, expanded metal and railings.	Measured flat over all, No deduction shall be made for the open spaces, over) supporting members shall not be measured separately.	1.00 (For painting all over)
12.	Gates and open palisade fencing including standards	Measured flat over all No. deduction shall be made of open spaces : supporting members shall not be measured separately, (see note).	1.00 painting all over
13.	Curved or enriched work	Measured flat	2.0 (For each side)
14.	Steel roller shutter	Measured flat (size of opening) over all jamb, guides bottom rails and locking arrangement etc., shall be included in the item (top cover shall be measured separately).	1.10 (For each side)
15.	Plain sheet door and windows	Measured flat (not including) frame	1.10 (For each side)
16.	Full glazed or gauze steel door and windows	Measured flat (not girthed) including Frame edges etc.	0.50 (For each side)
17.	Partly paneled and partly glazed or gauzed steel doors	Measured flat (not girthed) including frame edges etc.	0.08 (For each side)
18.	Collapsible gate	Measured flat (size of opening) no separate measurements shall be taken for the top and bottom guide rails, rollers, fittings, etc.	1.50 (For painting all over)

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**Note :** The height shall be taken from the bottom of the lowest of rail if the palisades do not go below it (or from the lower end of palisades, if they protect below the lower rail) up to the top of palisades, but not upto the top of standards if they are higher than the palisades.

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[illegible]

[illegible]

**CODE OF PRACTICE C-13 (B)**  
**SCHEDULE OF FIXTURES AND**  
**FASTENINGS FOR DOORS,**  
**WINDOWS, VENTILATORS,**  
**WARDROBES AND CUPBOARDS**

**NOTATIONS**

Da.....	Teakwood doors fully paneled or fully glazed or partly paneled : and glazed
Db.....	Bathroom and W.C. door with single shutter
Dc.....	Doors plying planked
Dd.....	Doors battened framed and braced
Wa.....	Teakwood windows fully paneled or fully glazed or partly paneled and glazed
Va-Ind.....	Teakwood ventilator (independent)
S.W.....	Steel Windows
SV-Ind.....	Steel ventilators (independent)
CB.....	Cupboard
S.1.....	Single shutter
S.2.....	Double shutter
S.4.....	Four shutter
B.....	Breadth of door shutter
T.....	Thickness of door shutter
H.....	Height of window shutter.
900.....	900 mm & below
900.....	above 900 mm
1200.....	1200 mm & below
1200.....	above

**NOTE : PLEASE READ CAREFULLY :**

- (1) Where detailed specification of an item provides for specific size of any fixture or fastening that shall prevail over the provisions in this schedule.
- (2) Fixtures and fastenings (except hold fasts which shall be of M.S. plate only) shall be of Brass, copper, oxidised brass, chromium plated brass, Iron, copper oxidised iron, or chromium plated iron as specified in the item of the work or detailed specifications.
- (3) External door and door failing in staircase excepting the door in balcony shall have sliding door bolt of size 300 mm. x 18 mm. in place of 250 mm. x 16 mm- as shown in this schedule.
- (4) The length of tower lock shown is for a door having shutter height up to 2100 mm. only. For door having shutter height more than 2100 mm. the length of tower bolts to be increased to the extent of increase of door shutter height beyond 2100 mm.
- (5) 150 mm. x 150 mm. size glass vision panel shall be provided in the doors of Officers chamber in addition to the scheduled provision if so directed by the Engineering in charge.
- (6) Diamond shape chromium plated brass peeping plate of approved quality shall be provided in one entrance door in residential building in addition to the scheduled provisions.
- (7) Drawer up a wardrobe shall be provided with one furniture handle and one drawer lock (4 levers) in addition to its scheduled provision.
- (8) For door and window with steel frame, 75 mm. size screws, shall be provided both in top bottom frame for fixity as shown below:
  - (a) For width up to 1200 mm.....2 Nos.
  - (b) For width above 1200 mm. and up to 1800 mm.....3 Nos.
  - (c) For every additional width of 500 mm. over and above 1800 mm.....1 No.
- (9) When the mortise lock (6 levers) and latch is specified to be provided to a door either in the item of work itself or by a separate item, the requirement of providing sliding door bolt, door latch and handles as per this schedule shall be dispensed with.
- (10) For door/window with ventilator at top, fixtures and fastenings of door/window plus those of ventilator (excluding hold fasts) shall be used.
- (11) Where the item of the work, or its specification provides for anodised aluminum fixtures, all the fixtures except hinges and screws will be of anodised aluminum and chromium plated iron hinges and screws shall be used.
- (12) For door, window, or cupboard frame abutting concrete section, instead of hold fasts as shown in the schedule-, coach screws of size mentioned below shall be used:
  - (a) Teak wood frame..... 125 mm.
  - (b) Steel frame.....75 mm.
- (13) The locking etc. in the door latch shall be so positioned that the can be properly rocked even if part of the latch, when fully slid, remains in the frame or masonry.
- (14) Showcase cupboards having single shutter shall be provided with all catcher instead of tower bolt (barrel type) as per schedule.
- (15) The size of the handle shown in the schedule indicates grip length.
- (16) Door stopper shall be shown in the schedule indicates grip length.
- (17) Piano hinges shall be for the full height of the shutter.
- (18) Shutter with pivot arrangements shall be pivot arrangement shall be provided with two pivots of approved size instead of hinges as per the schedule.
- (19) For butt hinges, only lengths are indicated in the schedule. The width of each flap being 5 mm. less than the thickness of the shutter to which they are to be fixed and the thickness of the flap shall be as specified in the relevant I.S. for heavy, medium or light as specified in the detailed specifications of the item of work.

## Schedule for Testing of Materials

For ensuring quality control and workmanship, various test prescribe below corresponding to the material concerned shall be taken as periodic intervals as stipulated below be taken.

The Material shall be got tested Govt. recognized Laboratory (R & B) or field Laboratory of GERI (R & 6) for which 1 % of the estimated amount to tender shall be recovered from the contractor from the R.A. Bill and Final Bills as the testing charges shall be paid by the Govt. to the GERI. However if the charges increase over 1 % no excess recovery shall be made from the contractor as per resolution of B&C department dated 10th May 1985, vide TNC/1085 (4) S.

Item No. as per Sch. B	Brief Description of Materials to be tested	Qty. of Material	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Total No. of Test to be taken
1.	Kapchi		<ul style="list-style-type: none"> <li>- Gradation test</li> <li>- Impact Value</li> <li>- Flakiness Index of aggregate</li> </ul>	CMT 1 to 100 – 1 test 100 to 500 – 3 tests 500 to 1500 – 5 tests 1500 to 5000 – 7 tests	
2.	Grit		<ul style="list-style-type: none"> <li>- Stripping Value</li> </ul>		
3.	Sand		<ul style="list-style-type: none"> <li>- Special gravity</li> <li>- Water absorption</li> <li>- Fineness Modulus</li> <li>- Silt – Content</li> <li>- Soundness</li> </ul>		
4.	Tiles		<ul style="list-style-type: none"> <li>- Dimension Test</li> <li>- Transverse strength</li> <li>- Water Absorption</li> <li>- Abrasion Test</li> </ul>		
5.	Teakwood		<ul style="list-style-type: none"> <li>- Anatomy Test</li> <li>- Density Test</li> <li>- Moisture Content Test</li> </ul>		
6.	Bricks		<ul style="list-style-type: none"> <li>- Water absorption</li> <li>- Effluence</li> <li>- Size</li> <li>- Comprehensive Strength</li> </ul>	1 Test @ 50,000 Bricks	
7.	Cement		<ul style="list-style-type: none"> <li>- Consistency</li> <li>- Setting Time</li> <li>- Compressive Strength</li> </ul>	1 Test @ 10.0 M.T.  As per manual of Quality Control	
8.	Steel		<ul style="list-style-type: none"> <li>- Tensile Strength</li> <li>- Yield Stress</li> <li>- Elongation</li> <li>- Size</li> </ul>		
9.	C.C. Cube test 1:2:4		<ul style="list-style-type: none"> <li>- Compressive Strength</li> </ul>	1 to 5 Cum.      1 No. 6 to 15 Cum.    2 Nos. 16 to 20 Cum.   3 Nos. 21 to 50 Cum.   4 Nos. 51 & Above Cum. 4 + 1 for each Cum or part thereof	

The contractor shall have to pay 1% of the estimate cost put to tender towards all testing of materials & same shall be deducted from their bills for the works. The testing of various materials shall be carried out in GERI and result received shall be binding to all. i.e. contractor and Govt.

Testing Charges of GERI shall be born by Govt. No refund be made or extra charge over 1 % shall be recoverable form the contractor.

**SIGN OF CONTRACTOR**

## **SPECIAL CONDITIONS OF CONTRACT FOR ELECTRICAL WORK**

### **1.**

#### **EXTENT OF WORK**

- 1.1.** The scope includes design, manufacture, inspection & testing at manufacturer's works, delivery to site, unloading & storage at site, installation, testing at site, commissioning, final painting and handing over to client the complete electrical work to be carried out at the site.
- 1.2.** The scope of work includes the following:-
  - 1.2.1. 11 kV VCB H.T. Panel/ DP STRUCTURE
  - 1.2.2. 250/125/63 KVA Oil Type Distribution Transformer – 11 kV / 0.433 kV
  - 1.2.3. 125/250 kVA DG sets, UPS, Inverters etc.
  - 1.2.4. H.V. XLPE cables and end termination
  - 1.2.5. Main Power Control Centre, D.G. Control cum synch Panel
  - 1.2.6. Utility system
  - 1.2.7. Mail Lighting Distribution Board ( MLDB ) & Main Power Distribution Board ( MPDB ).
  - 1.2.8. L.V. capacitor bank with APFCR panel
  - 1.2.9. L.V. XLPE cable and end termination
  - 1.2.10. Earthing and lightning protection system
  - 1.2.11. Internal Wiring with conduits, wires, junction boxes, switches, sockets, Lighting distribution boards.
  - 1.2.12. Light fixtures for General Area and Parking area
  - 1.2.13. Auxiliaries items viz. Cable tray/ Cable Trench with necessary mounting / fixing supports, Route ON / OFF Push button sets
  - 1.2.14. Conduiting wiring and necessary electrical work for Fire Alarm & Detection System, Computer network system, Telephone network, Security & Access Control System etc.
  - 1.2.15. External Lighting and Cable laying, lighting poles/mast installation
  - 1.2.16. Façade lights, area lighting, street lights, landscape lighting, pathway lighting, High masts, functional lightings etc
  - 1.2.17. Under water and water body lighting system
  - 1.2.18. Civil work viz. Foundation, trenches, excavation, back filling, cutting and drilling holes through walls or floors, chiseling in wall if required or any civil work required to complete the job
  - 1.2.19. Safety accessories, tools, tackles, spares, consumables
  - 1.2.20. Extra low voltage system installations like Voice and Data, Cable TV systems
  - 1.2.21. Security and surveillance systems like CCTV / Public address / Evacuation / Access control etc.

### **2. SCOPE OF WORK :**

- 2.1.** The work to be carried out under this contract comprises of the Electrical Installation work for the proposed project called for in the documents. The work covered under this contract comprises of supply (wherever called for), installation, connection, testing and commissioning the Electrical installation commencing from point of electric power supply within the project site as per specifications, relevant Indian standards, Code of practice
- 2.2.** The contractor shall carry out and complete the said work under this contract in every respect in conformity with the current rules and regulations of the local Electricity Authority, the Indian Standards and with the directions of and to the satisfaction of the Consultant and owner. The Contractor shall furnish all labor and install all materials, appliances, equipment ( except those items which will be supplied by the Owner to the contractor at site ), necessary for complete provision and testing of the whole electrical installation as specified herein and shown on the drawings. This also includes any material, appliances, equipment not specifically mentioned herein or noted on the drawing as being furnished or installed but which are necessary and customary to make complete installation with all outlets for power, light, telephone conduits, all other conduits and other electrical systems shown in the schedule or described herein, properly connected and in working order.

**2.3.** The work shall include all incidental jobs connected with electrical installation such as excavation for trenches and back filling, cutting/drilling holes through walls/floors and grouting for fixing of fixtures, equipment etc. Chiseling in the wall or principal structure is not permitted. In general, the work to be performed under this contract shall comprise of the following :-

**2.4.** Substation comprising of :

2.4.1.H.T. Switchgear & H.T Cable

2.4.2.Transformer

2.4.3.D. G. set

2.4.4.Substation accessories

2.4.5.Earthing

2.4.6.Power Control Centre

2.4.7.Main L.T panel

**2.5.** Lighting distribution board (LDB)

2.5.1. Earthing and lightning protection system installation

2.5.2.Plate / Pipe electrode type earth station

**2.6.** Earth continuity conductor

**2.7.** Internal and external lighting with fixtures

**2.8.** UPS/Stabilizer

**2.9.** All qualities mentioned in the Bill of quantity are approximate and the contractor shall not be eligible for any claim due to any variation in / or omission of any item.

**2.10.** Any extra item shall be calculated on the rate analysis basis approved by OWNER.

**2.11.** It is the responsibility of the contractor to co-ordinate with Torrent Power Ltd. / Electrical Inspector and fulfil all the requirements of Torrent Power Ltd. at no extra cost and arrange for the power connection.

### **3. ABBREVIATIONS :**

The following, abbreviations have been used in the accompanying specifications, drawings and Bill of quantity :

ISS	:Indian Standard Specifications.
HRC	:High Rupturing Capacity.
GI	:Galvanized Iron.
MS	:Mild Steel.
MV	:Medium Voltage.
LV	:Low Voltage.
PVC	:Polyvinyl Chloride.
AMP	:Amperes.
V	:Volts.
KV	:Kilo Volts.
HV	:High Voltage
KW	:Kilo Watt
KVA	:Kilo Volt Ampere
PF	:Power Factor
Hz	:Frequency
KWH	:Kilo Watt Hour
XLPE	:Cross Linked Polyethelene
ACB	:Air Circuit Breaker
LED	:Light Emitting diode
PLC	:Programmable Logic Controller
UPS	:Uninterrupted Power Supply
DP	:Double Phase
IEE	: Institute of Electrical Engineers, London.

MCB	: Miniature Circuit Breaker.
TPN	: Triple pole and Neutral.
SP	: Single Pole.
MCCB	: Moulded case Circuit breaker.
VCB	: Vacuum circuit breaker.
CT	: Current transformer.
DB	: Distribution board.
DG	: Diesel generator.
BOQ	: Bill of quantity.
SITC	: Supply, installation, testing and commissioning.
L.O.I	: Letter of intent/Acceptance letter.

#### 4. REGULATIONS AND STANDARDS :

**4.1.** The installation shall conform in all respects to Indian standard code of Practice for Electrical Wiring installation IS : 732-1963 and IS : 2214-1963 ( Silver Nitrate Pure and analytical reagent ). It shall also be in conformity with the current Indian Electricity, Rules, Indian Electricity Act, National Electrical Code and Regulations of the Local Electrical supply Authority in so far as these become applicable to the installation. Wherever this specification calls for a higher standard of material and/or workmanship than those required by any of the above regulations then this specification shall take precedence over the said regulations and standard. In general, the materials equipment and workmanship not covered by the above shall conform to the relevant Indian Standards.

**4.2.** The electrical installation work shall follow Codes, Indian standard specifications and rules (Within the best meaning of the same) under this contract.

**4.3.** The following list is given for general guidance only in addition to list given in each individual section, however all other latest editions of Codes, Indian standard specifications and Rules shall also be followed when it is required.

I.S: 8623	Low voltage switchgear & control gear assemblies.
I.S: 10118	Code of practice for selection, installation and maintenance of switchgear and control gear.
I.S: 4237	General requirement for switch gear and control gear for voltage not exceeding 1000 Volt a.c. or 1200 volts d.c.
I.S: 13947	Low voltage switchgear and control gear.
I.S: 9224	Low voltage fuses.
I.S: 8828	Circuit breakers for out protection for household and similar installations.
I.S: 12640	Earth leakage circuit breaker
I.S: 1248	Direct acting indicating analog electrical measuring instruments
I.S: 2705	Current transformers.
I.S: 4201	Application guide for voltage transformers.
I.S: 6875	Control switches for voltage upto and indicating 1000V a.c. 1200 V d.c.
I.S: 5578	Guide for marking of insulated conductors..
I.S: 11353	Guide for uniform system of marking and identification of conductors and apparatus transmission.
I.S: 8197	Terminal markings for electrical measuring instruments and their accessories.
I.S: 694	Specifications for PVC insulated cables for working voltages up to and including 1100 volts.
I.S: 2551	Danger notice plates.
I.S: 3043	Code of practice for earthing.
I.S: 5216	Guide for safety procedures and practices in electrical work.



I.S: 1646      Code of practice for fire safety of building : Electrical installation.  
Indian Electricity Act as amended up to date.  
Indian Electricity Rules as amended up to date.  
Rules and Regulations of Bombay Regional Council of Fire Insurance & Association of India for Electrical wiring.

**5. FEES, PERMITS AND TESTS :**

- 5.1.** The Contractor shall pay for any and all fees and obtain permits required for the installation work. On completion of the work the contractor shall obtain and deliver to the OWNER, certificates of final inspection and approval by the local electric supply authority and the electrical inspector.

**6. 10.0      UTILITY SUPPLY :**

- 6.1.** The location of receipt of incoming utilities supply ( Hook up Points ) like HT supply shall be verified with various concerned authorities. It is the responsibility of the contractor to co-ordinate with various utility agencies, the exact location of such Hook Up Point and mode of connection. Further the contractor shall co-ordinate with such utility agencies to provide necessary drawings, documents, get their approval, make the necessary arrangement for the payments and arrange the utilities supply at no extra cost.

**7. 11.0      ACTUAL ROUTE OF CABLE :**

- 7.1.** The location of the cables, panel boards etc. is only indicative, therefore, the actual route of cables and the location of panel boards may differ from the plans according to the details of the building construction and the conditions of executions of the installations.
- 7.2.** The contractor shall supply and install at his expense all secondary materials and special fittings found necessary to overcome the interference and to supply the modifications on the route of cables and conduits that are found necessary during the work, to the complete satisfaction of the owner's representative.

**8. 12.0      MATERIAL AND EQUIPMENT :**

- 8.1.** All material and equipment shall conform to the relevant standards and shall be of the approved make and design. The materials and equipment shall conform to relevant Indian Standards. The Contractor shall be responsible for the safe custody of all the materials and shall insure them against theft, damage by fire, earthquake etc. A list of items of materials and equipment, together with sample of each shall be submitted to the OWNER within 10 days of the award of the contract. Any item which is proposed as a substitute, shall be accompanied by all technical detail giving sizes, particulars of materials and the manufacturer's name and shall be submitted along with the tender or bid offer. At the time of the submission of proposed substitute the Contractor shall state the credit, if any due to the owner. In the event the substitution is approved, all changes and substitutions shall be requested in writing and approvals obtained in writing from OWNER. OWNER's decision in the matter shall be final.
- 8.2.** All materials of the same kind of service shall be identical and made by the same manufacturers. Any deviation to this rule shall be approved by the Consultant. Top priority shall be given to the products that have a permanent agent providing spare parts and maintenance facilities in the same city where the project is situated.
- 8.3.** The make of electrical equipments, components, accessories, etc. has been mentioned in order of priorities. The tenderer has to quote for the first priority as mentioned above after ascertaining that the first preference materials are available. If at a later stage during executing the work, material of the first preference make are not available, the contractor has to get approval from the OWNER to use other make of material prior to procurement. Any rate difference for the first preference make and the one approved will be passed on to the owner.

**9.      MANUFACTURERS :**

**9.1.** Where manufacturers have furnished specific instructions relating to the materials used in this job, covering points not specifically mentioned in these documents, these instructions shall be followed in all cases.

**9.2.** Where manufacturer's names and/or catalogue numbers are given, this is an indication of the quality, standards and performance required.

**9.3.** When interfacing occurs, equipment shall be mutually compatible in all respects.

**10. RATING :**

**10.1.** Rating of all items shall be appropriate for the conditions on the particular site on which the items will be used. All the equipment shall be fit for continuous work under the worst conditions of site and shall be rated for the following ambient condition.

**10.2.** Outdoor temperature 50 deg. cel.

**10.3.** Temperature under shed 45 deg. cel.

**10.4.** Salty, dusty and humid

**10.5.** Coastal area

**11. 15.0 INSPECTION AND TESTING :**

**11.1.** OWNER'S representative reserves the right to request inspection and testing at manufacturer's works at all reasonable times during manufacture of items for this contract. Tests on site of completed works shall demonstrate, among other things :

**12.** That the equipment installed complies with specification in all particulars and is of the correct rating for the duty and site conditions.

**13.** That all items operate efficiently and quietly to meet the specified requirements.

**14.** That all circuits are correctly fused and protected and that protective devices are properly coordinated.

**15.** That all non current carrying metal work is properly and safely grounded in accordance with the specifications.

**15.1.** The contractor shall provide all necessary instruments and labor for testing, shall make adequate records of test procedures and readings, shall repeat any tests requested by the OWNER and shall provide test certificates signed by a properly authorized person. Such test certificates shall cover all works.

**15.2.** If tests fail to demonstrate the satisfactory nature of the installation or any part thereof then no claims for the extra cost of modifications, replacements or re testing will be considered. OWNER's decision as to what constitutes a satisfactory test shall be final.

**15.3.** The above general requirements as to testing shall be read in conjunction with any particular requirements specified elsewhere.

**16. PRICE DETAILS :**

**16.1.** At anytime and at the request of OWNER, the contract shall provide details or breakdown of costs and prices of any part or parts of the works.

**17. TEST CERTIFICATES :**

**17.1.** The contractor shall submit test certificates for all the electrical material/system installed. These shall be issued by a government recognized inspection office certifying that all equipment, materials, construction and functions are in agreement with the requirements of these specifications, ISI and when ISI is not applicable other approved certifying agencies.

**18. INSTRUCTION MANUAL :**

**18.1.** The contractor shall prepare and produce instruction, operation and maintenance manuals in English for the use, operation and maintenance of the supplied equipment and installations, and submit 3 sets to OWNER, at the time of handing over.

**19. SAMPLES AND CATALOGUES :**

- 19.1.** Before ordering the material necessary for these installations, the contractor shall submit to OWNER for approval, a sample of every kind of material such as cables, conductors, conduits, switches, socket outlets, circuit breakers, lighting fixtures, boxes etc., along with the catalogues.
- 19.2.** For big items such as switchboards, the submission of catalogues shall be enough. Prior to ordering any electrical equipment/material/system, the contractor shall submit to OWNER, the catalogues, along with the samples, at least from three different manufacturers. After the selection of manufacturer by OWNER, the contractor shall arrange inspection and testing at the manufacturer's factory or assembly shop for final approval. No material shall be procured prior to the approval of the OWNER.

**20. VENDOR AND SHOP DRAWINGS :**

- 20.1.** The contractor shall prepare and submit to OWNER, for his approval, two sets of vendor detailed drawings of all distribution boards, switch boards, outlet boxes, special pull boxes, and other likewise material, equipment to be fabricated by the contractor, or other vendor within 15 days of signing of the contract.
- 20.2.** Before starting the work, the contractor shall submit to OWNER for his approval in the prescribed manner, the shop/execution drawings for the entire installation, specially the main connections and junctions, the route of conduits and cables, no. and size of wires drawn through the conduits, location of all the outlet points, and switch boards and distribution boards and any other information required by OWNER. OWNER reserves the right to alter or modify these drawings if they are found to be insufficient or not complying with the established technical standards or if they do not offer the most satisfactory performance or accessibility for maintenance.

**21. AS BUILT DRAWINGS :**

- 21.1.** At the completion of work and before issuance of certificate of virtual completion the contractor shall submit to OWNER, three sets of layout drawing drawn at appropriate scale indicating the complete wiring system "as installed". These drawings must provide (in plan, folded elevation and section)
- 21.2.** Location and details of distribution boards, main switches, switchgear and other particulars.
- 21.3.** Location of all earthing stations, route and size of all earthing conductors, manholes etc.
- 21.4.** Route and particulars of all cables.
- 21.5.** Lighting layout plan for all the floors alongwith circuit distribution details.
- 21.6.** External Area Lighting Plan.

**22. GUARANTEE :**

- 22.1.** At the close of the work and before issuance of final certificate of virtual completion by OWNER, the contractor shall furnish written guarantee indemnifying OWNER against defective materials and workmanship for a period of one year after completion. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to OWNER, the following :
- 22.2.** Any defective work or material supplied by the contractor.
- 22.3.** Any material or equipment supplied by OWNER which is damaged or destroyed as a result of defective workmanship by the contractor.
- 22.4.** Any material or equipment damaged or destroyed as a result of defective workmanship by the contractor

## **GENERAL MATERIAL SPECIFICATIONS FOR ELECTRICAL EQUIPMENTS**

### **1. Printed instruction chart**

- 1.1. Material specification
  - 1.1.1. Providing printed instruction charts both in English & Gujarati and duly framed with front glassed for shock treatment chart.
- 1.2. Workmanship
  - 1.2.1. The printed instruction chart should be provided in panel room, substation space, feeder pillar etc.

### **2. Rubber matting:**

- 2.1. Material specification
  - 2.1.1. Rubber matting should be given for the main panels for the below mention voltage grade.
  - 2.1.2. Voltage grade: 440 volts, minimum thickness 6 mm
  - 2.1.3. Voltage grade: 11000 volts, minimum thickness 9 mm
  - 2.1.4. It should be FRP material sheet, provided for panel (make: Sintex or equivalent)
- 2.2. Workmanship
  - 2.2.1. The rubber matting should be provided at floor for every floor mounting HT/LT panels.

### **3. First aid kit (standard)**

- 3.1. Material specification
  - 3.1.1. Minimum quantities for low risk establishments and activities may be considered as a general guidance leaflet on first aid.
  - 3.1.2. 20 individually wrapped sterile adhesive dressings (assorted sizes) appropriate for the activity (detectable dressings (colored blue) should be available (if catering is to be undertaken).
  - 3.1.3. 2 sterile eye pads.
  - 3.1.4. 4 individually wrapped triangular bandages (preferably sterile)
  - 3.1.5. 6 safety pins (optional)
  - 3.1.6. 6 medium size individually wrapped sterile unmedicated wound dressings (approx. 12cm × 12cm)
  - 3.1.7. 2 large sterile individually wrapped unmediated wound dressings (approx. 18cm × 18cm)
  - 3.1.8. 1 pair of disposable glove
- 3.2. Workmanship
  - 3.2.1. The first aid box should be provided in substation area, panel room, etc.
  - 3.2.2. It should be placed in location which is easy in access & visibility.

### **4. Rubber Hand Gloves**

- 4.1. Material Specification & Workmanship
  - 4.1.1. Applicable standards: Unless otherwise modified in this specification the rubber hand gloves shall comply with IS: 4770-1968 or its latest version
  - 4.1.2. Voltage Rating : 3.3 kV
  - 4.1.3. Test Potential: 1.5 kV
  - 4.1.4. Max. leakage Current & test potential : 12mA
  - 4.1.5. The leakage current at the normal working voltage of the gloves shall not exceed 300 micro Amps
  - 4.1.6. The minimum breakdown voltage of the gloves shall be 25 kV
  - 4.1.7. The minimum and maximum dimension of the gloves shall be in accordance with Indian Standards.
  - 4.1.8. The allowable value of Tensile Strength, Elongation at Break, Tensile Set and ageing properties shall be as stipulated in Indian standards
  - 4.1.9. The Gloves shall be marked with Type of Gloves & its Size

## 5. The LT Switch Gear & Panel

### 5.1. Material specification

5.1.1. The It shall be manufactured as per the relevant Indian and international standards.

5.1.2. All the components in the panel shall be of the panels shall be as per approved make.

The panels shall be manufactured with sheet steel prepared using cnc machines for accurate cutting, bending and drilling etc. The sheet metal shall be pre-treated before painting. The assembly of the panels shall be with new techniques for easy removal and refitting of the components. The panel shall have a high degree of reliability and safety of the operating personnel. The components of identical feeders should be fully compatible to each other. The panel manufactured shall be fully conforming to the following standards.

IS 1248 & 3107	: direct acting electrical indicating instruments
IS 2959	: ac contactors up to 1000v
IS 13947	: ac circuit breakers
IS 2705	: current transformers
IS 3156 & 4146	: potential transformers
IS 4047	: specification for air break switches and combination fuse switch units for voltage not exceeding 1000v
IS 6875	: control switches for voltages up to and including 1000v ac and 1200v dc.
IS 1822	: motor duty switches
IS 12021	: specification for control transformer
IS 8623	: factory built assembly of switchgear & control gear for voltage not exceeding 1000v
IS 13947 (part i)	: degree of protection for enclosure
IS 3842	: specification for electrical relays for ac system
IS 2208 & 9224	: specification for hrc fuses
IS 5082	: wrought al. And aluminium alloys, bars, rods, tube and sections for electrical purposes.
IS 4237	: general requirement for switchgear & control gear for voltage not exceeding 1000v
IS 3231	: electrical relays for power system protection 151
IS 375	: marking and arrangement for switchgear bus bars, main connection and control Wiring
IS 5578	: guide for marking of insulated conductors.
IS 3618	: pre-treatment of ms sheets for phosphatising

### 5.2. Miniature Circuit Breaker

5.2.1. Miniature circuit breakers shall be quick make and break and break type non-welding self-wiping silver alloy contacts for 10 ka short circuit both on the manual and automatic operation, confirm with british standard bs : 3871 (part-i) 1965 and is :8825 (1996) with facility for locking in off position.

5.2.2. The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10ka, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "on" and "off" indications. 'C' characteristic current limiting type, 10 ka and having quick break with trip free operating mechanism. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sqmm aluminum or 2.5 sqmm copper and for higher ratings; the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

5.2.3. The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection

### 5.3. Switch Fuse Unit

- 5.3.1. This unit shall be approved make triple pole metal clad switch fuse unit 415 volt, 200 amp, cat iii with link type h.r.c. fuses and natural link confirming to i.s.s. erected on angle iron frame, double break type suitable for load break duty (ac 23), quick make and break action. Separate neutral link shall be provided. The door of panel shall be duly interlocked with operating mechanism so as to prevent closing of the switch when the door is not properly secured. It shall be provided with at least 2 auxiliary contacts. All contacts shall be silver plated and all live parts shall be shrouded. The incoming and outgoing terminals of switches shall be adequately sized to receive 3.5 core x 120 sq mm xlpe aluminum cables. High rupturing capacity of not less than 35mva at 415 volts hrc fuse links shall be provided with visible indicators to show that they have operated. The switch fuse unit shall be manufactured in accordance with is: 4047-1967 as amended to date.

### 5.4. Fuse

- 5.4.1. Fuses shall be of high rupturing capacity (hrc) fuse links and shall be in accordance with is: 2000-1962 and having rupturing capacity of not less than 35 mva at 415 volts. The backup fuse rating as per site requirements / equipment.

### 5.5. Porcelain Fuse

#### 5.5.1. Features

- 5.5.1.1.** It should be made from top quality porcelain.
- 5.5.1.2.** Best quality Brass, Phosphorus Bronze components and ETP copper contacts should be heavily silver plated to improve the high conductivity.
- 5.5.1.3. WEATHER CONDITION:** The material used in construction of the fuse unit shall be suitable for use under following weather condition:-
- |                   |   |
|-------------------|---|
| Temp. Range       | : 0 to 50 C   |
| Relative humidity | : 2% to 100%  |
| Altitude-upto     | : 1000 Meters   |
| Use               | : Outdoor, in dist. box or indoor in consumer's premises. |
- 5.5.1.4.** The fuses shall be suitable for continuous operation at AC 415 V and frequency 50 Hz
- 5.5.1.5.** IS: 2086/1993 with latest amendment for fuses up to 100 Amp
- 5.5.1.6.** The fuses base shall be provided with two fixing holes for fixing the fuse base by means of screwier bolts.
- 5.5.1.7.** The fuse base shall have contacts for suitably engaging with the contacts of the fuse carrier rigidly under any condition. The contacts shall be made out of such a metal which will not lose its electricity due to heating of the contracts on full load with 20% overload current or heat generated and required pressure is maintained even after repeated engagements and disengagement. The contact for rating 63 A and above will also have extended strips for fixing cable lugs by means of bolt.
- 5.5.1.8. FUSE CARRIER:** The fuse carried shall have contacts suitable for engaging with fuse base contacts. They shall be provided with suitable terminals for the connection of the fuse elements. The fuse carrier shall be so constructed that it is capable of being reversible for introduction into the fuse base. The contacts shall be made out of the metal which will not lose its elasticity on account of heating of the contacts on full load with 20% overload conditions or heating due to blowing of the fuse element due to short circuit and required pressure is maintained and even after repeated engagement and disengagement.
- 5.5.1.9.** Every fuse carrier shall be clearly and indelibly embossed with the following information.
- |                   |                                 |
|-------------------|---------------------------------|
| <b>5.5.1.9.1.</b> | Rated Current                   |
| <b>5.5.1.9.2.</b> | Rated voltage                   |
| <b>5.5.1.9.3.</b> | Size of fuse wire               |
| <b>5.5.1.9.4.</b> | Manufacturer's name/Trade mark. |

## 5.5.2. Workmanship

- 5.5.2.1. The carrier and fuse base when installed in the intended manner shall have all live parts so protected as to prevent inadvertent contact with such live parts.
- 5.5.2.2. The fuse carrier shall be provided with a handle or grip and shall be shaped in acceptable manner so that it will be easy to withdraw the carrier without use of any tools and without danger to any L.M. or operator.
- 5.5.2.3. All metal parts shall be protected against corrosion by suitable methods.
- 5.5.2.4. Live parts of the fuse carrier shall be covered either by a shield or barrier of insulating materials or be counter sunk not less than 3 mm below surface of the base and covered with water proof insulating sealing compound which will not deteriorate or flow at temp lower than 100 C.
- 5.5.2.5. Live parts on the underside of the fuse base for surface mounting shall be either covered by a shield or barrier of insulating materials or be counter sunk not less than 3mm below the surface of the base and covered with water proof insulating sealing compound which will not deteriorate or flow at a temp. lower than 100 degree C or on full load current with 20% overload or blowing of fuse under short circuit condition or shall have clearance of not less than 6.0 mm for 16A and 32A and 9mm for 63A, 100A and 200A size from the mounting surface and reliably prevented from loosening.
- 5.5.2.6. Screws upon which the general assembly of the fuse base and carriers terminals and contacts depend shall be prevented from loosening or backing out by lock, washers, stacking or other reliable means.
- 5.5.2.7. If screws used in the assembly of a fuse are loosened or removed in order to install the fuse elements or to connect the fuse into a circuit they should be thread into metal and shall be provided with washers

## 5.6. Moulded Case Circuit Breaker

- 5.6.1. The MCCB shall be air break type and having quick break with trip free operating mechanism confirmed to is : 8825 and iec-60947-1/2 standard.
- 5.6.2. It should have thermal magnetic trip unit, adjustable thermal protection from 0.8 -1 in for 400 amp. And short circuit protection from 5 -10 in for rating more than 4000amp.it should be of rated operational voltage of 690 v ac (50 hz) and insulation voltage of 750v ac. It should have electrical life of 4000 (2500) operations and mechanical life of 10000 (8000) operations for rating 400 amp. (>400 amp.) All the MCCB above 400 shall be have breaking capacity of 50ka. And 25 ka for MCCB < 400 amp rating
- 5.6.3. Housing of the MCCB shall be of heat resistant and flame retardant insulating material. Operating handle of the MCCB shall be in front and clearly indicate on / off / trip positions. The electrical contact of the circuit breaker shall be of high conducting non deteriorating silver alloy contacts. The MCCB shall be provided with thermal / magnetic type bi-metal over load release and electro-magnetic short circuit protection device. All the releases shall operate on common trip bus bar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided. The MCCB whenever called for in the appendix drawings shall provide an earth fault relay. The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date. The electrical parameters of the MCCB shall be as per the descriptions given in the attached drawings.

## 5.7. Contactor:

- 5.7.1. Contactor shall be air break type, having 3 power contact and 4 nos. Of auxiliary contact conforming to is: 2959, contactor provided shall be ac4 duty type for capacitor and ac3 duty type for motor loads. It shall be suitable for minimum class ii intermittent duty. It shall be capable of making and breaking starting current of motors and require capacity of capacitor load of corresponding rating. Auxiliary contacts shall be rated for at least 6a and shall be capable of carrying the maximum estimated current, also shall be break before

make type. No volt coil working voltage shall be 360 V to 440 V. It should be complete with over current relay with single phasing protection.

**5.8. Thyristorised / Solid State Fast Response Pfc / Solid-State Ssr Switching (Apfc Relay)**  
:-

- 5.8.1. The automatic power factor controller should be of 12 step microprocessor base and having following features. It shall form thyristorised / solid state fast response pfc / solid-state ssr switching.
- 5.8.2. Automatic step section depending upon the system power factor and targeted power factor, relay should sense the capacity of each bank automatically and accordingly only required nos of capacitor should be switched on in any case
- 5.8.3. This controller should take sensing current and voltage from incomer of I.t. sides.
- 5.8.4. Required epoxy cast resin c.t.'s for sensing incomer should be supplied by the contractor. Summation c.t. (if required) should be supplied by the contractor. Apfc controller shall have rs 485 communication port
- 5.8.5. Automatic selection of c/k ratio (min. Capacitor step size/c.t. ratio)
- 5.8.6. Indication of real time p.f. with lagging or leading
- 5.8.7. Prevent leading p.f. during low load condition
- 5.8.8. Audio (hooter) and visual alarm with reset push button for low p.f. below targeted.
- 5.8.9. Max. Acquisition time: - 2 sec.
- 5.8.10. Smallest group to sense :- 5 kvar
- 5.8.11. Type of switching: - thyristorised / solid state relay.
- 5.8.12. Microprocessor based displaying system p.f., kvar, average power factor since reset, kvar per stage, system 3 phase voltage, current , power factor, kw, kvar, stage on off indication shall be included
- 5.8.13. PFC should sense 3 phase kvar correctly even in unbalanced load 3 phase 4 wire systems.
- 5.8.14. PFC should be provided with adequate harmonic filter in case of higher harmonic level of 3/5/7/9/11<sup>th</sup> harmonic more than 5 % or total thd more than 7%.
- 5.8.15. It shall be capable of selecting and connecting right value of capacitors. To effect complete correction within 2 seconds by var sensing relay.
- 5.8.16. The apfc relay should have rs-485 communication port to communicate with computer.
- 5.8.17. The 12 step p.f. controller should operate capacitor in 12 steps depending upon system power factor.
- 5.8.18. The capacitor must be disconnected in the event of power supply failure and should be protected against high inrush current, when power supply restored or at the time of automatic and time delayed switching of capacitor.

**5.9. Capacitors:**

- 5.9.1. Supplying, installation, testing and commissioning of double layer app / extra low losses mdxl type, rated  $450 \pm 10\%$  volt, 50 hz., three phase, delta connected, capacitor in required bank/bunch size and having following features.
- 5.9.2. Watt losses total  $< 0.5w / kvar$ ,
- 5.9.3. Degree of protection ip 31, with safety feature like pressure sensitive disconnect or (over pressure tear off fuse), with discharge resistor,
- 5.9.4. Complete with minimum two earthing terminal, name plate rating etc.
- 5.9.5. Confirming to is-2834/1986 and latest relevant is.
- 5.9.6. It shall be capable of coping with over voltage condition.
- 5.9.7. Above-mentioned capacitor banks should be connected with the outgoing feeders of the apfc panel. Capacitor should be supplied as per above-mentioned table.
- 5.9.8. All the capacitor should be tested in tpsecl / recognized laboratory and two copies of the test reports/certificates of the capacitors shall be submitted to the client. Catalogues/technical details of the capacitor shall be furnished along with technical bid of the tender.
- 5.9.9. After commissioning of whole automation system, contractor shall have to analyze the harmonic level of the whole system i.e. Harmonic level of thd of whole system if found more than 5.0%, then necessary instruments/systems like harmonic filter, output filter etc. Shall be supplied and fitted to control harmonic level of thd of whole system to achieve less than 5.0%, without any extra cost.



#### 5.10. Main bus bar:

- 5.10.1. Three phase and neutral bus bar shall be designed for minimum specified rated current. Bus bar shall be high quality, air insulated, high conductivity, high strength, tinned copper with non hygroscopic colored sleeve. Bus bar copper shall be electrolytic grade. Minimum bus bar size used must be derived by considering current density of bus bar and shall be mounted with standard bus bar SMC (seat molded compound)/dmc support at sufficient interval to avoid sag and effectively **withstand** electromagnetic stress in the event of short circuit capacity of 50 ka rms symmetrical for 1 sec. And pick short circuit current of 105 ka. The bus bar shall be housed in separate compartment and shall be isolated with at least 3mm thick Bakelite sheet or higher grade material. Bus bar and panel board design shall be as per Indian electricity rule and CPRI norms and standards. Bus bar shall be extendible type for future expansion. Necessary cut out arrangement shall be provided for the same. The size of neutral bus bar shall be same as that of phase bus bar for main panel and lighting panel. The bus bar shall be arranged such that minimum distance between them does not remain lower than below.

Between phase	: 25 mm
Between phase and neutral	: 25 mm
Between phase and earth	: 25 mm
Between neutral and earth	: 20 mm.

- 5.10.2. The bus bar and interconnections shall be insulated with heat shrinkable PVC sleeve with standard color identification codes. The bus bar shall be connected by chromium plated or tinned plated brass bolts and nuts and washers shall be used for tightening. All connection between bus bar and circuit breaker/ switch and terminals shall be thoroughly insulated aluminum strips of proper size to carry rated current.

#### 5.11. Time Switch

- 5.11.1. Approved make time switch with single pole air break contacts suitable for 230 v / 16a, complete with self starting motor driven clock on & off automatic arrangement at any predetermined time during each 24 hours, with nickel cadmium rechargeable battery backup erected as directed

- 5.11.2. Technical specification

Operating voltage	240 v ac
Supply frequency	50-60 hz
Power consumption	Less than 4 w
Ambient temperature	-10 0c to 55 0c
Clock accuracy	+/- 1 sec./day at 20 0c
Switching contact	2 c/o contact
Manual over ride	Provided
Mounting	Din rail

#### 5.12. Contactors:

- 5.12.1. 32/70 amp. 500 v 50 hz tp high rupturing capacity contactors for incoming 3 phase, 4 wire, 440 v, 50 hz electric supply having following technical data.
- 5.12.1.1. Main poles - 3
  - 5.12.1.2. Current rating – minimum 32/70 amp.
  - 5.12.1.3. Duty - ac – 3
  - 5.12.1.4. Terminal capacity - suitable for connecting 4 x 50 sq mm aluminium conductor cable with or without cable end socket.

**5.13. Panel Feeder Meter:**

- 5.13.1. It shall be provided for generator feeder. It shall be dial flush mounted digital power meter. It shall have metering capacity of all three phase voltage, current, kw, kva, kvar, pf, frequency phase angle. It should show three phase parameter at a same time on display. Instrument shall have measuring capacity of accuracy class-1.

**5.14. Indication Lamp**

- 5.14.1. Indication lamp shall be led type panel mounted, low power consumption, long life, o/l and s/c protected with its holders etc. Suitable for specified voltage shall be used.

On indication	: red
Off indication	: green
Trip indication	: amber

**5.15. Current Transformers**

- 5.15.1. The current transformers shall have synthetic cast resin insulation and be of the single phase type, with number of cores as per the specific requirements.
- 5.15.2. The primary & secondary connections shall be clearly labeled.
- 5.15.3. All current transformers shall have insulation level and short time rating as per main switchgear. All current transformers shall be dimensioned to carry continuously a current of 120% of the rated current. The ratios shall be as per the specific requirements.

**5.16. Voltage/Potential Transformer (PT):**

- 5.16.1. The voltage transformers shall be insulated for full voltage rating.
- 5.16.2. The pt shall have synthetic resin insulation and be of single phase type. Rated secondary voltage shall be  $110 \text{ V}/\sqrt{3}$  unless otherwise specified.
- 5.16.3. Pt shall be capable of withstanding thermal and mechanical stresses resulting from short circuit and momentary current rating of breaker/switches.

**5.17. Control Switches/Selector Switches:**

- 5.17.1. Control and meter selection switches shall have integral name plate and for all other devices, the same shall be located below the respective devices. Instrument and devices mounted on the face of the panels shall also be identified on the rear with the same number.
- 5.17.2. All control switches shall be rotary, back connected type having cam operation contact mechanism. Phosphor bronze contacts shall be used on switches
- 5.17.3. The handle of control switches used for circuit breaker operation shall turn clockwise for closing and anti-clockwise for tripping and shall be spring return to neutral from close/trip with lost motion device.
- 5.17.4. Control switch for dg and incomer panels shall have one set of lost motion spare contacts.
- 5.17.5. Ammeter selector switches shall be with off position and with make before break feature and shall have 3 positions to read the three phase currents. Voltmeter selector switches shall also be of 3 positions and off position, suitable to read phase to phase voltages.
- 5.17.6. The control switches, operating handles, meters, relays etc shall be mounted at the front of the switchgear panels. The instruments shall not be mounted less than one meter or more than two meters from the floor level. Ammeters and voltmeters are to be provided with selector switches. Operating handles shall not be mounted at a height more than 1.75 meters. Breaker control switches wherever provided shall be so designed that when released by the operator it shall automatically return to a neutral position. They shall be fitted in sequence with lock to avoid inadvertent operation and shall be arranged such that after passing the "closed" position the control switch cannot be moved into the "closed" position again without passing the

"open" position. Each panel shall have indicating lamps for "on", "off", "trip" "trip circuit healthy" and "spring charged".

5.18. Auxiliary Supply

- 5.18.1. Auxiliary dc and ac supply shall be derived from the incoming source of the panel with suitable control arrangements for indication circuits, closing circuits, space heaters etc.
- 5.18.2. Separate dc insulated wire buses shall be provided. Dc supply required for protection/ indication/ tripping shall be taken from the above wire bus bars through protective fuses.
- 5.18.3. Suitable fuses and links shall be provided for individual circuits for protection and also for isolation from bus wire without disturbing the other circuits. Bus wires from panel to panel shall be wired through necessary control terminals.
- 5.18.4. Panel heaters and thermostats shall be provided in all the panels.

5.19. Wiring And Controls:

- 5.19.1. Control supply of the each individual feeder shall be taken from the auxiliary contact of the MCB, so by switching the MCB, control supply of the concern feeder will be controlled. The main object of doing this is to cut-off power as well as control supply from the feeder at the time of maintenance / repairing. The wiring inside the modules for power and control protection and instrumentation shall be done using 1.1 kV grade, PVC insulated FRP copper conductor cables confirming to is 694 and is 8130. Power wiring inside the starter module shall be rated for full current rating of contactor but not less than 4.0 sqmm size. For c.t. 2.5 sq.mm. Cu. Wire shall be used whereas other control wiring shall be done using 1.5 sq. Mm wire. Control wiring and indicating lamps shall have protective fuses (hrc type) .the necessary ferrules shall be filled to all wire terminals for ease of identification. Only one conductor shall be permitted to one termination.

5.20. Cable Compartment:

- 5.20.1. Cable compartment should have adequate space to accommodate required number xlpe insulated copper or aluminum conductor both in incoming & outgoing. There should be ample space for the termination of this cable.

5.21. Construction:

- 5.21.1. The panel shall comprise fully compartmentalized bottom entry, extensible type cubicle pattern, and front operated, suitable for floor / stand mounting as per site requirement. The panel board shall be divided into distinct vertical sections comprising of completely metal enclosed bus compartment running horizontally
- 5.21.2. The schematic diagrams are interned as a guide and manufacturer shall develop his own general arrangement and schematic drawing adding necessary auxiliary devices , accessories , components peculiar to supplied equipments , ferrules number , terminal number etc. Which are required for safe, convenient, efficient a proper operation of the 415 volts switchboard / m.c.c.

5.22. Following shall be taken care.

- 5.22.1. Main bus bar should be electrolytic tin copper type with heat shrinkable PVC sleeves with colour code.
- 5.22.2. All internal wiring and all connection shall be with copper wires and strips as required. Copper flexible wire shall be used below 100 amps.
- 5.22.3. All component, frame etc shall be earthed. A common internal earth bar with two separate earthing leads shall be provided.
- 5.22.4. Powder coating to be done on all sheet metal works as required.
- 5.22.5. Panel should have ms base frame for floor mounting unless otherwise specified.
- 5.22.6. The board should be front operated and extendible type.
- 5.22.7. Compression type brass glands and crimping lugs for incomer and outgoing ends.
- 5.22.8. All ammeters to be provided with CTs and selector switch and control fuses.

- 5.22.9. Panel components shall be specified.
- 5.22.10. The design and location of damp panel to be approved by the engineer incharge before fabrication and installation
- 5.22.11. All panels should be dust and vermin proof.
- 5.22.12. All panels should be fabricated out of 14 gauges CRCA sheet. The doors should be made from 14 gauge CRCA sheet.
- 5.22.13. All meters should be digital type only unless and otherwise specified.
- 5.22.14. Panel builder shall be CPRI approved.
- 5.22.15. The board should meet with requirement of IS 2147/1962.
- 5.22.16. All the switches used should be capable of withstanding the ac23 duty for motor operation. The switches should have quick break. The contacts should be silverplated double break type. The switch should confirm to IEC 947-iii.
- 5.22.17. If it is possible panel component as well as accessories should be one make.
- 5.22.18. The board should with stand the system prospective fault current.
- 5.22.19. The switches shall confirm to IS: 4047 the fuses shall conform to IS: 220 the fuses shall be of hrc type.
- 5.22.20. Engraved plastic labels shall be provided indicating the feeder details, capacity, cable size, and load in kW and danger signs.
- 5.22.21. The entire panel board should be with adequate height width & depth as per relevant prevailing standard
- 5.22.22. Include foundation bolts of suitable size as per requirement.
- 5.22.23. All compartment doors should be concealed hinged type & handles of feeders to be interlocked mechanically with the doors such that door cannot be opened when the switch position "on" & switch cannot be "on" when the doors is on open position.
- 5.22.24. Detailed drawing shall be got approved prior to manufacture.
- 5.22.25. If required only front opened and operated panel for ldb and ahu panels will be accepted.
- 5.22.26. If capacitors of apfc panels are not mounted in the panel itself than separate closed/covered rack with sufficient ventilation shall be included.
- 5.22.27. Engraved PVC labels shall be provided on incoming and outgoing feeders.
- 5.22.28. Sld showing circuit inside the d. B. Shall be posted inside of door and covered with transparent laminated plastic sheet.
- 5.22.29. The name plate with panel designation shall be fixed at the top of central panel. And name plate showing feeder details shall be provided on each feeder module as well as termination door.

#### 5.23. General requirement of the panel

- 5.23.1. The tenderer must have CPRI approval for manufacturing panel for the tenderer, who has not CPRI approval, has to make panel from CPRI approved panel manufacturer only.
- 5.23.2. Each switch fuse unit must be complete with the operating handle interlock; suitable h.r.c. fuses etc as per site requirement.
- 5.23.3. The entire l.t. switch gear unit should confirm to IS-13947.
- 5.23.4. All the CTs shall have cast resin type only with class i accuracy and each ct should have short link.
- 5.23.5. Indication lamp shall be led type panel mounted, low power consumption, min. 100000 hours of life, o/l and s/c protected with its holders etc. Suitable for specified voltage shall be used.
- 5.23.6. All the measuring instruments should be of accuracy class 1.0.
- 5.23.7. Each door of the panel should be earthed separately by flexible link.
- 5.23.8. The above cubicle pattern l.t. switch board comprising of incoming and outgoing described above must be complete with necessary floor stands, foundations bolts, copper inter connections between bus bars and incoming / outgoing / ats / variable frequency drive, inter wiring with PVC copper cables, labels marked for incoming / outgoing / ats / variable frequency drive, earthing terminal etc. And other required major / minor items.
- 5.23.9. All internal wiring work should be permanently marked / labelled at terminations with numbers or letters corresponding to diagram.

- 5.23.10. A copper earth with bus must also run throughout the panel.
- 5.23.11. Ample space in each compartment shall be provided for easy maintenance and repairing.
- 5.23.12. Extra fans should be provided for cooling the panel if required and as per directed by engineer-in-charge
- 5.23.13. The complete board should be scraped, cleaned and painted with powdercoated paint after application of 7 tank process and primer using siemens grey shade coat at manufacturer's works as per relevant is.. An easy access to bus bar should be kept for testing, maintenance and checking. The board should be prepared and erected in accordance with the prevailing Indian electricity rules and regulations. The appearance of the panel board should be neat, clean and pleasant. The panel should be fabricated from suitable size angles and 14 swg CRCA sheet steel and angle / channel iron sections. Sufficient space should be available for cable jointing. All live parts must be covered with non- hygroscopic insulated sheet. The lifting lugs / hooks should also be provided for handling the board. The necessary sufficient louvers should be provided for heat dissipation and air cooling.
- 5.23.14. The space requirement for board must be specified. The board is to be installed on the r.c.c. platform having cable trench 1.0 metre. Size. Cable entry to panel board should be at bottom long. A floor stand and operating platform having minimum width of 1 metre. Should also be incorporated.

#### 5.24. Safety Shutter Devices:

- 5.24.1. Shutters shall be provided at bus bar chamber cut out for closing the same when the drawable chassis of the modules are drawn out.
- 5.24.2. The bus bar shutters shall be automatically operated by the movement of the carriage.

#### 5.25. Insulators:

- 5.25.1. Insulators of moulded or resin bonded material shall have a durable, non-hygroscopic surface finish having a high anti-tracking index. Insulators, barriers made out of hylam, synthetic resin bonded paper, treated wood will not to be accepted.
- 5.25.2. Insulators shall be mounted on the switchgear structure such that there is no likelihood of their being mechanically over-stressed, during normal tightening of the mounting and bus bars, connections etc.

#### 5.26. Earthing:

- 5.26.1. Copper earth bar of minimum 25mm x 3mm (or specified size) size shall be run through whole length of panel. The frame work of panels shall be connected to this earth bar and it shall be provided to facilitate connection with main earth coming from earth pit on both sides of panels. The earth continuity conductor of each in/out feeder shall be connected to this earth bar. The armor shall be properly connected to earthing clamp, and clamp shall be ultimately bonded with earth bar.

#### 5.27. Danger board:

- 5.27.1. 440 volt danger board as per IS: 2551-1982 in English and Gujarati shall be fixed on all sides of panel.
- 5.27.2. The board shall be glass enameled with red background and white letterings.
- 5.27.3. The danger notice plate shall be made out of 1.6mm thick mild steel sheet. Approximate size should be 200mm x 150 mm.
- 5.27.4. The letters, figures, the conventional skull and bones etc shall be positioned on the plate as per IS 2551-1982. The said figures & pictures shall be painted in single red color as per is-1978

#### 5.28. Painting:

- 5.28.1. The panel shall undergo chemical de-rusting and blasting and shall be effectively prophesied as per is-6005. The panel shall be thoroughly rinsed with clean water

after phosphate followed by final rinse with dilute dichromate solution and even drying. The phosphate coating shall be sealed by the application of two coats of ready mixed staving type zinc chromate primer.

- 5.28.2. Two coats of finishing powder coated paint shall be applied. The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns. The color for the finishing paint shall be approved by the engineer. The finished appearance of panels shall present an aesthetically pleasing appearance free from dust and uneven surfaces.

5.29. Brief description of the atomization:

- 5.29.1. The atomization is meant to control the acbs, MCCBs, contactors and other switchgears fully automatically as directed in drawing or elsewhere. The main features to be take care are.

- 5.29.1.1. The bus coupler acb must be off when any generator is on load or outgoing from dg or incoming from dg to lt main panel acb is on
  - 5.29.1.2. The apfcr and fixed capacitors feeders must be electromechanically interlocked in such a way that, any of the capacitor does not come in line when any dg is on load.
  - 5.29.1.3. The transformer outgoing acb (incomer-1 of main LT panel) and outgoing acb of dg as well as incomer of main LT panel can never be "on" together.
  - 5.29.1.4. All the switchgears should be mechanically interlocked in such a way that, all above conditions must be fulfilled even on manual mode of operation of dg / acbs.
  - 5.29.1.5. If client needs to provide additional back-up protection of reverse current / reverse powers relay it must be included.

5.30. Tests and inspection:

- 5.30.1. All site tests as per Indian standards and high voltage test of bus bars in presence of engineer-in-charge.

5.31. Drawings:

- 5.32. Manufacturers shall submit for approval the single line, general arrangement drawing including material list, accessories, components peculiar to supplied equipments, ferrules numbers, terminal numbers, foundation drawings and control wiring drawings. Approval of schematic drawings, single line and control wiring drawings shall be obtained before starting the manufacturing of panel board. Manufacturer shall submit the 04 copies of final prints with laminations and 01 reproducible tracing of each and every drawing. Out of these 04 copies, 01 copy should be affixed in the panel as directed by engineer-in-charge.

5.33. Test certificates

- 5.33.1. Type test certificates of all standard component parts, e.g. Contactors, breakers, switches, fuses, relays, ct's, vt's, and for the standard factory built assembly shall be submitted by the supplier.

5.34. instruction manuals

- 5.34.1. The supplier shall furnish specified number of copies of the instruction manual which would contain detailed instructions for all operational & maintenance requirement. The manual shall be furnished at the time of dispatch of the equipment and shall include the following aspects:
  - 5.34.2. Outline dimension drawings showing relevant cross-sectional views, earthing details and constructional features.
  - 5.34.3. Rated voltages, current, duty-cycle and all other technical information, which may be necessary for correct operation of the switchgear.
  - 5.34.4. Catalogue numbers of all components liable to be replaced during the life of the switchgear.
  - 5.34.5. Storage for prolonged duration.

- 5.34.6. Unpacking.
  - 5.34.7. Handling at site.
  - 5.34.8. Erection.
  - 5.34.9. Pre commissioning tests.
  - 5.34.10. Operating procedures
  - 5.34.11. Maintenance procedures.
  - 5.34.12. Precautions to be taken during operation and maintenance work.
- 5.35. Workmanship
- 5.35.1. The panel should be fabricated from CPRI approved panel manufacturer, each switch fuse unit must be complete with the operating handle interlock, suitable h.r.c. fuses etc as per site requirement. All the l.t. switch gear unit should be of the same company.
  - 5.35.2. All the CTs shall have cast resin type only and each ct should have short link. Indication lamp shall be led type panel mounted, low power consumption, min.100000 hours of life, o/l and s/c protected with its holders etc. Suitable for specified voltage shall be used.
  - 5.35.3. All the measuring instruments should be of accuracy class 1.0 each door of the panel should be earthed separately by flexible link. The above cubicle pattern l.t. switch board comprising of incoming and outgoing described above must be complete with necessary floor stands, foundations bolts, copper inter connections between bus bars and incoming / outgoing / ats / variable frequency drive, inter wiring with PVC copper cables, labels marked for incoming /outgoing / ats / variable frequency drive, earthing terminal etc. And other required major / minor items.
  - 5.35.4. All internal wiring work should be permanently marked / labelled at terminations with numbers or letters corresponding to diagram. A copper earth with bus must also run throughout the panel.
  - 5.35.5. Ample space in each compartment shall be provided for easy maintenance and repairing.
  - 5.35.6. The required size capacitor bank with thyristorised base apfc relay should be in corporate inside all pcc, lighting, hvacs panel, where ever required.
  - 5.35.7. Extra fans should be provided for cooling the panel if required and as per directed by consultant / engineer-in-charge

## **6. DOL starter**

- 6.1. Material specification
  - 6.1.1. Applicable standards: IS: 13947 (part 4/sec1) 1993:low voltage switchgear and control gear: part 4 contractors and motor starters, sec 1 electromechanical contactors and motor starters [superseding is 2959 & is 8544(all parts)] (amendment 1)
  - 6.1.2. Operation range should be -20% to + 15% of rated coil voltage
  - 6.1.3. Suitable for intermittent duty class 30
  - 6.1.4. Under-voltage protection below 40% of rated voltage.
  - 6.1.5. Adequate space and terminal sizes for terminations of recommended cables of either copper or aluminum, easy to install and maintain.
  - 6.1.6. Starter enclosure should be minimum ip-53.
- 6.2. Workmanship
  - 6.2.1. Direct on line should be made from 16 g CRCA sheet duly epoxy powder painted
  - 6.2.2. Inside and outside with hinge door and locking arrangement consisting of suitable size of on-off isolated (AC-3/23 duty) main fuses, single phasing prevented. Indicating lamp for r-y-b phases overload relay, automatic water level controller, a meter, volt meter each with selected switch incoming wire duly socket crimped, main contactor start-stop push button to be erected on angle iron frame grouted on wall as directed.

## **7. Indoor & Outdoor Lighting Equipments**

- 7.1. General material specification
  - 7.1.1. This section relates to technical specification for indoor & outdoor lighting equipments of the project.

- 7.1.2. All fixtures shall be complete with accessories necessary for installation whether so detailed under fixture description or not.
- 7.1.3. Fixture housing, frame or canopy shall provide a suitable cover for the fixture outlet box or fixture opening.
- 7.1.4. Fixtures shall be installed at mounting heights as detailed on the drawings or instructed on site by the engineer in charge.
- 7.1.5. Fixtures and/or fixture outlet boxes shall be provided with hangers to adequately support the complete weight of the fixture. Design of hangers and method of fastening other than shown on the drawings or herein specified shall be submitted to the engineer in charge for approval.
- 7.1.6. Pendant fixtures within the same room or area shall be installed plumb and at a uniform height from the finished floor. Adjustment of height shall be made during installation as per engineer in charge instructions.
- 7.1.7. Flush mounted and recessed fixtures shall be installed so as to completely eliminate light leakage within the fixture and between the fixture and adjacent finished surface.
- 7.1.8. Fixture mounted on outlet boxes shall be tightly secured to a fixture stud in the outlet box. Extension pieces shall be installed where required to facilitate proper installation.
- 7.1.9. Fixture shall be completely wired and constructed to comply with the regulations and standards for electric lighting fixtures, unless otherwise specified. Fixtures shall bear manufacturer's name and the factory inspection label unless otherwise approved.
- 7.1.10. Wiring within the fixture and for connection to the branch circuit wiring shall not be less than 2.5 sqmm copper for 250 volt applications. Wire insulation shall suit the temperature conditions inside the fixture and wires bypassing the choke/ballast shall be heat protected with a heat resistant sleeve.
- 7.1.11. Metal used in lighting fixtures shall be not less than 22 swg or heavier if so required to comply with the specification or standards. Sheet steel reflectors shall have a thickness of not less than 20 SWG. The metal parts of the fixtures shall be completely free from burrs and tool marks. Solder shall not be used as mechanical fastening device on any part of the fixture.
- 7.1.12. Ferrous metal shall be bowdlerized and given a corrosion resistant phosphate treatment or other approved rust inhibiting prime coat to provide a rust-proof base before application of finish.
- 7.1.13. Non-reflecting surfaces such as fixture frames and trim shall be finished in baked enamel paint.
- 7.1.14. Light reflecting surface shall be finished in baked white enamel having a reflection factor of not less than 80%. All parts of reflector shall be completely covered by finish and free from irregularities. After finish has been applied and cured, it shall be capable of withstanding a 6 mm radius bend without showing sign of cracking, peeling or loosening from the base metal. Finish shall be capable of withstanding 72 hours exposure to an ultraviolet sun lamp placed 10 cm from the surface without discoloration, hardening or warping and retain the same reflection factor after exposure. Test results shall be furnished for each lot of fixtures.
- 7.1.15. Fixture with visible frames shall have concealed hinged and catches. Pendant fixtures and lamp holders shall be provided with ball type Algiers or similar approved means. Recessed fixtures shall be constructed so as to fit into an acoustic tile ceiling or plaster ceiling without distorting either the fixture or the ceiling plaster rings/flanges shall be provided for plaster ceiling. Fixtures with hinged diffuser doors shall be provided with spring clips or other retaining device prevent the diffuser from moving.
- 7.1.16. Detailed catalogue cuts for all fixtures, or, if so required by the engineer in charge sample fixtures shall be submitted for approval to the architect/consultant before orders for the fixtures are placed. Shop drawings for non-standard fixture types shall be submitted for approval to the architect/consultant.
- 7.1.17. Recessed fixtures shall be constructed so that all components are replaceable without removing housing from the ceiling.

## 7.2. Lamps:

- 7.2.1. Lamps shall be supplied and installed in all lighting fixtures furnished under this contract. All lamps shall be rated for 250 volts.
- 7.2.2. Lamps used for temporary lighting service shall not be used in the final lighting of fixtures units.



- 7.2.3. Lamps shall be of wattage and type as shown on the drawings and schedule. Where not shown, the details shall be ascertained from the architect / engineer in charge before procurement.
- 7.2.4. Lamps for permanent installation shall not be placed in the fixtures until so directed by the architect / engineer in charge, and this shall be accomplished directly before the building portions are ready for occupation.
- 7.2.5. Lamp should be of the same make as of control gear/ballast.

#### 7.3. Fluorescent fittings with hi - frequency ballast:

- 7.3.1. Only single and/or two lamp ballast shall be used in any one fixture. Ballast shall be completely enclosed inside sheet steel casing and shall have corrosion - resistant finish. Ballast shall contain a thermosetting type compound not subject to softening or liquefying under any operating conditions or upon ballast failure. Compound shall not support combustion. All ballast shall be of high power factor compensated to above 0.9pf. Ballast temperature and sound rating shall be specified by the manufacturer and guaranteed. Ballast shall be for operation at the voltages and frequencies indicated and under temperature conditions prevailing in the various locations of the premises. Tapped ballast is preferred.
- 7.3.2. Ballast general/technical specification must be within the specified limit as mentioned in is 13021 part-i&ii with latest amendments. The e.m.i & r.f.i values must be as per is 6842 with latest amendments, if any. The ballast should have over voltage protection circuit and transient/spike suppression circuit. Total harmonic distortion should be less than or equal to 33%, current crest factor (peak/rms current value) should be  $\leq 2$ .
- 7.3.3. All fluorescent fixtures shall be provided with separate wiring channel with cover plate and an earth terminal. All screws shall be chromium brass screws. Lamp and starter holders shall be out of tough molded plastic with spring loaded rotor type contactors rendered shock and vibration proof. Condensers shall be low loss paper impregnated hermetically sealed complying with is 1969-196. Internal wiring shall be neatly clipped and where by passing the ballast, a suitable heat resistant barrier or sleeve shall be provided.
- 7.3.4. Minimum working (burning) life of fluorescent lamp should be more than or equal to 15000 hours. (Necessary confirmation must be sought from the manufacturer). Lamp lumen output should be  $\geq 91$  lumen/watt. Depreciation of lumen output over life span of lamp should not exceed 10%.
- 7.3.5. The combined power factor should be more than or equal to 0.92 at 230 volt.
- 7.3.6. Surface mounted fixtures longer than two feet shall have one additional point of support besides the outlet box fixture stud when installed individually. Pendant individually mounted fixtures four feet long and smaller shall be provided with twin stem/conduit hangers. Stems shall have ball aligners or similar devices and provided for a minimum of 25 mm vertical adjustment. Stem shall be of appropriate length to suspend fixtures at required mounting height.
- 7.3.7. Lamps shall have bi-pin bases and a minimum approximate rating.

#### 7.4. Emergency lighting

##### 7.4.1. Code & standards:

<b>7.4.1.1.</b>	National building code of india	: SP: 7 2005
	Specification for emergency lighting unit	IS: 9583-1981
	Code of practice for safety colors and safety signs	IS: 9457-1980
	Fire protection safety sign	IS: 12349-1988
	Fire safety in hotels-code of practice	IS: 13716
<b>7.4.1.2.</b>	Code of practice for fire safety of building(general)	
	Exit requirement and personal hazards	IS: 1644-1988
	Code of practice for fire safety of building (electrical Installation)	IS: 1646
	Graphic symbols for fire protection plans	IS: 12407-1988

##### 7.4.2. Technical specifications:

- 7.4.2.1.** Ac supply for charging of battery: 240V AC, 50/60 Hz.

- 7.4.2.2. Recharging period should be 10-12 hours and regulated battery charging with constant voltage tapering current characteristics and goes into trickle charge when the battery attains full charge
- 7.4.2.3. Emergency light switches on instantly on ac mains failure. Switches off automatically and reverts back to battery charging mode after supply resumption.
- 7.4.2.4. Automatic low battery cut-off.
- 7.4.2.5. Over voltage protection
- 7.4.2.6. Manual switch for switching of emergency light when not required.
- 7.4.2.7. Rugged metal body with powder coated finish.
- 7.4.2.8. Provision of wall mounting of the light fixture should be provided.
- 7.4.2.9. It should be with ni-mh/ni-cd rechargeable battery of constant current charge type.
- 7.4.2.10. All emergency lighting should be tested in accordance with en60598-2-22.
- 7.4.2.11. Inbuilt push test switch should be provided.
- 7.4.2.12. Battery backup: 3 hour for emergency signages & 1 hour for the emergency light

#### 7.5. Decorative post top lantern / flood light fixtures

- 7.5.1. The light fixture construction shall be of die cast aluminum or otherwise as specified with a separate compartment for integral ballast equipment. The reflector shall be anodized polished aluminum. The glass reflector shall be heat-resistant.
- 7.5.2. Lamp holder shall be of porcelain and shall comprise of a terminal block of non-hygroscopic material. The luminaries shall have integral ballast housed in water tight and dust tight metal cases. Ballast shall be pre-wired to the lamp socket and terminal block, requiring only power supply leads to the ballast primary terminals.
- 7.5.3. The light fixtures shall be minimum IP66 unless until mentioned in the schedule.

#### 7.6. Earthing

- 7.6.1. All the light fixtures, indoor & outdoor, shall be properly earthed by means of copper conductor as mentioned elsewhere in this document.

#### 7.7. Special notes

- 7.7.1. The successful tenderer will have to supply the makes from above in consultation with the client/architect/consultant without any extra cost.
- 7.7.2. Tenderer should have to specify the list of makes considered in the tender while quoting the rates in the tender, in covering letter of separate letter enclosure. However, the final decision for accepting make specified by tenderer would be of engineer in charge / architect.
- 7.7.3. As far as possible, the successful tenderer will have to place order directly to the manufacturer or its authorized dealer. The engineer in charge have right to check the challans of supplier.
- 7.7.4. Make of components required to be used by contractor to complete the installation, if not mentioned anywhere, shall be required to get it approved by engineer in charge before installation in writing.
- 7.7.5. Within a week of work order, the contractor shall submit the sample and/or catalogue of each item / component of above mentioned approved make for the approval of the engineer in charge / architect.
- 7.7.6. The contractor should have to prepare full fledged lighting demo of each kind of light fixtures as per instruction of engineer in charge / architect for approval at no extra cost.

#### 7.8. Workmanship

- 7.8.1. The fixture shall be installed as per manufacturer's instruction, with all necessary accessories. The job also includes connection of fixture with respective outlet point with heat resistant wires through heat resistance sleeve and PVC connector. Proper earthing shall be provided to the fixtures.
- 7.8.2. The contractor has to work in co-ordination with existing contract. The conduits are already laid in the slab by existing contractor. The contractor has to solve any dispute mutually and practically regarding existing work done by existing contractor.

### 8. Decorative Lighting poles

- 8.1. GI Lighting pole should conforming to I.S. 2713-1980 with latest amendment

- 8.2. The pole shall be provided with 12mm diameter tapped hole with bolt nut welded for earthing at suitable height as directed by Engineer-in-charge.
- 8.3. The Pole shall be painted with one coat of red oxide and two coats of aluminium paint after erection prior to commissioning.
- 8.4. Please refer section 24 of material specification for details of B class GI Pipe
- 8.5. Decorative Pole, with Base Plate made out of G.I tubular pole, primed and painted.
- 8.6. The column shall also be provided with flush door at the bottom with proper strengthening to the cutout of the door opening.
- 8.7. A junction/ looping box with Heavy duty 3 phase connector shall be built into the pole.
- 8.8. The Pole shall be painted two coats of polyurithyne based Paint.
- 8.9. MCB of required rating to be provided with pole.
- 8.10. Workmanship
  - 8.10.1. The lighting poles shall be fabricated from heavy duty cold-rolled ms pips and painted as specified. The pole shall have a base plate, a large access panel, and necessary fixture mounting bracket at top. The access panel shall provide easy access to a multi-way porcelain connector and fuse/MCB board, to be mounted inside the pole. The access shall be specially fabricated with adequate reinforcement and weather gasket to prevent ingress of moisture and vandal proof. Poles shall have large diameter entries for incoming and outgoing cable and two earth studs. The pole fabrication shall conform to the drawings and where such drawing is not available; the contractor shall make such drawing and have it approved before fabrication.
  - 8.10.2. The pole shall house a multi-way terminal block and MCB as shown on the drawings.
  - 8.10.3. Foundation bolts & nuts shall be provided with the pole

## 9. Poles Foundation

- 9.1. Material specification
  - 9.1.1.1:2:4 cement concrete foundation (along with base plate and cable guard pipe and earthing wire etc. Which are included in other item) of 450mm x 450mm x 900 mm length for 4 meter poles, 600mm x 600mm x 1200mm for pole up to 8.5 mtr height, 600mm x 600mm x 1500mm for pole up to 8.5 mtr height, with necessary plastering and colour washing for pole. The item includes excavation and supply of cement, sand, kapachi, grit etc. By the contractor. The contractor should make necessary arrangement for water required for the works at his own cost. The site should be cleaned off excess material after the work is completed.
- 9.2. Workmanship
  - 9.2.1. The foundation with necessary plastering and colour washing shall be arranged for pole for good finishing of the foundation

## 10. Pole Box:

- 10.1. Material specification
  - 10.1.1. Sintex or approved make SMC press moulded composite frp ( plastic) loop-in, loop-out box approx. 207mm thick complete with Bakelite connector strip 4 way & hinged doors having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamp & earth bolt of following size of box. (a) 300mm x 200mm x 100mm
  - 10.1.2. Press moulded composite FRP (plastic) loop- in, loop-out, dust & water proof, junction box, minimum 2 mm thick (Sintex or equivalent), with doors hinged on top side (open able from bottom to top) having locking arrangements ,with above mentioned size.
  - 10.1.3. Should be provided with 6 amp sp MCB 10ka.
- 10.2. Workmanship
  - 10.2.1. GI mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamps & earth bolt.
  - 10.2.2. The box should have provision for 2 nos. (or 3 nos. If required) cable entries suitable for size of the cable. The box should be so designed to prevent ingress of foreign material including rainwater.
  - 10.2.3. The box should accommodate the following:

- 10.2.4. For the poles of 4 m height the junction box sintex or equivalent make SMC press moulded composite frp (plastic) to be fixed on streetlight pole with suitable g.i. clamp and bolts, nuts.
- 10.2.5. A danger notice caution sticker should be fixed on junction box.
- 10.2.6. Each box should be complete with earthing strip for cable (armoured) termination and earthing bolts for the same.

## 11. Ceiling Fan, Regulators And Clamps :

- 11.1. Material specification
  - 11.1.1. Ceiling fan should follow the below mentioned standards
    - 11.1.1.1. IS 374(part 0/sec 0):1979 : electric ceiling type fans and regulators  
(third Revision)
    - 11.1.1.2. IS 2997(part 0/sec 0):1964 : air circulator type electric fans and  
regulators
    - 11.1.1.3. IS 302 (part 2/sec 80):2003 : safety of household and similar electrical  
Appliances
    - 11.1.1.4. Part 2 particular requirements, sec 80 fans (superseding is 12155:1987)
  - 11.1.2. Ceiling fans including their suspension shall conform to relevant iss with secondary safety device incorporated against free fall of fans from their hooks.
  - 11.1.3. Fan hooks made of M.S. rods of 15 mm diameter shaped in 'u' form with their legs projecting horizontally on the top at least 19 cm on either side and tied over the top reinforcement of the roof shall be laid in the concrete slabs.
  - 11.1.4. The body of the ceiling fan, exhaust fan and fan regulator shall be connected to the earthing system by proper earth leads.
- 11.2. Workmanship
  - 11.2.1. The all ceiling fans shall be wired to ceiling roses or to special connector boxes and suspended from hooks or shackles. There shall be no joints in the suspension rod.
  - 11.2.2. In case of "I" beams, the suspension arrangements fabricated out of m.s. plates shall be shaped suitably to catch the flanges and shall be held together by means of laying bolts, nuts, check nut and split pin.
  - 11.2.3. For concrete roofs, ceiling fans hooks shall be got buried in the concrete during construction.
  - 11.2.4. The suspension arrangement for the fans shall be so designed that the fans canopies shall completely hide suspension element.
  - 11.2.5. Unless otherwise specified all ceiling fans shall be hung 2.75m above the floor.
  - 11.2.6. In the case of measurement of extra down rod for ceiling fans including wiring, the same shall be measured in units of 10 cms & length less than 5 cm shall be ignored. The cost of wiring for extra down rod shall be paid as per supplying and drawing cable in existing conduits

## 12. Exhaust Fans

- 12.1. Material specification
  - 12.1.1. Exhaust fans shall conform to is 302(part 2/sec 80):2003 : safety of household and similar electrical appliances: part 2 particular requirements, sec 80 fans (superseding is 12155:1987) and other relevant iss.
  - 12.1.2. It should be reversible fresh air cum exhaust fan
- 12.2. Workmanship
  - 12.2.1. The exhaust fans shall be erected at the places indicated by the engineer-in-charge. For fixing exhaust fans a circular opening shall be provided in the wall to suit the size of the frame, which would be fixed by means of rag bolts, embedded in the walls, opening shall be neatly plastered to the original finish of the wall. The exhaust fan shall be wired as near to the opening as possible by means of flexible cord. Care being taken that the blades rotate in the proper direction.
  - 12.2.2. The exhaust fan for installation in corrosive atmosphere shall be painted with special PVC paint or chlorinated rubber paint. Installation of exhaust fan in kitchen, dark room and such other special locations shall be carried out giving due consideration for the specific requirements.
  - 12.2.3. The body of the ceiling fan, exhaust fan and fan regulator shall be connected to the earthing system by proper earth leads.

### **13. MS Fabricated Items.**

- 13.1. Material specification
  - 13.1.1. Materials: all structural steel shall conform to i.s. 226-1975. The steel shall be free from the defects mentioned in i.s. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. Rivet bars shall conform to i.s. 1148-1992.
  - 13.1.2. When the steel is supplied by the contractor test certificates of the manufacturers shall be obtained according to i.s. 226-1975 and other relevant Indian standards
- 13.2. Workmanship
  - 13.2.1. The steel section as specified or required shall be cut square and to correct length as per drawing and design. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make of the required length of member, except as indicated in the drawings or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in such a manner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed / permitted.
  - 13.2.2. Steel riveted or bolted in built up sections, framework.
  - 13.2.3. The steel structure as shown in the drawings or as per directions of the engineer-in-charge shall be laid out on a level platform to full scale and to full size or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.
  - 13.2.4. Wooden templates 12 mm to 19 mm thick or metal steel templates shall be made to correspond to each connecting gusset plate and rivet holes shall be accurately marked on them and drilled. The templates shall be laid on the steel members and holes of the steel members shall also be marked for cutting. The base of steel columns and the position of anchor bolts shall be carefully set out.
  - 13.2.5. All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified, shop drawings giving complete details and information for the fabrication of the component parts of the structure, including location, type size, length and details of rivets, bolts, or weld shall be prepared in advance of the actual fabrication and as approved. The drawings shall indicate the shop and field rivets and bolts. The steel members shall be distinctly marked or stencilled with paint with the identification marks as given in the shop drawings.
  - 13.2.6. The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal sections.
  - 13.2.7. Great accuracy shall be observed in fabrication of various members so that this can be assembled without being unduly packed, strained, or forced into position and when built up, shall be true and free from twists, bends, buckles or open joints. Before making holes in individual members for fabrication the steel work intended to be riveted or bolted together shall be as embedded or clamped properly and tightly so as to ensure close abutting or lapping of the surfaces of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight and fitted close together.
  - 13.2.8. Web splice plates and fillers under stiffeners shall be cut to fit within 3 mm or flange angles, web plates of girders shall have to no cover plates shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spliced shall have clearance of not more than 6 mm.
  - 13.2.9. The erection, clearance for cleared ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm at each end but where for a practical reason greater clearance is necessary, suitably designed neating shall be provided.
  - 13.2.10. Pins and rollers shall be accurately turned to gauge. These shall be straight and smooth and free from flaws. The roller bearing shall be provided with adequate arrangements for holding the girders of truss resting on it. In columns caps and bases, the ends of shafts together with the attached gusset angles, channels etc. After riveting together shall be accurately mechanized so that the paths connected but against each other over the entire surfaces of contact connecting angles or channels shall be fabricated and placed in position with greater accuracy so that they are not unduly reduced in thickness by machining.

- 13.2.11. The ends of bearing stiffeners shall be mechanized or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm or less in diameter and reamed thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm than the nominal diameter of rivets or black bolts depending upon the diameter of rivets.
- 13.2.12. Holes shall have their axis perpendicular to the surface bored through. The drilling or reaming shall be free from burrs, and the holes should be clean and accurate holes for countersunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing.
- 13.2.13. The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, as shown in the drawing or as directed. Generally the following principles shall govern the use of rivets turned and fitted bolts and black bolts.
- 13.2.14. Rivets and turned and fitted bolts shall be used where the connection is such that slip under load has to be avoided.
- 13.2.15. Black bolts may be used very sparingly where a force is carried through a connection without impact, vibration or reversal of stresses.
- 13.2.16. Riveting :
  - 13.2.16.1. The parts assembled for riveting shall be in close contact with each other and the bearing stiffeners shall bear tightly both top and bottom without being drawn or caulked. Members to be riveted shall be properly pinned or bolted and rigidly held together while riveting. Drifting of holes shall not be permitted except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding the nominal diameter of rivets or bolts. Drifting done during assembling shall not distort the metal or enlarge the holes.
  - 13.2.16.2. The shanks of rivets shall project beyond the plate surface sufficiently so as to fill the hole thoroughly and form the required head after riveting.
  - 13.2.16.3. The riveting shall be done by hydraulic or pneumatic process. However where such facilities are not available hand riveting may be permitted. The rivet shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10 mm may be fitted cold. Rivets shall be of heat finish with heads full and of equal size. All loose burnt or badly formed rivets with concentric or deficient heads shall be cut out and replaced. The heads of rivets shall be central to shanks and shall grip the assembled members firmly. In cutting out rivets, care shall be taken so as not to injure the assembled members caulking or reoccupying shall not be permitted.
  - 13.2.16.4. For testing rivets, a hammer weighing approximately 0.25 kg shall be used. Both heads of the rivets shall be tapped slack rivets will give a hollow sound and a jar.
  - 13.2.16.5. All rivet heads shall be painted with red lead paint within a week of their fixing.
- 13.2.17. Bolting
  - 13.2.17.1. All bolts and nuts shall be hexagonal and of equal size unless specified otherwise. The screwed heads shall conform to i.s. 1363-1960 and the threaded surface shall not be tapered. The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly.
  - 13.2.17.2. Where turned and fitted bolts are required to be used in place of rivets there shall be provided with washers not less than 6 mm thick so that the nut when tightened shall not bear on the unthreaded body of the bolt. Tapered washers shall be provided for all heads and nuts bearing on levelled surfaces. The threaded portion of the bolt shall not be within the thickness of the parts bolted together. The faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of lock nuts, spring washers, cross cutting or hammering down of threads as directed.

- 13.2.17.3.** Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming, coat of red lead, as per relevant specification of painting there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of lock nuts, spring washers, cross cutting or hammering down of threads as directed.
- 13.2.17.4.** Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming, coat of red lead, as per relevant specification of painting

#### **14. 1.1 kV Grade LT Cables**

##### **14.1. Material specification**

##### **14.1.1. Applicable Standards**

- |  |  |
|--|--|
| IS-694   | : PVC insulated cables for working voltages up to and including 1100V.   |
| IS-1554  | : (Part-I) PVC insulated (heavy duty) electric cables for working voltages up to and including 1100V.            |
| IS-1554  | : (Part-II) PVC insulated (heavy duty) electric cables for working voltages from 3.3kV up to and including 11kV. |
| IS-3961  | : Recommended current ratings for cables   |
| IS-8130  | : Conductors for insulated electric cables and flexible cords.   |
| IS-5831  | : PVC insulation and sheath of electric cables   |
| IS-6380  | : Specification of Elastomeric Insulation & Sheath of Electric Cables  |
| IS-7098  | : (Part-I & II) Cross linked polyethylene insulated PVC sheathed cables for working voltages up to 33kV.         |
| IS-3975  | : Mild steel wires, strips and tapes for armoring cables.  |
| IS-1753  | : Aluminium conductors for insulated cables  |
| IS-1255  | : Code of practice for installation and maintenance of power cables up to and including 33kV rating.             |
| IS-12943   | : Brass glands for PVC cables  |
| IS-10418   | : Drums for electric cables  |
| IS-10810   | : (Part 0 to 63) Method of test for cables   |
| IS-6474  | : Polyethylene insulation and sheath of electric cables  |
| IS-5819  | : Recommended short circuit ratings of high voltage PVC cables   |
| IEC-60502  | : Power cables with extruded insulation & their accessories for rated voltages 1kV to 30kV                       |
| IEC-540 & 540A   | : Test methods for insulation and sheaths of electric cables and cord  |
| IEC-60332  | : Test on electric cables under fire conditions.   |
| IEC-60754  | : Test on gases evolved during combustion of electric cables.  |
| IEC-10333  | : Cable joints and terminations  |
| IEC Hand Book for Temperature Index Cable in fire regarding temperature Index Chapter-6. |  |
| Any other applicable standards   |  |

##### **14.2. Testing:**

- 14.2.1.** The contractor shall take full responsibility of testing pre-commissioning and commissioning of cabling system being installed by him. It shall be overall responsibility of the contractor to arrange and complete all activities in complete co-ordination with equipment commissioning agency keeping in view the overall commissioning programmed. The contractor shall submit a check list for testing and commissioning and the activities shall be carried out in accordance with the check list.
- 14.2.2.** Testing and electric measurement of cable installations shall conform to IS: 1255.
- 14.2.3.** Prior to installation, cables shall be tested for
- 14.2.3.1.** Continuity of conductors
  - 14.2.3.2.** Insulation resistance between conductor and earth
  - 14.2.3.3.** Insulation resistance between the conductors
- 14.2.4.** After installation each cable shall be tested for
- 14.2.4.1.** Insulation resistance between conductors

- 14.2.4.2.** Insulation resistance between the conductors and earth
- 14.2.4.3.** Absence of cross phasing
- 14.2.4.4.** Firmness of terminations

- 14.2.5. The check and commissioning tests shall be carried out as part of the installation work and the contractor shall not be paid any extra amount for the same.
- 14.2.6. The contractor shall have to bring all testing equipment/instruments in sufficient numbers. All instruments shall be calibrated to the satisfaction of the purchaser before actual testing and tests to be conducted by qualified experienced personnel.
- 14.2.7. All documents/records regarding test data and all other measured values shall be submitted for approval and subsequent record and reference. All cables shall be energized only after certification from certification personnel that cable is ready for energizing. The results of all tests shall conform to the specification requirement as well as guaranteed data.

14.2.8. General:

- 14.2.8.1.** The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian standards specifications, manufacturer's instruction, all cables run in parallel between LT. side of the existing transformer, LT incomer ACB's of LT switch board panel / outgoing of panel to motor terminal etc as required and as directed by the engineer-in-charge. Excavation and refilling using Stones, road crossing using RCC pipe, sand etc. Will be in the scope of contractor and shall be done as per relevant is standard.
- 14.2.8.2.** The cable shall confirm to relevant is which should be specified and shall bear ISI mark. The quantities mentioned above are approximate only. The cables should be supplied after taking actual measurement jointly. No straight joint in any cables shall be permitted. Any piece or cut length shall have to be taken back by contractor. The contractor should plan and purchase the cable to avoid wastage / cut length / excess length as the corporation will not accept the same under any circumstances. The cable shall be genuine and of approved make only.
- 14.2.8.3.** Root marker shall be provided for every 10 meter length of underground cable and cable identifier for every 20 meter length of cable not covered in underground.
- 14.2.8.4.** RCC half round muff of standard make shall be provided for protection of underground cable.
- 14.2.8.5.** All above item should be got approved from engineer-in-charge before execution.
- 14.2.8.6.** The cables shall be delivered at site in the original drums with manufacturer's name, size and type clearly written on the drums.
- 14.2.8.7.** All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.
- 14.2.8.8.** The cable shall be supplied in single length i.e. Without any intermediate joint or cut unless specifically approved by the client. The cable ends shall be suitably sealed against entry of moisture, dust, water etc. With cable compound as per standard practice.

14.2.9. Conductor:

- 14.2.9.1.** Uncoated, annealed copper / aluminium, of high conductivity, up to 4 mm<sup>2</sup> size the conductor shall be solid and above 4 sq. Mm, the conductor shall be concentrically stranded as per iec: 228.

14.2.10. Insulation:

- 14.2.10.1.** Cross link polyethylene (xlpe) extruded insulation rated at 70oc.

14.2.11. Core identification:

- Two cores : red and black
- Three cores : red, yellow and blue
- Four core : red, yellow, blue and black
- Single core : green, yellow for earthing.



Black shall always be used for neutral.

- 14.2.12. Assembly:  
**14.2.12.1.** Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.
- 14.2.13. Armour:  
**14.2.13.1.** Galvanized steel flat strip / round strips applied helically in single layers complete with covering the assembly of cores  
**14.2.13.2.** For cable size up to 10 sq mm : armor of 1.4 mm dia g.i. round wire  
**14.2.13.3.** For cable size above 10 sq mm : armor of 4 mm wide 0.8 mm thick gi strip
- 14.2.14. Sheath:  
**14.2.14.1.** St -2 PVC along with polypropylene fillers to be provided. Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables. Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. Of 50oc and operating temperature of cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black. Sequential length marking along with size and other standard parameters shall be required at every 1.0 meter on the outer sheath.
- 14.2.15. Testing:  
**14.2.15.1.** The finished cables shall be tested at manufacturer's works for all the routine tests for all the length and size of cables to be delivered at site and the certificate for the same shall be furnished to client. If required, the cables shall be tested in presence of the client's representative.  
**14.2.15.2.** Voltage test: each core of cable shall be tested at room temperature at 3 kV AC RMS for duration of 5 minutes.
- 14.2.16. Conductor resistance test:  
**14.2.16.1.** The DC resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20 degree centigrade to check the compliance with the values specified in the is 8130 – 1976.  
**14.2.16.2.** Cable tests before and after laying cables at site:  
**14.2.16.2.1.** Insulation resistance test between phases, phase to neutral and phase to earth.  
**14.2.16.2.2.** Continuity test of all the phases, neutral and earth continuity conductor.  
**14.2.16.2.3.** Earth resistance test of all the phases and neutral.  
**14.2.16.2.4.** All the tests shall be carried out in accordance with the relevant is code of practice and Indian electricity rules. The vendor/contractor shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all the expenses in connection with such tests. All tests shall be carried out in the presence of client and the results shall be prescribed in forms and submitted.
- 14.2.17. Cable marking:  
**14.2.17.1.** The outer sheath shall be legibly embossed at every meter with following legend: electric cable: 1100 v, size: \_\_\_\_c x \_\_\_\_mm<sup>2</sup> with manufacturers name, year of manufacturing and isi symbol. The Surat Municipal Corporation shall be also is written with embossed writing on the cable.
- 14.2.18. Sealing drumming and packing:  
**14.2.18.1.** After tests at manufacturer's works, both ends of the cables shall be sealed to prevent the ingress of moisture during transportation and storage. Cable shall be supplied in length of 500 metres or as required in non-returnable drums of sufficiently sturdy construction. Cables of more than 250 meters shall also be

supplied in non-returnable drums. The spindle hole shall be minimum 110 mm in diameter.

- 14.2.18.2.** Each drum shall bear on the outside flange, legibly and indelibly in the english literature, a distinguishing number, the manufacturer's name and particulars of the cable i.e. Voltage grade, length, conductor size, cable type, insulation type, and gross weight. The direction for rolling shall be indicated by an arrow. The drum flange shall also be marked with manufacturer's name and year of manufacturing etc.

**14.3. Workmanship**

- 14.3.1.** Cables shall be laid in the routes marked in the drawings. Where the route is not marked, the Contractor shall mark it out on the drawings and also on the site and obtain the approval of the CLIENT AND/OR ITS ARCHITECT before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.
- 14.3.2.** Cables shall be laid on walls, cable trays, inside shafts or trenches. Saddling or support for the cable shall not be more than 500 mm apart. Plastic identification tags shall be provided at every 30 m. Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher. In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc unless marked on drawing by architect / consultant. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion. Cables shall be protected with Stone or cement tiles on all the three sides as shown on drawings. Width of excavated trenches shall be as per drawings. Back fill over buried cables shall be with a minimum earth cover of 750 mm to 1000 mm. The cables shall be provided with cables markers at every 10 meters and at all loop points. All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end termination indicating the feeder number and the Panel/Distribution board from where it is being laid.

**14.3.3. In case of cables entering the buildings**

- 14.3.3.1.** It would be done duly only through pipes. The pipes shall be laid in slant position, so that no rainwater may enter the building. After the cables are tested the pipes shall be sealed with M. seal & then tarpaulin shall be wrapped around the cable for making the entry watertight.

**14.3.4. Testing: LT cables shall be tested upon installation with a 500 V Meggar and the Following readings established:**

- 14.3.4.1.** Continuity on all phase Insulation Resistance, between conductors, all conductors and ground
- 14.3.4.2.** All test readings shall be recorded and shall form part of the completion documentation.

**14.3.5. Format for cable testing certificate:**

- 14.3.5.1.** Drum no. from which cable is taken :
- 14.3.5.2.** Cable from \_\_\_\_\_ to \_\_\_\_\_
- 14.3.5.3.** Length of run of this cable \_\_\_\_\_ meter
- 14.3.5.4.** Insulation resistance test
- 14.3.5.4.1.** Between core 1 to earth \_\_\_\_\_ mega-ohm
- 14.3.5.4.2.** Between core 2 to earth \_\_\_\_\_ mega-ohm
- 14.3.5.4.3.** Between core 3 to earth \_\_\_\_\_ mega-ohm
- 14.3.5.4.4.** Between core 1 to core 2 \_\_\_\_\_ mega-ohm
- 14.3.5.4.5.** Between core 2 to core 3 \_\_\_\_\_ mega-ohm
- 14.3.5.4.6.** Between core 1 to core 3 \_\_\_\_\_ mega-ohm
- 14.3.5.4.7.** Duration used:
- 14.3.5.4.8.** High voltage test: Voltage Duration
- 14.3.5.4.9.** Between core and earth
- 14.3.5.4.10.** Between individual cores

## 15. Cable Laying

### 15.1. Route

- 15.1.1. Before the cable laying work is undertaken, the route layout of the cable shall be submitted to the Engineer -in-Charge and the work shall be undertaken only after approval of the route layout.
- 15.1.2. Whenever cables of different voltages are laid following points shall be noted while laying along well demarcated or established roads, the LV / MV cables shall be laid further from the kerbed line than HV cables.
- 15.1.3. Cables of different voltages and also power and control cables shall be kept in different trenches with adequate separation. Where available space is restricted such that this requirement cannot be met, LV / MV cables shall be laid above HV cables.
- 15.1.4. Where cables cross one another, the cable of higher voltage shall be laid at a lower level than the cable of lower voltage.
- 15.1.5. Proximity to communication cables.
  - 15.1.5.1. Power and communication cables shall be as far as possible cross each other at right angles. The horizontal and vertical clearance between them shall not be less than 60 cm.

### 15.2. Methods of Laying

- 15.2.1. The cables shall be laid direct in ground, pipe, closed or open ducts, and cable trays or on surface of wall etc. The method(s) of lying required shall be specified in the tender / schedule of work.

### 15.3. Laying direct in ground

- 15.3.1. This method shall be adopted where specified in the schedule of works. Normally this method shall be adopted when the cable route is through open ground, along roads, lanes, etc. and where no frequent excavations are likely to be encountered and where re-excavation is easily possible without affecting other services.

### 15.3.2. Trenching

- 15.3.2.1. Width and depth of the trench shall be as shown in the drawing. When more than one tier of cables is unavoidable and vertical formation of laying is adopted, the depth of the trench shall be increased by 30 cm for each additional tier to be formed
- 15.3.2.2. The trenches shall be excavated in reasonably straight lines. Wherever there is a change in the direction, a suitable curvature shall be adopted complying with the minimum bending radius specified in Table – 11. Where gradients and changes in depth are unavoidable, these shall be gradual. The bottom of the trench shall be level and free from stones, Stone bats etc.

### 15.3.2.3. TABLE – 2

System voltage	Minimum bending radius		
	Single Core	Multi-Core	
		Armored	Unarmored
11KV	20D	12D	15D
22KV	25D	15D	20D
33KV	30D	20D	25D

Note: Where "D" is the overall diameter of the cable

- 15.3.2.4. Excavation should be done by suitable means – manual or mechanical. The excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench.
- 15.3.2.5. Adequate precautions should be taken not to damage any existing cable(s), pipes or any other such installations in the route during excavation. Wherever Stones, tiles or protective covers or bare cables are encountered, further

excavation shall not be carried out without the approval of the Engineer-in-Charge.

- 15.3.2.6.** Existing property, if any, exposed during trenching shall be temporarily supported adequately as directed by the Engineer -in-Charge. The trenching in such cases shall be done in short lengths, necessary pipes laid for passing cables there in, if required. If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with sheeting as the excavation proceeds. Where necessary, these may even be left in place when backfilling the trench.
- 15.3.2.7.** Excavation through lawns shall be done in consultation with the department concerned.

#### 15.3.3. Laying of Cable in Trench

- 15.3.3.1.** Sand cushioning: The excavated trench shall be provided with a layer of clean, dry sand cushion of not less than 8 cm in depth, before laying the cables therein. However, sand cushioning may not be provided for MV cables, where there is no possibility of any mechanical damage to the cables due to heavy or shock loading on the soil above if so specified in the tender document and as per approval of the Engineer-in-Charge. Sand cushioning shall however be invariably provided in the case of HV cables.
- 15.3.3.2.** The cable drum shall be properly mounted on jacks, or on a cable wheel at a suitable location, making sure that the spindle, jack etc. are strong enough to carry the weight of the drum without failure and that the spindle is horizontal in the bearings so as to prevent the drum creeping to one side while rotating.
- 15.3.3.3.** The cable shall be pulled over in rollers in the trench steadily and uniformly without jerks and strain. The entire cable length shall be far as possible laid off in one stretch. PVC / XLPE cables less than 120 sq.mm size may be removed by "Flaking" i.e. by making one long loop in the reverse direction. For short runs and sizes up to 50 sq.mm of MV cables, any other suitable method of direct handling and lying can be adopted without strain or excess bending of the cables.
- 15.3.3.4.** After the cable has been so uncoiled, it shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 m apart and drawn straight. The cable shall then be lifted off the rollers and laid in a reasonably straight line.
- 15.3.3.5.** Testing before covering. The cables shall be tested in presence of the Engineer -in-Charge for continuity of cores and insulation resistance and the cable length shall be measured, before closing the trench.
- 15.3.3.6.** Sand covering: Cables laid in trenches in a single tier formation shall have a covering of dry sand of not less than 17 cm above the base cushion of sand before the protective covers laid. In the case of vertical multi -tier formation, after the first cable has been laid, a sand cushion of 30 cm shall be provided over the base cushion before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30 cm as stated above. Cables in the top most tiers shall have final sand covering not less than 17 cm before the protective cover is laid. Sand covering as stated above need not be provided for MV cables where a decision is taken by the Engineer -in-Charge as per sub clause (iii-a) above, but theater tier spacing should be maintained with soft soil instead of sand between tiers and for covering. Sand cushioning shall however be invariably provided in the case of HV cables.
- 15.3.3.7.** Extra loop cable
  - 15.3.3.7.1.** At the time of original installation, approximately 3 m of surplus cable shall be left on each terminal end of the cable and on each side of the underground joints. The surplus cable shall be left in the form of a loop. Where there are long runs of cables such loose cable may be left at suitable intervals as specified by the Engineer-in-Charge.

- 15.3.3.7.2.** Where it may not be practically possible to provide separation between cables when forming loops of a number of cables as in the case of cable emanating from a substation, measurement shall be made only to the extent of actual volume of excavation, sand filling etc and paid for accordingly.
- 15.3.3.8.** Mechanical protection over the covering: Mechanical protection to cables shall be laid over the covering to provide warning to future excavators of the present of the cable and also to protect the cable against accidental mechanical damage by pick-axe blows etc. as follows:
- 15.3.3.8.1.** Unless otherwise specified, the cables shall be protected by second class Stone of nominal size 22 cm x 11.4 cm x 7 cm or locally available size, placed on top of the sand (or, soil as the case may be). The Stones shall be placed breadth wise for the full length of the cable. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and projects at least 5 cm over the sides of the end cables.
- 15.3.3.8.2.** Where Stones are not easily available, or are comparatively costly, there is no objection to use locally available material such as tiles or slates or stone / cement concrete slabs. Where such an alternative is acceptable, the same shall be clearly specified in the tender specifications.
- 15.3.3.9.** Backfilling
- 15.3.3.9.1.** The trenches shall be then backfilled with excavated earth, free from stones or other sharp edged debris and shall be rammed and watered, if necessary in successive layers not exceeding 30 cm depth.
- 15.3.3.9.2.** Unless otherwise specified, a crown of earth not less than 50 mm and not exceeding 100 mm in the centre and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of the earth, however, should not exceed 10 cms so as not to be a hazard to vehicular traffic.
- 15.3.3.9.3.** The temporary restatements of roadways should be inspected at regular intervals, particularly during wet weather and settlements should be made good by further filling as may be required.
- 15.3.3.9.4.** After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and materials as the surrounding area and repaved in accordance with the relevant building Specifications to the satisfaction of the Engineer -in-Charge.
- 15.3.3.9.5.** Where lawns have been cut out of necessity, or kerb stones displaced, the same shall be repaired and made good, except for asphaltting, to the satisfaction of the Engineer -in-Charge and all the surplus earth or rock shall be removed to places as specified.
- 15.3.3.10.** Laying of single core cables
- 15.3.3.10.1.** Three single core cables forming one three phase circuit shall normally be held in trefoil formation and shall be bound together at intervals of approximately 1m. The relative position of the three cables shall be changed at each joint at the time of original installation, complete transposition being effected in every three consecutive cable lengths.
- 15.3.3.11.** Route markers
- 15.3.3.11.1.** Location: Route markers shall be provided along with the runs of cable allocations approved by the Engineer -in-Charge and generally at intervals not exceeding 100m. Markers shall also be provided to identify change in the direction of the cable route and locations of underground joints.

- 15.3.3.11.2.** Plate type marker: Route markers shall be made out of 23 cms.X 12 cms G.I. /aluminium plate welded / bolted on 35 mm x 35 mm x 6 mm angel iron, 60 cms long. Such plate markers shall be mounted parallel to and at about 0.5 m away from the edge of the trench.
- 15.3.3.11.3.** CC marker: Alternatively, cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 20 mm in size) shall be laid flat and centered over the cable. The concrete markers, unless otherwise instructed by the Engineer -in-Charge, shall project over the surrounding surface so as to make the cable route easily identifiable.
- 15.3.3.11.4.** Inscription: The words IITG-MV / HV CABLE as the case may be shall be inscribed on the marker.

#### 15.4. Laying in Pipes / Closed Ducts

- 15.4.1. In locations such as road crossing, entry in to buildings, paved areas etc., and cable shall be laid in pipes or closed ducts. Stone ware pipes, GI, CI or spun reinforced concrete pipes shall be used for cables as specified in the schedule of works.
- 15.4.2. Where cables pass through foundation walls or other underground structures, the necessary ducts or openings will be provided in advance for the same. However, should it become necessary to cut holes in existing foundations or structures, the electrical contractor shall determine their location and obtain approval of the Engineer in Charge before cutting is done.
- 15.4.3. At road crossing and other places where cables enter pipe sleeves adequate bed of sand shall be given so that the cables do not slack and get damaged by pipe ends.
- 15.4.4. At road crossings, the top surface of pipes shall be at a minimum depth of 1 m from the pavement level. When pipes are laid cutting existing road, care shall be taken so that the soil filled up after laying the pipes is rammed well in layers with watering as required to ensure proper compaction. A crown of earth not exceeding 10 cm should be left at the top. After the subsidence has ceased, the top of the filled up trenches in road ways or other paved areas shall be restored to the same density and material as the surrounding area in accordance with the direction of the Engineer -in-Charge (Civil) up to his satisfaction.
- 15.4.5. All G.I. pipes shall be laid as per layout drawings and site requirements. Before fabrication of various profiles of pipe by hydraulically operated bending machine (which is to be arranged by the Contractor), all the burrs from the pipes shall be removed. G.I. pipes with bends shall be buried in soil / concrete in such a way that the bends shall be totally concealed. For G.I. pipes buried in soil, bitumen coating shall be applied on the buried lengths. Installation of G.I. pipes shall be undertaken well before paving is completed and necessary coordination with paving agency shall be the responsibility of Electrical Contractor. The open ends of pipes shall be suitably plugged with G.I. plugs after they are laid in final position. G.I. plugs shall be supplied by the Contractor at no extra cost.

#### 15.5. Laying in Open Ducts.

- 15.5.1. Open ducts with suitable removable covers (RCC slabs or checkered plates) are generally provided in substations, switch rooms, plant rooms, and workshops etc. for taking the cables. The cable ducts should be of suitable dimensions for the number of cables involved.
- 15.5.2. For laying of cables with different voltage ratings in the same duct shall be avoided. Where it is inescapable to take HV & MV cables same trench, they shall be laid with a barrier between them or alternatively, one of the two (HV / MV) cables may be taken through pipe(s). Splices or joints of any type shall not be permitted inside the ducts.
- 15.5.3. The cables shall be laid directly in the duct such that unnecessary crossing of cables is avoided.
- 15.5.4. Where specified, cables may be fixed with clamps on the walls of the duct or taken in hooks / brackets / cable trays through in ducts.
- 15.5.5. Where specified, ducts may be filled with dry sand after the cables
- 15.5.6. Are laid and covered as above, or finished with cement plaster, especially in high voltage applications.

- 15.6. Laying on Surface
  - 15.6.1. The method may be adopted in places like switch rooms, workshops, tunnels, rising (distribution) mains in buildings etc. This may be necessitated in the works of additions and / or alternations to the existing installation, where other methods of laying may not be feasible. Cables may be laid in surface by any of the following methods as specified:
    - 15.6.1.1.** Directly clamped by saddles or clamps
    - 15.6.1.2.** Supported on cradle
    - 15.6.1.3.** Laid on troughs / trays duly clamped.
- 15.7. Laying on Cable Tray
  - 15.7.1. This method may be adopted in places like indoor substations, air - conditioning plant rooms; generator rooms etc. or where long horizontal runs of cables are required within the building and where it is not convenient to carry the cable in open ducts. This method is preferred where heavy sized cables or a number of cables are required to be laid. The cable trays may be either of perforated sheets Type or ladder type as specified.

## **16. LT Cable Terminations:**

- 16.1. Material Specification
  - 16.1.1. Cable termination:
    - 16.1.1.1.** Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used. Crimping shall be done with the help of hydraulically operated crimping tool. For joints where cable is with aluminium conductor and bus bars are aluminium, bimetallic lugs shall be used with compound. Cupal type of washers, crimping tool shall be used for crimping any size of cable.
  - 16.1.2. Cable glands:
    - 16.1.2.1.** Cable glands shall be of brass single compression type. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations. Glands should be of nickel-plated brass, with PVC shrouds over it. Before applying PVC shrouds, all bare metal shall be wrapped with pressure sensitive adhesive tape.
  - 16.1.3. Ferrules:
    - 16.1.3.1.** Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.
  - 16.1.4. Cable joints:
    - 16.1.4.1.** Kit type joint shall be done and filled with insulating compound. The joint should be for this 1.1 kV grade insulation, cable termination for conductors up to 4 sqmm may be insertion type and all higher sizes shall have compression type lugs. Cable termination shall have necessary brass glands. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends. Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages. Insulation cutting shall be done properly taking care that no area of the conductor remains exposed. Crimping shall be done with the help of hydraulic tool. Proper insulation tape shall be applied at the cable and lug joint.
  - 16.1.5. Saddles and clips:
    - 16.1.5.1.** Saddles and clips shall be PVC covered or of g.i. fixing screws shall be round head brass, where screws are used. Nuts shall be or brass, square pressed type.
  - 16.1.6. Jointing sleeves:

- 16.1.6.1.** Jointing sleeves shall be of brass with standard termination. Solder type cable connectors / cable sleeves shall be used to join the cable / conductors. The solder used shall comply with BS 219 type no corrosive flux only shall be used.

**16.2. Workmanship**

- 16.2.1. Suitable Size of crimped type solder less lugs should be used for all copper/aluminium cables and stud type terminals. Crimping shall be done with the help of hydraulically operated crimping tool. Crimping tool shall be used for crimping any size of cable.
- 16.2.2. Suitable Size of Cable gland should be used where cable is entering in DB or Panel. For indoor type single compression type cable glands shall be used and for outdoor type double compression type shall be used. Before applying a PVC shrouds, all bare metal shall be wrapped with pressure sensitive adhesive tape.
- 16.2.3. Proper Size of Cable Jointing Kit shall be used to joint two cables and shall be filled with insulating compound. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armoring shall be earthed at both ends. Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages.

**17. DWC Pipe For Cable Protection Excavation And Covering The Cable:**

**17.1. Material Specification**

- 17.1.1. Double walled corrugated pipes (dwc) of polyethylene ( conforming to is 14930 ii ) with necessary connecting accessory of same material at required date for laying of cable below ground / road surface for enclosing the cable and back filling the same to make ground as per original.
- 17.1.2. Diameter of pipe 90mm.
- 17.1.3. Excavation and covering the cable:
- 17.1.4. The dwc duct shall be prominently marked with indelible ink, with the following information at interval of every meter to enable identification of the pipe. The size of the ink markings shall be distinct, clear and easily visible.
- 17.1.5. Ink marking would have following written:
  - 17.1.5.1.** Manufacturer's name (can be in abbreviated form)
  - 17.1.5.2.** Name of the duct with size
  - 17.1.5.3.** Lot no. Of the product
  - 17.1.5.4.** Date of manufacture
  - 17.1.5.5.** Product length
  - 17.1.5.6.** Surat municipal corporation

**17.2. Workmanship**

- 17.2.1. This item includes excavation/ breaking of roads, refilling/restating land/road and covering of cable with RCC half rounds/sand etc. The covering of cable should be with RCC half round muff with cushioning of sand both on top and below of the cable. The RCC half rounds shall be of good quality. Necessary cable covering material should be supplied by the contractor. Where there are more than one cable are to be laid, minimum spacing of 225 mm should be kept, and both cables should be covered with RCC half rounds individually.
- 17.2.2. The item includes excavation of cable trench having depth of 50 to 90 MM (As instructed by engineer in charge) and refilling the same after cable laying and covering. All labour and material required for excavation, covering of cable and refilling shall be supplied by the contractor and the rate should include all such labour, material etc. Any damage to any of the services during excavation, covering, refilling shall be to the contractor's account. The work shall be carried out to the satisfaction of Engineer- in-charge. Refilling work of the trench should be carried out after final supervision of the representative of the corporation. After completion of covering work and testing, trench should be refilled and ground should be levelled including watering etc. If road of pavers-block is broken, the same shall be restated as original



## 18. RCC Hume Pipe

- 18.1. The Concrete Pipes shall be conforming to IS: 458/2003 (Fourth Revision) with Amendment 1 with regards to Design /Dimensions / Tolerances / Workmanship & Finish / Materials used for making the Pipes.
- 18.2. The Pipes shall be manufactured by spinning process. The ends of the concrete pipes shall be suitable for flush joints or collar joints or suitable for Socket & Spigot, roll on joints or confined gasket joints as per the requirements

## 19. Cable Tray

- 19.1. Material Specification
- 19.1.1. Ladder type cable tray. The cable tray shall be fabricated out of 2 mm thick slotted/perforated ms sheets as channel sections, single or double bended. The channel sections shall be supplied in convenient lengths and assembled at site to the desired lengths. These may be galvanized or painted as specified.
- 19.1.2. The jointing between the sections shall be made with coupler plates of the same material and thickness as the channel section. Two coupler plates, each of minimum 200mm length, shall be bolted on each of the two sides of the channel section with 8mm dia round headed bolts, nuts and washers. In order to maintain proper earth continuity bond, the paint on the contact surfaces between the coupler and cable tray shall be scraped and removed before the installation.
- 19.1.3. The permissible uniformly distributed load for various type of cables trays and for different supported span shall be as per is.
- 19.1.4. The width of the cables tray shall be chosen so as to accommodate all the cables in one tier, plus 30 to 50% additional width for future expansion. This additional width shall be minimum 100mm. The overall width of one cable tray shall be limited to 1000mm.
- 19.1.5. Factory fabricated bends, reducers, tee / cross junction. Etc shall be provided as per good engineering practice. The radius of bends, junctions etc. Shall be less than the minimum permissible radius of bending of the largest size of cable to be carried by the cable tray.
- 19.1.6. The cable tray shall be suspended from the ceiling slab with the help of 10 mm dia ms round or 25 mm x 5 mm flats at specified spacing. Flat type suspenders may be used for channels up to 450 mm width bolted to cable trays. Round suspenders shall be threaded and bolted to the cable trays or to independent support angle 50 mm x 50 mm x 5mm at the bottom and as specified these shall be grouted to the ceiling slab at the other end through an effective means, as approved by the engineer – in – charge, to take the weight of the cable tray with the cables.
- 19.1.7. The entire tray (except in the case of galvanized type ) and the suspenders shall be painted with two coats of red oxide primer paint after removing the dirt and rust, and finished with two coats of spray paint of approved make synthetic enamel paint.
- 19.1.8. The cable tray shall be bonded to the earth terminal of the switch bonds at ends.
- 19.1.9. The cable tray shall be measured on unit length basis, along the centre line of the cable tray, including bends, reducers, tees, cross joints, etc.
- 19.1.10. The ladder type of cable tray shall be fabricated of double bended channelsection longitudinal members with single bended channel section rungs of cross members welded to the base of the longitudinal members at a centre to centre spacing of 250 cm as per is.
- 19.2. Workmanship
- 19.2.1. The free vertical distance between parallel perforated trays/racks/ladder shall be at least 250mm and the perforated trays shall be 50mm away from the walls.
- 19.2.2. The trays shall be fixed to the brackets with proper nuts and bolts system.
- 19.2.3. The perforated trays shall be free from sharp edges and burns etc. so that joint between two trays shall be without any clearance and matched in proper shape.
- 19.2.4. At the bends the curvature in all axes of perforated trays/racks shall be 20R or maximum size of cable.
- 19.2.5. The supporting brackets/fixing bolts size shall be so calculated that the design load as specified under sub clause of clause 2.17 does not exceed.

- 19.2.6. The perforated trays shall be installed in such a way that as far as possible the cables can be laid directly in place rather than be pulled through.
- 19.2.7. The cables shall be fixed in the perforated trays by means of plastic ties or plastic coated wires etc.
- 19.2.8. The perforated cable trays along with their supporting arrangements shall be properly earthed by the supplier with nut and bolts from the earthing risers provided by purchaser, generally in the vicinity of the tray routing. The earthing shall be as per latest I.E. rules and IS/IEC recommendation, the size of earth connection shall be such that its conductance should be more than the conductance of the 14 sq.mm. Copper conductor cross section

## 20. Main Line Wiring, Internal Wiring And Point Wiring

### 20.1. Material Specification

#### 20.1.1. Standards

Code of practice for electrical wiring installation system voltage not exceeding 650	: IS: 732
Code of practice for fire safety of buildings general) electrical installation	: IS: 1646
Rigid steel conduits for electrical wiring	: IS: 1653
Fittings for rigid steel conduits for electrical	: IS: 2667
Flexible steel conduit for electrical wiring	: IS: 3480
Accessories for rigid steel conduits for	: IS: 3837
PVC insulated cables (wires)	: IS: 694
Rigid non-metallic conduits for electrical wiring	: IS: 2509
Flexible (playable) non-metallic conduits for	: IS: 6946
Three pin plugs and sockets	: IS: 1293
Conductors for insulated electrical cables and	: IS: 8180
Specification for conduit for electrical installation	: IS: 9537--1980
Accessories for non-metallic conduits for electrical wiring	: IS: 3419
Switches	: IS: 3854
Plugs	: IS: 6538
Shunt capacitors for power systems	: IS: 2834-1954
Hrc cartridge fuses and links up to 660 volts	: IS: 2208
General and safety requirement for lighting fittings	: IS: 1913-1969
Code of practice for lighting public thorough fares	: IS: 2944-1981
3 pin plug sockets	: IS: -1293
Specification of conduits for electrical installation	: IS: -8130
Guide for electrical layout in residential building Indian electricity act and rules	: IS: 4648

#### 20.1.2. Rigid and flexible conduits:

- 20.1.2.1.** All conduits shall be rigid PVC pipe having minimum wall thickness of medium gauge 1.5 to 1.8 approved by FIA. & ISI and shall confirm to IS 9537.
  - 20.1.2.1.1.** Up to 38 mm. Diameter - minimum 1.8 mm. Wall thickness.
  - 20.1.2.1.2.** Above 40 mm. Diameter - minimum 2.2 mm. Wall thickness.
  - 20.1.2.1.3.** 20, 25, and 32 mm diameter- minium1.5 mm wall thickness
- 20.1.2.2.** Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduit shall be terminated in brass adapters.

**20.1.2.3. Accessories:**

- 20.1.2.3.1.** PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, plugs etc. Shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS: 2667-1964 and IS: 3857-1966. All fitting associated with galvanized conduit shall also be galvanized.

**20.1.3. Casing and Capping**

- 20.1.3.1.** Casing and capping shall be of good quality PVC, free from defects like deformations, unevenness, blisters, cavities, etc.
- 20.1.3.2.** The casing shall be of square or rectangular body with top of the side walls suitable for tightly fitting slide-in type capping with double grooving. All surfaces shall have smooth finish inside and outside.

**20.1.4. Wires:**

- 20.1.4.1.** All wires shall be single core multi-strand/ flexible copper frls type PVC insulated as per IS: 694 and shall be 660 v\1100 v grade.

- 20.1.4.2.** All wires shall be colour coded as follows :

Phase	Colour of Wire
R	red
Y	yellow
B	blue
N	black
Earth	green (insulated)
Control (if any)	grey

- 20.1.4.3.** All off wires shall be same as phase wire

**20.1.5. Switches & Sockets:**

- 20.1.5.1.** Switches shall be moulded plate type flush piano type with silver-coated contacts. Sockets shall be 3 pin with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes. All screws shall be brass-chromium plated and shall be counter sunk type with half round head or flat headed. For heavy duty, metal clad sockets m.c.b/ isolator mounted in a galvanized steel box shall be provided.

**20.2. Workmanship**

**20.2.1. Point wiring**

- 20.2.1.1.** The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 25 mm. diameters unless otherwise indicated or approved. Size of wires shall not be less than 1.5 sqmm copper or 2.5 sqmm aluminium

Nominal Dia of wires (mm)	Nominal Cross sec. Area (mm <sup>2</sup> )	20 mm		25 mm		32 mm		38 mm	
			B	S	B	S	B	S	B
1/2.40	1.50			8	6	15	9	-	--
1/1.80	2.50			6	4	10	8	-	--
1/2.24	4.00			4	3	8	6	-	--
1/2.80	6.00			4	3	6	6	-	--
1/3.55	10.00		-	3	2	5	4	6	5

**Note:** **S:** Runs of conduits which have distance not exceeding 4.25 m. between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

**B:** Runs of conduits which deflect from the straight by more than 15°

**20.2.1.2.** Conduits shall be kept at a minimum distance of 100 mm. from the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephone, TV & Computer piping (if possible)

**20.2.1.3.** Separate conduits/raceways shall be used for :

**20.2.1.3.1.** Normal lights and 5 A 3 pin sockets on lighting circuit.

**20.2.1.3.2.** Separate conduit shall be laid from D.B. to switch board or point.

**20.2.1.3.3.** Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets.

**20.2.1.3.4.** Emergency lighting.

**20.2.1.3.5.** Telephones.

**20.2.1.3.6.** Fire alarm system.

**20.2.1.3.7.** Public address system & Music system.

**20.2.1.3.8.** For all other voltages higher or lower than 230 V.

**20.2.1.3.9.** T.V. Antenna.

**20.2.1.3.10.** Water level guard.

**20.2.1.3.11.** Computer Wiring

**20.2.1.3.12.** Call bell wiring layout of conduits shall be generally as indicated on drawings and the layout shall be supplemented and complemented by contractor on site with the approval of the Engineer.

**20.2.1.3.13.** Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

**20.2.1.3.14.** Conduits run on surfaces shall be supported on GI 12 mm. thick pressure saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500 mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No cross-over of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

**20.2.1.3.15.** Conduits embedded into the walls shall be fixed by means of staples at not more than 500 mm. intervals. Chases in the walls shall be

neatly made and refilled after laying the conduit and brought to the finish of the wall but final finish will be done by the building contractor.

- 20.2.1.3.16.** Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the Engineer, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete. Suitable fish wires shall be drawn in all conduits before they are embedded.
- 20.2.1.3.17.** Where conduit passes through expansion joints in the building, adequate expansion fittings shall be used to take care of any relative movement.
- 20.2.1.3.18.** Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm. clear per plate truly cut and fixed with cadmium plated brass screws. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the Perspex cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.
- 20.2.1.3.19.** Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.
- 20.2.1.3.20.** An insulated earth wire of copper rated capacity shall be run in each conduit. The earth continuity conductor shall be as follows.
- 20.2.1.3.21.** Load balancing: Balancing of circuit in three-phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

20.2.2. Minimum size of earth conductor not forming part of same cable as associate circuit conductor

Nominal cross section area of Largest associated copper circuit Conductor in Sq. MM	Nominal cross section area of Earth continuity conductor in Sq. MM
6.0	2.5
10.0	6.0
16.0	6.0
25.0	16.0
35.0	16.0
50.0	16.0

20.2.4. Lighting & Power Wiring:

- 20.2.4.1.** All final branch circuits for lighting and appliances shall be flexible copper wire of appropriate size run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, and junction boxes.
- 20.2.4.2.** Branch circuit conductor sizes shall be as shown in the schedule of quantities and or drawings.
- 20.2.4.3.** All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits, of the same phase.
- 20.2.4.4.** Flexible cords for connection to appliances, fans and pendants shall be 650/1100 V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with

strengthening cord. Colour of sheath shall be subject to the Engineer's approval.

- 20.2.4.5.** Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.
- 20.2.4.6.** Control switches shall be connected in the phase conductors only and shall be 'ON' when knob is down. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.
- 20.2.4.7.** Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq.mm. Copper shall be used.
- 20.2.4.8.** Every conductor shall be provided with identification ferrules at both ends matching the drawings.

#### 20.2.5. Testing

- 20.2.5.1.** The entire installation shall be tested for:
- 20.2.5.2.** Insulation resistance.
- 20.2.5.3.** Earth continuity.
- 20.2.5.4.** Polarity of single pole switches

### 21. MCB, ELCB & LT Distribution Boards

#### 21.1. Material Specification

##### 21.1.1. Distribution board

- 21.1.1.1.** Distribution board using tpn/ dp/ sp MCB/MCCB isolator, earthing terminal, connector strip for phase neutral and earth for each circuit, CRCA sheet steel housing and complete.
- 21.1.1.2.** Common banking of neutral & earth conductor is not allowed. It shall be suitable to operate on 415/220 volt, 50 Hz. A. C. Supply and withstand short circuit current of 10ka.

##### 21.1.1.3. Construction

- 21.1.1.3.1.** Distribution boards shall be fabricated from 2mm. Gauge CRCA sheet or shall be factory readymade as specified in the material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall and dead front operated. Distribution boards shall be powder coated with 7-tank process application. The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links.
- 21.1.1.3.2.** There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB's and other accessories. Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.
- 21.1.1.3.3.** It should be totally enclosed and made dust, vermin and weatherproof such that, it meets to the IP-51 and IP-54 protection for indoor and outdoor application respectively.
- 21.1.1.3.4.** A detachable cover plate of 2mm. CRCA sheet shall be on front of board such that, all live parts of the electrical accessories mounted on board shall be accessible only on removal of said cover plate. The cover plate shall be fixed to the board with adequate size zinc passivity metal screws. Above the detachable cover plate, one additional hinged door of 2 mm thick CRCA sheet should be provided with necessary locking arrangement and suitable gasket capable of withstanding corrosive and humid atmosphere.
- 21.1.1.3.5.** Inter connection of wiring shall be done with 660/1100 v. Grade, PVC insulated, flexible copper conductor of one size higher current carrying capacity than that of switch rating.

- 21.1.1.3.6.** Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° c over the ambient. Each board shall have two separate earthing terminals.
- 21.1.1.3.7.** Circuit diagram indicating the load distribution shall be pasted on the inside of the db as instructed. One earthing terminal for single phase and two terminals for 3 phases DB shall be provided with an earth strip connecting the studs and the outgoing ecu earth bar.
- 21.1.1.3.8.** The top and the bottom faces of the DB shall be provided for conduit entry of minimum 1.5" dia if required and shown in drawing, copper cable entry provision shall be made. The circuit connection from MCB's shall be brought to elemex type connector provided on top/bottom of the db. The connector shall be suitable to receive phase, neutral and earth wire/cable coming from each individual circuit. The connectors shall have identification tag. The faces if asked shall be kept detachable. All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/fuse base by means of insulated single conductor copper wires as follows
 

Up to 15 Amp	2.5 sqmm
25 Amp	4.0 sqmm
32 Amp	6.0 sqmm
40 Amp	10 sqmm
63 Amp	16 sqmm
- 21.1.1.3.9.** Each db shall have indicating lamp, preferably neon type denoting power availability in the board. Indicating lamps shall be complete with fuse.

#### 21.1.2. MCCB / Miniature Circuit Breakers (MCB):

- 21.1.2.1.** Miniature circuit breakers shall be quick make and break and break type non-welding self-wiping silver alloy contacts for 10 ka short circuit both on the manual and automatic operation, confirms with British standard BS : 3871 (part-i) 1965 and is :8825 (1996) with facility for locking in off position.
- 21.1.2.2.** The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10ka, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "on" and "off" indications. 'c' characteristic current limiting type, 10 ka and having quick break with trip free operating mechanism. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sqmm aluminium or 2.5 sqmm copper and for higher ratings; the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.
- 21.1.2.3.** The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection

#### 21.1.3. RCCB / ELCB

- 21.1.3.1.** The RCCB should suffice all the requirements of is as per code is - 12640 - 1988. The RCA should be current operated and not on line voltage.
- 21.1.3.2.** The RCCB should ensure mainly the following functions:
  - 21.1.3.2.1.** Measurement of the fault current value.
  - 21.1.3.2.2.** Comparison of the fault current with a reference value.
  - 21.1.3.2.3.** The RCCB should have a torrid transformer which has the main conductors of primary (p - n) which check the sum of the current close to zero

- 21.1.3.2.4.** All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant
- 21.1.3.2.5.** It should be truly current operated
- 21.1.3.2.6.** It should operate on core balance torrid transformer
- 21.1.3.2.7.** Its accuracy should be  $\pm 5\%$ .
- 21.1.3.2.8.** It should operate even in case of neutral failure.
- 21.1.3.2.9.** It should trip at a present leakage current within 100 ma
- 21.1.3.2.10.** Its enclosure should be as per ip 30.
- 21.1.3.2.11.** Its mechanical operation life should be more than 20,000 operations.
- 21.1.3.2.12.** It should provide full protection as envisaged by IE rules-61-a, 71-EE, 73-EE, and 1985 and also rule 50 of ie rule 1956.
- 21.1.3.2.13.** It should conform to all national and international standards like IS: 8828-1993, IS: 12640-1988, BS 4293 - 1983, CEE 27 (international commission rules for the approved of electrical equipment)

## 21.2. Workmanship

- 21.2.1. The D.B. shall be properly grouted in the wall in concealed manner taking care that the powder coating is not scratched and dents are not formed on the D.B. The MCBs and ELCBs in the distribution boards shall be fixed as per the circuit details provided. All the wires terminating in the MCBs and the ELCBs shall be lugged for proper contact and ferrules depicting the circuit no's shall be provided. D.B.s mounted in concealed manner shall have a groove around it so as to save the finish of the plaster and colour during future opening of the door. The distribution boards shall have circuit chart tagged on the door for future maintenance. Danger notice plates shall be fitted to the distribution boards with screws and not stuck so as to assure its presence for a longer duration.

## 22. Earthing System

### 22.1. Material Specification

- 22.1.1. The earthing system complete in all respect with all equipments, fittings and accessories for efficient and trouble-free operation. The material to be supplied by the contractor and work to be carried out by the contractor shall be in general, but not limited to, conforming to the specification laid down for each item.

### 22.1.2. Codes & standards

- 22.1.2.1.** The design, material, assembling, inspection and testing shall comply with all currently applicable statutes, regulations and safety codes in the locality where the system will be installed. The equipment shall also confirm to the latest applicable standards and codes of practice as mentioned below

S r.	Item	Relevant is
1	Code of practice for earthing	IS 3043
2	Insulation co-ordination application guide	IS 3716
3	Code of practice for protection of buildings and allied structures against lightning	IS 2309
4	Indian electricity rules, 1956	
5	Indian electricity act, 1910	
6	National electrical code	

### 22.1.3. Materials required

- 22.1.3.1.** All required hardware such as bolts, nuts, washers (round and spring type), anchor fasteners, screws, etc. Of sizes and type as required shall be conforming to relevant is. All hardware shall be hot-dip galvanized or zinc passivated /cadmium plated as per requirement of work either mechanical fabrication or electrical jointing
- 22.1.3.2.** All other items required for installation shall be as approved by engineer in-charge.



22.2. Workmanship

- 22.2.1. Following activities shall be carried out for the earthing station
- 22.2.2. Excavation in hard murrum.
- 22.2.3. Laying Watering pipe.
- 22.2.4. Stone masonry with cast iron frame and hinged covers.
- 22.2.5. Charcoal and Salt fill.
- 22.2.6. Earth station should be 1 meter away from building.
- 22.2.7. Keep minimum 3 meter distance between two earth pits.
- 22.2.8. The pit should be minimum 4 meter deep.
- 22.2.9. The earth resistance should not exceed 1 ohm.
- 22.2.10. All earth pits of same category shall be interlinked with strip.
- 22.2.11. Separate earthing for the Audio-Video device to be provided as required

22.2.12. INSTALLATION OF SYSTEM

- 22.2.12.1.** The plate/pipe electrode, as far as practicable, shall be buried below permanent moisture level but in no case less than 3 M below finished ground level
- 22.2.12.2.** The plate/pipe electrode shall be kept clear of the building foundation and in no case, it shall be nearer by less than 2 M from outer face of the respective building wall / column
- 22.2.12.3.** The plate electrode shall be installed vertically and shall be surrounded with 150 mm. thick layers of Charcoal dust and Salt mixture
- 22.2.12.4.** 20 mm. dia. G.I. pipe for watering, shall run from top edge of the plate / pipe electrode to the mid level of block masonry chamber
- 22.2.12.5.** Top of the pipe shall be provided with G.I. funnel and screen for watering the earth / ground through the pipe
- 22.2.12.6.** The funnel with screen over the G.I. pipe for watering to the earth shall be housed in a block masonry chamber as shown in the drawing
- 22.2.12.7.** The masonry chamber shall be provided with a Cast Iron hinged cover resting over the Cast Iron frame which shall be embedded in the block masonry
- 22.2.12.8.** Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS: 3043, Code of Practice for Earthing Installation
- 22.2.12.9.** The earth conductors ( Strips / Wires, Hot dip G.I. / copper ) inside the building shall properly be clamped / supported on the wall with Galvanized Iron clamps and Hot Dip GI screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level
- 22.2.12.10.** The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished
- 22.2.12.11.** Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long and bitumen coated
- 22.2.12.12.** The earth conductors shall be in one length between the earthing grid and the equipment to be earthed
- 22.2.12.13.** Minimum distance of 2 meter shall be maintained between other electric conductor, earthing conductor and the conductor laid for the lightning protection system. Earthing and lightning protection system conductors shall be bonded to each other to prevent side flashover in case of non-availability of adequate clearance
- 22.2.12.14.** The earthing met conductors, risers, earthing cables, etc. passing through walls shall be covered with galvanized iron sleeves for the passage through wall. Water stop sleeves shall also be provided wherever the earthing conductor enters the building from outside

22.2.13. INSPECTION AND TESTING

- 22.2.13.1.** The following earth resistance values shall be measured with an approved earth megger and recorded.
- 22.2.13.2.** Each earthing station

- 22.2.13.3.** Earthing system as a whole
- 22.2.13.4.** Earth continuity conductors
- 22.2.13.5.** Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 1 ohm in each case. In case of more earth resistance, the Contractor shall have to carry out necessary modification in the system without any cost implication to the Client
- 22.2.13.6.** Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed
- 22.2.13.7.** All tests shall be carried out in presence of the consultant / client and report should be submitted in two sets

22.2.14. Size of GI Earth-strip for earthing shall be generally under:

- 22.2.14.1.** HT Switch-yard/Earthing station: 50 x 6 mm GI strip
- 22.2.14.2.** Switch-boards up to 800 Amps: 40 x 6 mm GI strip
- 22.2.14.3.** Other switch-boards and motors including 50HP and above: 32 x 6 mm GI strip
- 22.2.14.4.** Motors less than 50HP up to and including 20HP: 32 x 3 mm GI strip
- 22.2.14.5.** Motors less than 20HP: 25 x 3 mm GI strip
- 22.2.14.6.** P.S.D.B.'s L.S.D.B's: 10 SWG GI Wire
- 22.2.14.7.** Transformer Neutral: Copper strip Size as per transformer rating
- 22.2.14.8.** Metering C.T's / P.T's, L.A's & TVM Box: (double earthing): 25mmx5 mm copper
- 22.2.14.9.** Lighting Conductor System: 32 x 6 mm GI strip

## **23. Portable Fire Extinguishers**

- 23.1. Portable Dry Chemical Powder Type Extinguisher
  - 23.1.1. Portable dry chemical powder type fire extinguishers shall be provided as ready means for dealing effectively and immediately with fire in the substation and pump house area. Following types of fire extinguishing equipment as per the "Schedule of Requirements" shall be provided.
    - 23.1.1.1.** Hand portable dry chemical powder type extinguisher of 2.5 kgs complete with initial charge and hanging brackets.
    - 23.1.1.2.** Hand portable type fire extinguishers shall fulfill the requirements of Indian Standard Specification IS: 2171 in respect of material, shape and construction etc. Each fire extinguisher shall be subjected to the performance as laid down in the above Indian Standards Specification.
  - 23.1.2. The portable fire extinguishers as stated above shall be located at suitable places. All the fire extinguishers shall be subjected to anti corrosive treatment and shall be painted and marked as per requirement of relevant standards.

## **24. B class GI pipe**

- 24.1. Materials.
  - 24.1.1. Galvanized iron pipes shall be of the medium type and of required diameter and shall comply with I.S. 1239-1990. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanized iron fittings shall be of the standard "R" or equivalent make.
- 24.2. Workmanship.
  - 24.2.1. Cutting, laying & jointing.
    - 24.2.1.1.** When the tubes are to be cut or rethreaded, the ends shall be carefully filed out so that no obstruction to bore is offered. The ends of the tubes shall then be threaded confirming to the requirements of I.S. 554-1955 with pipe dies and tape carefully in such a manner as will not result in slackness of joints when two pieces are screwed together.
    - 24.2.1.2.** The taps and dies shall be used only for straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack as the latter procedure may not result in a water tight joint. The screw threads for the tube and fitting shall be protected from edge until they are fitted.
    - 24.2.1.3.** In jointing the tubes, the inside of the socket screwed end of the tubes shall be oiled and smeared with white or red lead and wrapped around with a few turns of fine spun yarn around the screwed end of the tube. The end shall

then be tightly screwed in the socket, tees etc. with a pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust and dirt during fixing. Burr from the joints shall be removed after screwing. After laying the open ends of the pipes shall be temporarily plugged to prevent access of water, soil or any other foreign matter.

- 24.2.1.4.** The threads exposed after 3 jointing shall be painted or in the case of underground piping thickly coated with approved anti-corrosive paint to prevent corrosion.

**24.2.2. Laying in trenches.**

- 24.2.2.1.** The width and depth of trenches for different diameters of tube shall be as for 15 to 80 mm dia tube width of trenches shall be 30 cm and depth of trenches 60 cm.

- 24.2.2.2.** At joints the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications of earth work in trenches.

- 24.2.2.3.** The pipes shall be painted with two coats of anti-corrosive bitumastic paint of approved quality. The pipe shall be laid on a layer of 75 mm sand filled upto 150 mm above the pipe if so specified. The remaining portion of trench shall be then filled with excavated earth. The surplus earth shall be disposed of as directed.

- 24.2.2.4.** When the excavation is done in rock the bottom shall cut deep enough to permit the pipe to be laid and cushion of sand 75 mm. In case of bigger diameter of tube where pressure is very high, thrust block of cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area if so specified.

**24.2.3. Fixing of tube fittings to wall ceiling and floors.**

- 24.2.3.1.** In case of fixing of tubes and fittings to the walls ore ceilings, these shall run on the surface of the wall or ceiling (not in chase) unless otherwise specified. The fixing shall be done about 15 mm clear off the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in ducts or recesses etc., provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable pipes may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeves shall be fixed at a place a pipe is passing through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors the pipe shall be laid in layer of sand filling.

- 24.2.3.2.** All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1:3 ( cement : 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight lengths at 2.0 metre c/c interval in horizontal run and 2.5 metre intervals in vertical run. For pipe of 15 mm dia upto 25 mm dia the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the Stone or concrete. However, for bigger diameter pipes the holes shall be carefully made of the smallest required size. After fixing the pipe holes shall be made good with cement mortar 1:3 (1 cement: 3 coarse sand) and properly finished to match the adjacent surface.

**24.2.4. Testing of joints.**

- 24.2.4.1.** After laying and jointing, the pipe and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking will be re done and all leaking pipes removed and replaced without extra cost.

- 24.2.4.2.** The pipes and fitting after they are laid shall be tested to hydraulic pressure of 6 kg / Sq cm the pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all stock and water hammer. The draw off takes and stock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fittings shall be tested in sections as the work of laying proceeds, keeping the joints exposed for inspection during the testing.
- 24.2.5. The width and depth of the trenches for different diameters of tube shall be as under.
- 24.2.6. For 15 to 80 mm dia tube width of trenches shall be 30 cm and depth 60 cm.
- 24.2.7. At joints, the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications of earth work in trenches.
- 24.2.8. The pipe shall be painted with two coats of anti-corrosive bitumastic paint of approved quality. The pipe shall be laid on a layer of 75 mm sand filled upto 150 mm above the pipe if so specified. The remaining portion of trench shall be then filled with excavated earth. The surplus earth shall be disposed off as directed.
- 24.2.9. When the excavation is done in rock the bottom shall cut deep enough to permit the pipe to be laid and cushion of sand 75 mm. In case of bigger diameter of tube where pressure is very high, thrust block of cement concrete 1:2:4 ( 1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area if so specified.
- 24.3. Mode of measurement and payments.
- 24.3.1.1.** The description of item , shall unless otherwise stated, be held to include where necessary, conveyances and delivery, handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shape and size, setting, fitting in position, straight, cutting and waste, return of packing etc.
- 24.3.1.2.** The length shall be measured on running metre basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to walls, ceiling, floors etc. shall be measured and paid under this item.
- 24.3.1.3.** All the work shall be measured in decimal system as fixed in its place, subject to tolerance given unless otherwise stated.
- 24.3.1.3.1.** Dimension shall be measured to the nearest 0.01 metre.
- 24.3.1.3.2.** Area shall be worked out to the nearest of 0.01 Sq. metre.
- 24.3.1.4.** In case of fittings with unequal bore, the largest bore shall be measured for the test.
- 24.3.1.5.** Testing of pipe lines, fittings and joints including providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the test.
- 24.3.1.6.** The rate includes galvanized steel tubing with screwed socket joints, together with all fittings (such as bends, sockets, springs, elbows, tees, crosses, short pieces, clamps and plug union etc. ) and fixing complete with clamping wall hooks, wooden plugs etc and also cutting, screwing and waste for making forged ( or handmade) bends or piping as required. The rate also includes cutting through walls, floors etc., and their making good and painting exposed threads with anti corrosive paint as above and testing. Where tubes are to be fixed to wall, ceiling and flooring, the rates shall not include painting of pipes, providing sleeves and sand filling under floor for which separate payment shall be made.
- 24.3.2. For purpose of calculating cubic content , cross section shall normally be taken at suitable intervals i.e. manhole or wall chamber intervals, except in a abnormal cases like sudden change in strata or undulating ground etc. where they may be taken at closer intervals as approved by the Engineer-in-charge whose decision shall be final, conclusive and binding.
- 24.3.3. Authorized width.
- 24.3.3.1.** Upto one meter depth, the width of the trenches for the purpose of measurements of excavation shall be arrived at by adding 40 cm to the external diameter of the tube (not the socket) where a pipe is laid on concrete bed / cushioning layer, the authorized width shall be external diameter of tube plus 40 cm or the width of concrete bed cushioning layer whichever is more.

- 24.3.3.2.** For depth exceeding one meter an allowance of 5 cm per metre of depth for each side of the trench shall be added to the authorized width (i.e. external diameter of pipe plus 40 cm) this allowance shall be applied to entire depth of trench. The authorized width in such cases shall therefore be equal to the depth of trench, plus external diameter of tube plus 40 cm.
- 24.3.3.3.** Where more than one tube is laid, the diameter shall be reckoned at the horizontal distance from outside to outside of the outermost pipes.
- 24.3.3.4.** Where sheeting etc. has been provided the authorized width of the trenches at bottom shall be increased to accommodate for sheeting etc. so the clear width available between faces of sheeting is as per provisions of (a), (b) & (c) above.
- 24.3.3.5.** If the sides of the trench are not vertical, the toes of the side slope shall at end at the top of the pipe and vertical sided trench of authorized width as per (a), (b), (c) and (d) above shall be excavated from these down to the bed of trenches.
- 24.3.4. Where the tubes are laid in trenches, the work of excavation and refilling shall be paid of separately. The rate also does not include painting of pipes and sand filling all round the tubes for which separate, payment shall be made. The length shall be measured in running metre basis.
- 24.3.5. The rate shall be for a unit of one running metre.

## **25. Open Well Mono Block Pump Set**

### **25.1. Applicable Indian Standards**

- IS: 1520-1980: Horizontal pumps for clear, cold, fresh, water.
- IS: 1520-1977: Technical requirements for roto-dynamic special purpose pumps.
- IS: 6595-1993: Horizontal centrifugal pumps for clear, cold, fresh water for agricultural purposes.
- IS: 8034-1989: Submersible pump sets for clear, cold, fresh water.
- IS: 8418-1977: Horizontal centrifugal self priming pumps.
- IS: 8472-1977: Regenerative self priming pumps for clear, cold, fresh water.
- IS: 9079-1989: Mono set pumps for clear, cold, fresh water for agricultural purposes.
- IS: 9137-1978: Code for acceptance tests for centrifugal mixed flow and axial pumps.
- IS: 9301-1984: Deep well hand pumps.
- IS: 9542-1980: Horizontal centrifugal mono set pumps for clear, cold, fresh water.
- IS: 9694-1980 (Pt I, II, III & IV): Code of practice for the selection, installation, operation and maintenance of horizontal centrifugal pumps for agricultural applications: Part I selection
- IS: 9694-1980: Part II Installation.
- IS: 9694-1980: Part III Installation.
- IS: 9694-1980: Part IV Maintenance.
- IS: 10572-1983: Methods of sampling pumps.
- IS: 10804-1986: Recommended pumping system for agricultural purposes.
- IS: 10805-1986: Foot-valve, reflux valve or non-return valve and bore valve to be used in suction lines of agricultural pumps.
- IS: 10981-1983: Code of acceptance test for centrifugal mixed flow and axial pumps.
- IS: 11004-1985 Pt I & II): Code of practice for installation and maintenance of deep well hand pumps: Part I-Installation.
- IS: 11004-1985: Part II-Maintenance.
- IS: 11346-1985: Testing set up for agricultural pumps.
- IS: 11501-1986: Engine mono set pumps for clear, cold, fresh, water for agricultural pumps.
- IS: 12225-1987: Jet centrifugal pump combination.

### **25.2. Standard Construction**

- 25.2.1. Pumps Portion: Graded Cast Iron pump with high class powder coated.
- 25.2.2. Motor should be designed, assembled and tested as per IS specifications, fully moisture proof & should run at low voltage successfully.
- 25.2.3. Winding & Insulation: Stator windings consist of synthetic enameled copper wire coils with slot insulations which provide rigidity to winding at all working temperatures. The vacuum impregnation gives stator a high insulation resistance to moisture that gives complete protection to the winding under all working conditions, including humid tropical climates.

- 25.2.4. Impeller: High tensile Bronze or Forged Impeller (Brass) should be Lead free & food graded.
- 25.2.5. Bearings & Shafts: Anti friction double Z Ball Bearings should be fitted along with lithium based grease in the motor at both the ends for long life. Shaft should be machined and grinded with latest technology to extremely fine limits to ensure proper fitting for bearings.
- 25.2.6. Rotor: Pressure die cast aluminum cage rotor with radial fins which should be dynamically balanced along with a stainless steel shaft.
- 25.2.7. Seal: High Alumina and graphite mechanical seal.

**26. Water Level Controller**

- 26.1. Standard Specification
  - 26.1.1. Water Level Controller should be completely Automatic System without any 'Pump set Protection Circuitry' feature:
  - 26.1.2. The system automatically controls pumping of water from Underground Sump / Well / Bore well to Overhead Tank.
  - 26.1.3. The system can be upgraded into "Multi-tank control system" to maintain water level in several overhead tanks.
  - 26.1.4. The system comes with Industrial Grade Electronic Components, Reliable Power Supply and Power Contactor in Powder coated Metallic Enclosure.
  - 26.1.5. The system is adoptable for any kind of starters of both Single phase and Three phase Motors.
  - 26.1.6. This system is based on AC Sensing Technology; hence the sensors are non-corrosive and maintenance free.
  - 26.1.7. This system is suitable for Residential Applications and simple Industrial requirements.
  - 26.1.8. The system has three positions Power Control Toggle Switch with "Auto" mode, "Off" mode and "Manual" mode.
  - 26.1.9. In "Manual" mode the Pump set can be controlled directly and level controller gets completely shut down and bypassed.
  - 26.1.10. Should follow IS 15840:2009 which defines Determination of volume of water & water level in lakes & ISO/TR 11330:1997 reservoirs

**Signature of Contractor**

**Signature of  
EXECUTIVE ENGINEER  
BUILDING  
DEPARTMENT  
BHAVNAGAR  
MUNICIPAL  
CORPORATION  
BHAVNAGAR**



सत्यमेव जयते



एक कदम स्वच्छता की ओर

# CPWD HANDBOOK OF HORTICULTURE



## Central Public Works Department

Ministry of Housing and Urban Affairs



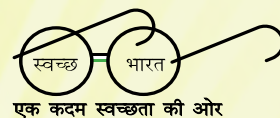


Zaitoon (*Olea europaea*)





सत्यमेव जयते



# CPWD HANDBOOK OF HORTICULTURE



**CENTRAL PUBLIC WORKS DEPARTMENT**

Ministry of Housing and Urban Affairs







Hon'ble Prime Minister planting Rudraksh Tree in the Parliment House







Hon'ble Minister and his wife visiting Bonsai stall during CPWD flower show



हरदीप एस पुरी  
HARDEEP S PURI



आवासन और शहरी कार्य राज्य मंत्री (स्वतंत्र प्रभार)  
नागर विमानन राज्य मंत्री (स्वतंत्र प्रभार)  
वाणिज्य एवं उद्योग राज्य मंत्री  
भारत सरकार

Minister of State (I/C), Housing & Urban Affairs  
Minister of State (I/C), Civil Aviation  
Minister of State, Commerce & Industry  
Government of India

### MESSAGE

It gives me immense pleasure to note that "CPWD Handbook of Horticulture" is being published by the Central Public Works Department on the occasion of 166<sup>th</sup> CPWD Day on 12 July 2020.

Green areas are the lungs for the planet Earth. Man survives only if the surrounding natural habitat is green and vibrant. Any grievous assault on nature puts our very survival as a human race in peril. We can all contribute in our own ways in keeping the earth green. In urban areas, tree lined avenues and parks supplement the ecosystem and add to the aesthetics.

I hope this book will be beneficial for the professionals and amateurs in the field of horticulture and ornamental gardening.

I congratulate Shri Vinit Kumar Jayaswal, Director General, CPWD and his team for publishing this handbook of Horticulture.

New Delhi  
07 July 2020



(Hardeep S Puri)





दुर्गा शंकर मिश्र

सचिव

**Durga Shanker Mishra**

Secretary



भारत सरकार  
आवासन और शहरी कार्य मंत्रालय  
निर्माण भवन, नई दिल्ली-110011

Government of India  
Ministry of Housing and Urban Affairs  
Nirman Bhawan, New Delhi-110011



### MESSAGE

Congratulations to Central Public Works Department for publishing 'CPWD Handbook of Horticulture' on the occasion of its 166<sup>th</sup> Foundation Day. This Handbook deals with various aspects of horticulture, landscaping and ornamental gardening. Green areas are not only important for environmental conservation, micro climate regulations, bio-aesthetics, but also for stress busting effects.

I am confident that this Handbook will increase awareness amongst horticulturists, professionals, garden amateurs, practicing engineers and architects.

I applaud the efforts of Shri Vinit Kumar Jayaswal, Director General, CPWD and his team in publishing this very useful Handbook.

(Durga Shanker Mishra)

New Delhi

7 July, 2020





Vinit Kumar Jayaswal  
Director General



सत्यमेव जयते

भारत सरकार  
Government of India



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### MESSAGE

It gives me immense pleasure to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 166<sup>th</sup> CPWD Day on 12 July, 2020.

Landscaping and horticulture are essential elements for healthy living and create pleasant eco-friendly surroundings. Trees, shrubs, foliage, flowering plants and green spaces trigger happy emotions with feelings of togetherness with nature. This ultimately improves work performance.

I hope this CPWD Handbook of Horticulture which contains various aspects of Horticulture will be beneficial to professionals, garden amateurs, garden lovers and public at large to update their knowledge in the field of landscaping, horticulture and ornamental gardening.

I appreciate the sincere efforts of Dr P. K. Tripathi, Deputy Director General, Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

  
(V K Jayaswal)

New Delhi  
July, 2020





भारत सरकार  
Government of India  
अपर महानिदेशक (प्रौ.)  
Additional Director General (Tech)  
केन्द्रीय लोक निर्माण विभाग  
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### Message

I am happy to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 166<sup>th</sup> CPWD Day on 12 July 2020.

Horticulture, landscaping and garden design is the foundation of any great landscape. The garden can incorporate both natural and man made materials. Plants are considered one of the most cost effective agents for remedying negative views of an area, thereby adding to its aesthetic value and significantly improving the visual amenity, economic and social conditions of the city.

Indoor air pollution is now considered by many experts to be one of the major threats to health. During pollution alerts, people are generally advised to stay indoors. Now a days Indoor plants are advised for air purification and absorption of obnoxious gases emitted through household gadgets.

I appreciate the sincere efforts of Dr P.K.Tripathi, Deputy Director General Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

  
( Anant Kumar )

New Delhi  
July, 2020





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सत्यमेव जयते

**केन्द्रीय लोक निर्माण विभाग**

उप महानिदेशक (उद्यान)

कमरा न. 235, ए-विंग

निर्माण भवन, नई दिल्ली-110011

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## **FOREWORD**

In CPWD, Horticulture deals with planting of ornamental plants in a such a way that it creates picturesque effect. The concept of landscape and horticulture is being implemented by way of using different kind of garden features that it must conform to the place and the purpose.

The importance of a tree can be attributed that a mature leafy tree produces as much oxygen in a season as ten people inhale in a year. A single mature tree can absorb carbon dioxide at a rate of 48 pounds per year and release enough oxygen back in to the atmosphere to support two human beings. On average, one tree produces nearly 260 pounds of oxygen each year. Two mature trees can provide enough oxygen for a family of four.

This book contains 30 chapters on different aspects of horticulture and ornamental gardening ranging over various fields of horticulture. I understand this book would be ready reference and beneficial for the professionals and garden amateurs through know how, discussions, experiences for refreshing and updating latest technology and methodology in the field of Horticulture and ornamental gardening.

I express my sincere gratitude and thanks to Sh. V. K. Jayaswal, Director General, CPWD for entrusting me this work.

I also express my sincere thanks to Sh. Anant Kumar, A.D.G.(Tech/Works) for guiding me during this work.

I take this opportunity to thank Sh. Yoginder Singh, Sh. Ram Singh Meena, Sh. R. Selvam, Sh. Ram Kumar Malik, Deputy Directors (Hort.). Sh. Ashwani Kumar Deshwal, Sh. Sudhir Kumar, Dr. S. K. Singh, Dr. Deepti Saxena, Sh. R. S. Chauhan, Dinesh Kumar Tyagi, Sh. B. B. Sharma, Sh. Y. K. Gaur, Assistant Directors (Hort.), for providing necessary data's and pictures during the writing of this book, and Sh. Amrit Singh Shokeen, Sh. Rahul Shukla and Sh. Dilip Kanojiya for typing this manuscript neatly.

**(Dr. P. K. Tripathi)**  
**Deputy Director General (Hort.)**

New Delhi  
July, 2020

# CONTENTS

INTRODUCTION	1
HISTORY	2
1. HORTICULTURE AND THE LANDSCAPE	3
2. GREEN WALL / VERTICAL GARDEN	15
3. MODULAR LANDSCAPING SOLUTIONS	17
4. HYDROPONICS	23
5. HOME GARDEN FEATURES	26
6. ROOF GARDENS	31
7. PLANT PHYSIOLOGY	32
8. TREES	33
9. PALMS	59
10. SHRUBS	67
11. HEDGES & EDGES	82
12. GROUND COVERS	87
13. CLIMBERS	89
14. ROSES	94
15. LAWNS	113
16. CHRYSANTHEMUM	117
17. RARE TREES IN CPWD LOCATIONS	121
18. MIRACLE FRUIT	146
19. DETAILS OF CPWD PARKS	149
20. COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI	162
21. DECORATION AT DIFFERENT SAMADHIES	168
22. DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS, PREPARATION OF FLORAL TABLEAU	190
23. WINTER SEASONAL FLOWERS	211
24. SUMMER AND RAINY SEASON FLOWERS	237
25. FLOWER BEDS	242
26. POTTED PLANTS	245
27. CACTUS & SUCCULENTS	248
28. ESSENTIAL ELEMENTS AND THEIR SOURCES	260
29. IMPORTANT FERTILIZERS	262
30. MEDICINAL PLANTS	266



# INTRODUCTION

The Horticulture Unit of CPWD was established way back on 1st April, 1912 under the able guidance of Shri R.H.Loke, Horticulture Superintendent. Since then the unit has evolved into a large wing, pioneer in execution of all kinds of horticulture & Landscape works. The major functions of the wing are as follows:

- Development & Maintenance of open spaces and parks
- Development of different types of gardens
- Raising of trees
- Development and Maintenance of Landscape and Horticulture works in Residences of Hon'ble Vice President, Prime Minister, Ministers, Members of Parliament, Judges of Supreme Court & High Court etc.
- Development and Maintenance of Landscape and Horticulture works in the Samadhi complexes of National Leaders spread in about 200 acres area. The Rajghat and other Samadhi complexes

are not only visited by International dignitaries and leaders but also International and local tourists.

- Development and Maintenance of Landscape and Horticulture works in Central Government office complexes and residential areas

Besides above, Horticulture wing is also involved in enhancing and conserving the green areas, aesthetic improvement of the gardens and preparation of green manure using green waste in localized areas, thereby maintaining and conserving an eco-friendly environment. The nurseries maintained by this wing of CPWD are well known for maintaining large collection of indigenous plants, seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture wing is maintaining two major nurseries i.e. Government Sunder Nursery and Government Mehrauli Nursery in New Delhi.



Hon'ble Prime Minister planting Kadamba Tree

## HISTORY

The Horticulture Wing of CPWD was established on 1st April, 1912 with a very small unit headed by Shri R.H. Loke (British origin), as Horticulture Superintendent. It was pioneer in the field of horticulture and famous for indigenous plants and collection of all kind of seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture Unit is maintaining two major nurseries viz., Govt. Sunder Nursery and Govt. Mehrauli Nursery.

Govt. Sunder nursery was inaugurated in February, 1949, presently spreaded in 20

acres land (approx.) at Nizamuddin, New Delhi. The nursery is bordered by Humayun's Tomb to the South and the National Zoological Park to the North.

Govt. Mehrauli Nursery is located in Shaheed Jeet Singh Marg, (in front of NCERT Gate No.2), Katwarai Sarai New Delhi. Mehrauli nursery is presently spread over in 33 Acre area (approx.) and is also having a collection of foliage's plant, perennials, seasonal plants, palms, cactus, Bougainvillea, money plants, roses, etc.





# CHAPTER - 1

## HORTICULTURE AND THE LANDSCAPE

The CPWD , comprises of Civil, Electrical, Architecture and Horticulture wings, finds its relation with the Built Infrastructure. The people of the world are slowly realizing the damage that has been done to our environment. The success of development and maintenance of landscaping features can be judged by the quality of relationship between the building, the site ,landscaping features and its surroundings .The natural resources which are useful in the landscaping should be environmentally sustainable and function efficiently and economically in the long run. Man`s greed for quick economic gains has led to imbalance of this planet thereby threatening to the very survival of mankind in the not very distant future. In our metro cities we are already experiencing the effects of soil, water, air and noise pollution which has already crossed the threshold of human tolerance and has manifested itself in the deterioration of all life forms. In this bleak scenario there is still a ray of hope if people in general are awake and realize that the solution for correcting our mistakes lies in our understanding of nature as a holistic phenomenon and take course of action intelligently and diligently.

In CPWD, Horticulture deals with planting of ornamental plants in such a way that it creates a picturesque effect .Landscaping gardening can be defined as the decoration of a tract of land with plants and other garden materials so as to produce a picturesque and naturalistic effects in a limited space. Landscape gardening can also be defined as the beautification of a tract of land having a house or other object of interest on it. It is a done with a view to create a natural scene by

the planting of lawn, ground covers, shrubs ,hedges and trees. The arrangement and final establishment of the garden features must be done in a such a way that it gives an effect of a natural landscape soothing to the heart. It must act in such a way that it helps in improving of the total living environment for the people. The concept of landscape and horticulture by way of using different kind of garden features must conform to the place and the purpose for which it is built example. Selection of plants in a Samadhi and in a recreational park are totally different to one another. Care must be taken to define the relationship between various colours of the plants, flowers, building or other objects present at the site.

### Landscape Concept and Garden Design :

Garden and garden features should be compatible to each other and meet the characteristics of the garden, because it is an extension of house and an enclosure for pleasure. It is essential to understand the site characteristic and its potential for development and conceptualize the scheme for specific purpose and design accordingly. Most of us love to be with nature and are often disappointed with the limited space available around the house, which makes us think that these little spaces do not accommodate beautiful gardens. Landscaping is making of pictures with plant materials and hence its principles are same as those of art. Followings are the points which needs to taken care during the landscape concept and garden design.

Rhythm: Repetition of same object at equidistance is called rhythm. It can be created through the shapes, progression of size or a continuous line movement, rhythm creates movement to the eye. In gardens generally trees of single species of equal height and shape are planted to create this effect. In Mogul gardens, fountains and water canals have also been extensively used to create such effects. Now-a-days other objects like lights are also used to

Whether you're planning to "borrow ideas," or coming up with your customized landscape design, you need to know the basic principles of landscape design. Understanding these landscape design principles will increase your creativity while at the same time help you generate new ideas. A great landscape design lies in the eyes of the artist, and these basic principles of landscape design will not only boost your creativity, but also ensure that the elements in your design have balance and harmony.

## Basic Principles of Landscape Design:

### 1. Unity

Unity in landscaping is the repetition and consistency of a design. Repetition is used to bring about unity in your design by repeating like elements which include plants and decor in the landscape. Consistency is used to create unity by fitting different elements of a landscape together to create a common unit or theme.

### 2. Balance

Balance is simply a sense of equality. There are two types of balance in design: symmetrical and asymmetrical balance. In symmetrical balance, two sides of the landscape are identical while in asymmetrical balance, the landscape composition is balanced using different elements and objects which have almost similar imaginary weight.

### 3. Contrast and harmony

Contrast helps highlight certain elements in your design, while harmony helps elements in a landscape composition look unified. Contrasting elements draw the viewer's attention when they're placed next to each other. Contrast and harmony are achieved by the comparison of any elements of art or using complementary colors side by side.

### 4. Color

Color gives your landscape design the dimension of real life. Warm colors (e.g. red and orange) seem to advance towards you, making an object seem closer. While cool colors like blues and greens seem to move away from you. Blues and greens are used to create perspective.

### 5. Transition

Transition is simply a gradual change. Transition in a landscape design is illustrated by gradually varying the plant size or the color intensity. Transition can also be applied to texture, foliage shape and size of different elements.

### 6. Line

Line is the mother of all elements in landscape design. Lines are used almost everywhere including creating beds, entryways, walkways, texture and perspective. Lines are also used to give an illusion of depth and distance.

### 7. Proportion

Proportion refers to the size of an element in relation to the other. Among the principles of landscape design, this is the most obvious one but still needs a little planning and thought. One must ensure that all the elements in a landscape design have proper proportions.

### 8. Repetition

Repetition is directly related to unity. It's good to have several elements and forms in

a garden, but repeating the same elements gives your design various expressions. Too many objects that are not related can make your design look unplanned and cluttered. Also, don't overuse an element since over using an element can make your design feel boring, uninteresting, and monotonous.

### **In Conclusion**

With these basic principles of landscape design designing a landscape can be a nice way of unleashing your creativity. Utilizing, colors, contrast, and lines all can help influence the design of your landscape.

### **Important Things to Consider When Planning Your Landscape Design:**

Whether you are interested in completely redesigning your landscape or simply making a few changes there are some important factors to consider before you start planting. While many people head straight to their local gardening supply store to browse the selections, creating a plan beforehand will help you chose plants that will best fit your needs and thrive in your landscape.

It's easy to go out and be tempted into buying plants that look beautiful at the garden store, only to get them home and realize they are wrong for your landscape. These tips will help you develop a plan and put you on the road to creating a beautiful, cohesive, and thriving landscape.

### **Know your Garden :**

Think about your regional climate, the topography of your site, and your soil type when planning your landscape.

Keep in mind that the specific conditions of your garden are likely to create a microclimate based on the amount and length of sun and shade exposure the area receives.

Microclimates are usually broken into one of four categories: full sun, partial shade, shade, or deep shade; take note of your landscape's microclimate when selecting plants for your landscape.

The topography of your site is important to consider as well as you plan; take note of how water drains in your landscape. The best landscape design will promote water movement away from your home towards other areas of your garden.

### **Who will be using your Garden :**

Think about who will be using your garden and how they will use it. Will children be using your garden? Do you have pets? Are you hoping to use your garden for outdoor entertaining? Remember you can create different spaces for different uses in your landscape using strategic plantings and hardscapes. Walkways can be used to move people from one area to another.

Since you will be using and maintaining your garden (or hiring someone to maintain it) consider what your maintenance style and



budget are. Be as realistic as you can. How much time will you truly have to put into your landscape? Or if you won't have the time will you have the money to pay someone else to put in the time? How much do you have to invest in your landscape? Determining the answer to these questions will help to ensure the success of your landscape for years to come.

### **Think about themes of your garden:**

A theme can unify your landscape and help guide your plant and material selections. Themes can be as simple as using consistent shapes or forms throughout your garden or as complex as creating a relaxation garden or an Oriental garden. When deciding on a theme for your garden, a good place to start is looking at the architecture of your home. Try to complement the lines and style of your home's architecture in your garden; after all, your garden is an extension of your home.

Themes can help guide how you place and select plants, decorations, hardscapes, and structures. Are you someone who wants lots of neat, geometric shapes and structures in your landscape? Do you want softer lines and a more natural feel to your space? Do you want a landscape to include only specific colors? Questions like these will help you choose a unified theme for your garden.

### **Create and link spaces :**

In order to get the most out of your garden, think of it as another room, or rooms, in your home. Just as a home has well defined and carefully planned rooms, so should your landscape; using your materials wisely allows you can create different "rooms" in your landscape. Don't forget to think about how you'll link your spaces. How will people move from one area of your garden to another? Create openings to encourage

exploration in your garden and keep people moving throughout the landscape.

### **Make your plants work for you :**

Early in your planning you should determine how your plants will function in your landscape. Plants can be used in a number of ways, they can provide you with fresh and delicious fruits and vegetables, beautiful scenery, lovely aromas, and much more. Plants can be used as barriers to define areas within your landscape as well as identify where your landscape ends. You can use plants to create physical barriers in your landscape by blocking both views and access to an area. If you want to keep your views open, but maintain some barriers, low growing plants can be used to create implied barriers, blocking access but not the view.

Correctly placed plants can also be used to alter your landscape site conditions. Temperature, light levels, and wind are greatly affected by the trees and plants in a landscape. The noises in your landscape can be affected by what you put into the design, such as water features or bird houses, as well as any physical barriers that keep your garden insulated from noises beyond your landscape.

### **Structure your plantings :**

Consider your various visual planes when selecting plants. Starting from the area above you, think about the overhead plane, this might include archways and trees.

Moving on to the vertical plane, consider how closely spaced or far apart plants will be, how plants will be layered or staggered (generally larger plants are used behind smaller plants), as well as the individual and massed heights and widths of your plants.

Don't forget about the ground plane (including how smaller plants will be grouped



and arranged as well as groundcovers and hardscapes).

Repeating similar shapes and structures in your garden will give you a unified view throughout your space.

### **Highlight important points :**

Using unique plants, distinct structures, or garden ornaments allows you to highlight a particular area of your landscape. Contrasting shapes, textures, sizes, and colors will help to capture attention and direct it to a specific area.

### **Pay attention to detail :**

Plants, hardscapes, and garden ornaments all have their own visual details, from various forms and shapes to an array of colors and textures. By thinking about how these visual details can be used to complement and contrast each other, you can create a cohesive and captivating landscape.

Don't just think about visuals; taking into consideration the scents of the plants you select for your landscape can enhance the experience you create for those in your garden. Think about when flowers will be blooming and fragrant, as well as what scents will complement each other in the landscape.

### **Think about the future :**

More specifically, take into account how the passage of time will affect your landscape plants. When selecting plants, make sure you consider the plant's growth rate, maintenance needs, and its eventual mature size. Make sure you provide your plants with enough room to reach their mature size. Keep in mind though, that mature size is typically based on optimal growing conditions, your landscape's specific conditions may cause a plant to grow larger or smaller.

### **Protect your resources:**

By choosing resource-efficient plants, consciously managing water, and choosing environmentally sound hardscapes, you can help protect and preserve your environment.

Before removing plants from your landscape, determine whether these plants truly need to be removed, or if they could be relocated to another area of your yard. When selecting new plants, look for resource-efficient plants, ones that will require less water, fertilizers, and pesticides.

When planning the changes to your landscape, consider installing a rainwater catchment system which will provide you with an environmentally sustainable source of irrigation water. With careful planning such a system can even be incorporated as an aesthetic design element.

Using environmentally friendly hardscapes, non-toxic preservatives, stains, paints, and cleaners is another way you can protect your natural resources. Also, consider reusing construction materials; before demolition starts consider what materials you might be able to reuse, repurpose, or incorporate into your new lands



## GARDEN STYLES

The Orangerie in the Gardens of Versailles with the Pièce d'Eau des Suisses in the background (French formal garden)



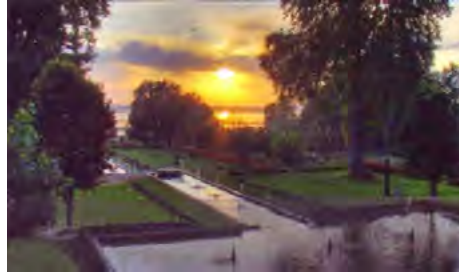
Stourhead (1741-80) (English garden)

Jardin del Generalife de Granada (Spanish garden)



Reflection of the Bagh-e Narenjestan (orange garden) and the Khaneh Ghavam (Ghavam house) at Shiraz, Iran (Persian garden)

Mughal gardens at Taj Mahal, Agra, India



Nishat Bagh, terrace garden at Srinagar, India (Mughal Gardens)

The Yuyuan Garden in Shanghai, China (created in 1559) shows all the elements of a classical Chinese garden



Ryōan-ji (late 15th century) in Kyoto, Japan, the most famous example of a Zen rock garden

Royal Botanic Gardens, Kew, London



Labyrinth maze of Bravaux, Durbuy, Belgium

Parc de Bagatelle, a rose garden in Paris



Roof garden on the top deck of a multi-storey car park at Hyderabad



# GARDEN FEATURES

GARDEN  
PAVING



GARDEN  
GATES



GARDEN  
ARCHES



GARDEN  
FURNITURES



GARDEN  
SCULPTURES



GARDEN  
GAZEBOS



GARDEN  
BRIDGES





# GARDEN FEATURES

GARDEN  
FOUNTAIN



GARDEN  
WATER FALLS



GARDEN  
WATER BODY



GARDEN  
ILLUMINATION



GARDEN  
CHILDREN  
PLAY AREA



GARDEN  
POP-UPS  
SPRINKLERS



GARDEN  
KNOTS







President Estate Garden

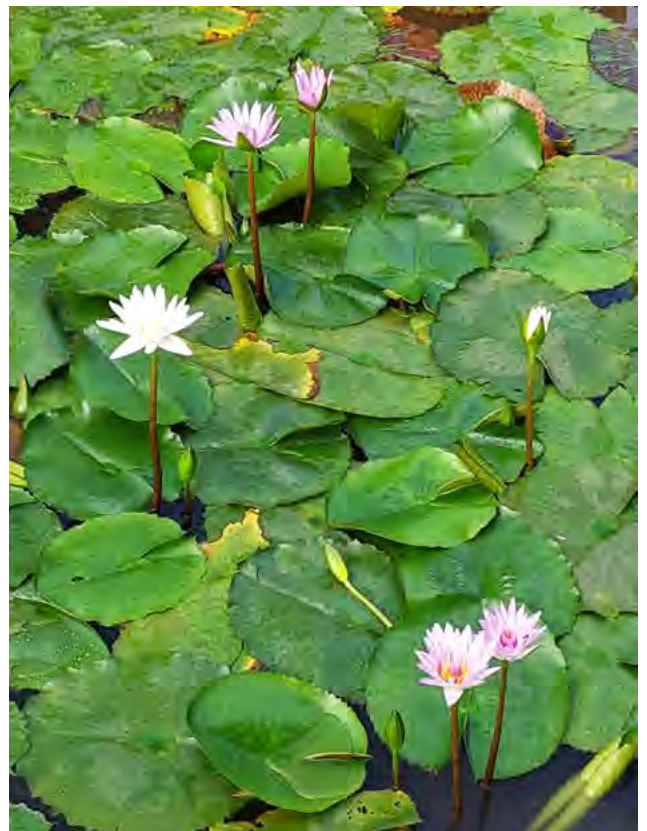


Landscaping Ideas

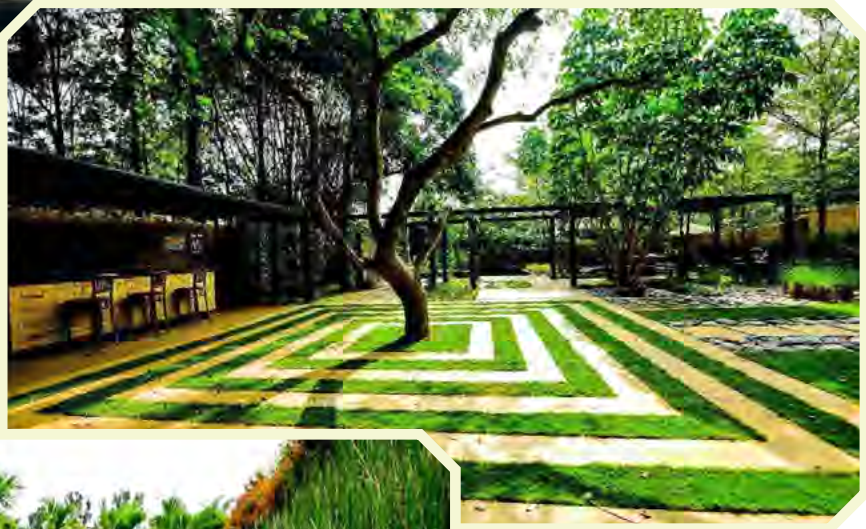




Landscaping Ideas







Landscaping Ideas

## CHAPTER - 2

### GREEN WALL / VERTICAL GARDEN

Green wall/Vertical Garden is the new concept of gardening particularly suitable for cities, as they allow good use of available vertical surface areas. With nationwide emphasis on being environment friendly and conserving resources beautiful creations like a Green Wall are bound to become common place in most commercial and residential buildings. A Green Wall, also known as living wall, bio wall or a vertical garden, is a living plant based exterior or interior wall to buildings or homes which may be free standing structures or part of the building. They are more frequently composed of climbing plants, but there are other options that some designers have incorporated in which the plants are grown in specially made support structure and growth media such as soil. The benefits of a Green Wall go far beyond aesthetics. A Green Wall is a natural insulation that helps to maintain and regulate the temperature within a building. It has been observed that the exterior of a wall with a Green Wall is 10 degrees cooler than an exposed wall. With the rising costs and shortage of energy, this feature reduces consumption of energy for heating or cooling in a multiple occupancy building. Living walls used on the interior of a building can also help to maintain humidity levels as well as assist in the air filtration, which can be a problem for some commercial buildings because they are located in crowded parts of the city. According to the EPA (Environmental Protection Agency), USA, poor indoor air quality is ranked fourth on a list of 31 of the worst environmental threats that the average worker faces each day. Another benefit of Green Wall is that they can be a means of water reuse. The Plants may purify slightly polluted water by

breaking down the nutrients and filtering into the water system. They also have the ability to absorb noise and reduce noise pollution inside the building while increasing the property value of a building. The living wall could also function for urban gardening or for its beauty. In vertical gardens, various types of modular panels can be used along with geotextiles fabrics, growing media, irrigation systems, and plants.

#### Commonly seen types of vertical gardens

Ideally the selected plants are planted into the modules or pots and are allowed to settle and grow over a period, before installation on site. Watering can be done manually or through irrigation systems which can be installed along with living wall structure. These living wall structures can be fixed directly to existing walls or can be fixed on to a MS framework in case of free standing living walls.

**Green wall:** This type consists of plastic modules which have a geotextile fabric bag which is filled with growing media and rooted plants are inserted into slits made into the bag placed inside the module. The modules can be fixed to walls directly or on a framework.

**Bio wall:** This type consists of plastic frames and plastic pots. Plants can be planted directly into the pots. The pots can be easily inserted into the frames, which are fixed to walls directly or on a framework.

**Living wall:** This type consists of felt fabric fixed on a support, which in turn is fixed to

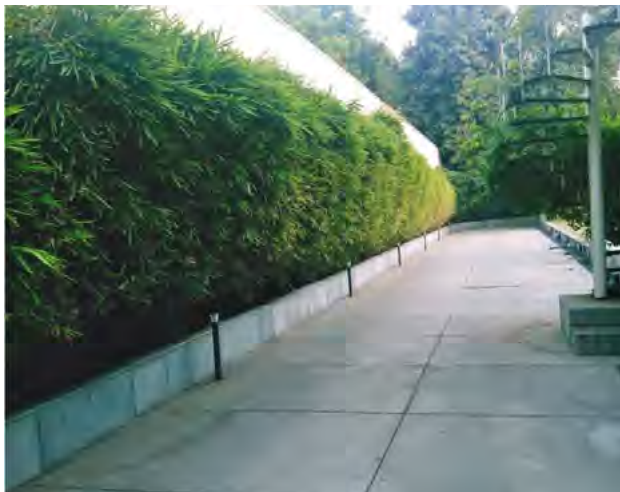


the wall. Plants can be planted directly into slits made to this fabric.

## Benefits:

### 1. Aesthetics.

Green walls combine the works of art by nature in different ways as there are numerous varieties of plants that can be used in different combinations.



### 2. Indoor Air Quality

It is well established that plants can purify air. Along with indoor potted plants, green walls go a long way in improving indoor air quality.

### 3. Health and Wellness.

Living in urban environments, we are surrounded by concrete, traffic, noise and pollution. It has a profound impact on our physical and mental wellness. Greenery softens this hard environment, acting as a tonic to ease stress and fatigue.





## CHAPTER - 3

### MODULAR LANDSCAPING SOLUTIONS

Landscape Horticulture around the country has been evolving with new trends and we need to keep in pace with the developments of the International world of green practices in order to keep up with the influx of Landscape developments in this country.

People have practiced landscaping for centuries. As far back as the ancient civilizations, humans were manipulating the land for both aesthetic and practical reasons. The addition of plants, changes to the existing terrain and the construction of structures are all part of landscaping. Today landscaping refers to the planning, laying out and construction of gardens that enhance the appearance and create useable space for outdoor activities around a home.

A high proportion of the population and economic activities are at risk from climate change are in urban areas, and a high proportion of global greenhouse gas emissions are generated by urban-based activities and residents. Suspended Particulate Matter (SPM) is the main problem of urban air pollution in India, caused mainly due to fast growing population of automobiles and poor traffic control, congested roads as well as factories in the peri urban areas. The most watched pollutants include particulate matter (PM), Nitrogen dioxide (NO<sub>2</sub>), Sulphur dioxide (SO<sub>2</sub>) and Carbon dioxide (CO<sub>2</sub>), that are continuously degrading the ambient air quality in major cities in India.

With the growth of urbanization the cities are converted in to concrete jungles day by day and consequently reducing the greenery, rise to global warming, here the need is to bring about greenery in the every little available area along with its beautification.

Landscaping products which can bring about greenery vertically as well as horizontally as per your need and available spaces as all of them are modular system. Followings are the some key Features & General Informations about Various Landscaping Products.



#### DRAIN MAT

Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile filter fabric bonded to the dimple side of the core. The filter fabric is securely bonded to prevent soil intrusion into the core flow channel while allowing water to freely enter the drainage core. Sheet drains solid cores allow water entry from one side and are typically used to collect and re-direct water from a structure or site. Sheet drains are designed for use in both vertical and horizontal drainage applications.

#### HONEYCOMB GRASS PAVER

Each Honeycomb Grass paver Unit made with a High-density recycled and UV rays-stale polythene (PE-HD), Weighing 1 kg.

and available in green or black colour. The Load bearing capacity is 200 tons/m<sup>2</sup> & Dimensions of the unit is 500mm x 430mm x 45mm.



- Instant lawn effect with minimal labour.
- Makes maintenance operations, including lawn moving very easy.
- Mobility to your lawn patch. Takes ample foot traffic.
- Eliminates heavy ground and soil preparation.
- Water logging is eliminated with the special studs provided below the trays.
- The unique interlocking trays allow replacement of damaged lawn instantly with matured turf.



## GREEN WALL

Each Green wall Unit made with a UV rays-stable RC Polypropylene (PP), Weighing <3.5kg. and available in green or black colour. The load bearing capacity is 150 kgs /module & Dimensions of the unit is 500mmx125mm.

- Modular Planting System
- Very Little framework Required
- Self Supporting & Strong Structure
- Easy for Creative Planting Design & Easy Maintenance
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible
- Each Plant can be Accessed & Maintained Individually.





## BIO WALL

“BIOWALL” it's a kind of Green wall made from the shown product. Where we can create most beautiful Green wall using our choice of plants, herbs etc.

As Highlighted above one of the main feature of BIOWALL is its flexibility in the sense of giving it a shape.

It gives freedom of having green wall in the required shape like Round, Half Circle, Square, Angular and Curve in addition to normal horizontal and vertical. Each Bio wall Unit is made with a UV rays-stable RC Polypropylene (PP), made in black colour, Dimensions of the unit is 450mm x 150mm x 125mm.

Available in box containing 4 frames + 12 pots and it covers area of 3 Sq.Ft.



## DRAIN CELLS

Drain cell Unit is made with 100% recycled Polypropylene available in black colour. Can take compressive load of  $> 100\text{t/m}^2$  Above 1200 KN having Discharge Capacity of 350 lit./min @1% Gradient Available in Dimension of: 610mm x 410mm x 30mm, 450mm x 450mm x 30mm & 450mm x 450mm x 20mm.



## GEO TEXTILES

Geotextiles are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect or drains. Typically made from polypropylene. Geotextile forms an integral part of drain cell system.

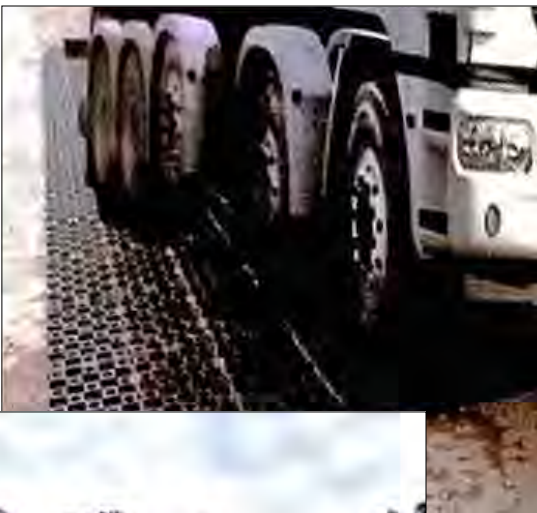
Available mainly in Gray, Black and White Colours in diff. GSM.



### ROAD SURFACE CELL

Basic Structure and Specifications are same as Multi Grow wall.

The Cells can be used in any situation where low to medium & heavy use parking surfaces, access roads for mining sites and driveways are required.



### MULTI GROW WALL

Each Multi Grow wall Unit is made with a High-density recycled and UV rays-stable polythene (PE-HD), Weighing <1kg. and available in black colour, The Load bearing capacity is 200 tons/m<sup>2</sup> & Dimensions of the unit is 480mm x 260mm x 51mm.

- Modular Planting System & Easy Maintenance
- Easy for Creative planting Design
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible





## ARTIFICIAL SPORTS SURFACE

With the modular landscaping solutions, it has been successfully completed sports grounds related projects for various surfaces for sports centres and gymnasiums.

- Sports surfaces for sports centres and gymnasiums.
- Artificial grass for both elite football and lower divisions/training pitches
- Sports and gymnastics mats
- Surfaces for Cricket, Volley Ball, Badminton
- Synthetic surfaces for tennis and multisport (outdoor) Skating etc.



## EASSY WALL

### A New Concept in Greenwall

Easy Hook Module system is one of the latest in many Green wall/ bio wall products introduced by the Modular Landscaping Solutions.

Just like other products, we can incorporate drip irrigation system in the Green wall made with help of Hook Easy module. With this facility we required less external irrigation elements and thus gives us enhanced irrigation efficiency and reduced cost, water flows smoothly throughout the system and maintains the green wall evenly.



## TECHNICAL SPECIFICATION OF THE MODULE:

Height: 130 mm Base : 90 x55 mm Top : 115 x 125 mm

New Modular Design: Better design gives elegant look to the green wall

- Simple Method: Easy to build method.

Eco Friendly: Made with UV stabilized recycled polypropylene material

- Instant Wall: We can create an instant wall by placing pre grown plants in the pots.
- Drainage Holes: Holes at the bottom allows excess water to flow next level.



## BIOWALL ULTRA

### USED AS KITCHEN GARDEN SYSTEM

How it works: it consists of two trays kept one over the other, with lower one providing the water to the upper tray where the plantations are done, the lower tray comes with a water level meter which helps to adjust the water level required in the lower tray.

### Where it can be placed:

- A corner of Kitchen
- Balcony or Verandah
- On the Terrace Area
- Backyard
- Window Cut outs.



# CHAPTER - 4

## HYDROPONICS

Hydroponics has, popularly, been defined as methods of growing plants without soil. The soilless culture defined as biotechnology technique that makes use of natural plant growth phenomena in obtaining better results from plants using inorganic or organic nutrients and standard agronomic practices. The fact is that soilless culture technology is a form of eco-technology that realizes the efficiency and profit from crop plants while maintaining harmony between human activities and the environment.

Thus, hydroponics and organic hydroponics are environment friendly technologies suitable for growing all kind of plants using balanced nutrients in a scientific way. This soilless culture technology not only supplements but also compliments the normal soil condition. It is a clean and scientific eco technology – a smart way to grow the plants.

Hydroponics is highly productive and yield superior quality crop produce round the year, irrespective of the soil and climatic conditions. Organic farming is as good as hydroponic farming albeit low and slow productivity.

### Soilless Culture Techniques:

A soilless culture technique refers to the methods of applying nutrient solution to the roots in an efficient way. There are ten techniques in soilless culture.

#### 1. Static Aerated Technique (SAT):

Plants are grown in a depth of static nutrient solution which is aerated either by providing air space in the root zone or by pumping air in

to nutrient solution in the tank. In organics, a simple pot or bag of organic medium is used. This is sometimes referred to as a “Passive Technique”. Ideally suited for learning the basics of hydroponics or organics and for doing R&D work. Never use this technique for regular growing of plants hydroponically (especially in the tropics) as mosquitoes might breed.

#### 2. Ebb and Flow Technique (EFT):

Plants are grown as a SAT, but the nutrient solution is drained off 3-4 times a day to permit the roots to breathe. This technique is sometimes called “Flood & Drain Technique”(in aggregate culture). In organics plants are grown in organic medium and only plain water is used for flooding. Good for home gardens and commercial nurseries. Almost any type of plants can be grown.

#### 3. Deep Flow Technique (DFT):

A depth of nutrient solution (4-6 cm) is circulated around the roots either by gravity or by using a pump. As the nutrient solution circulates, it absorbs oxygen from the atmosphere. This technique is also referred to as “Dynamic Root” Floatation Technique” and as “Raceways Hydroponics”. Ideal for leafy vegetables and all shallow rooted plants. In organics, fish tank water or any liquid organic nutrient source is used.

#### 4. Aerated Flow Technique (AFT):

This is modified version of DFT. Here, the nutrient solution is profusely aerated by special mechanism. Oxygen level of 10-12 ppm is maintained in the nutrient solution.

The Japanese “Kyowa Hyponica System” and “Styrofoam Float System” adopt AFT, Excellent for growing both leafy and fruit vegetables and certain ornamentals. In organics, fish tank water or any liquid organic source is used.

### **5. Nutrient Film Technique (NFT):**

A thin film of nutrient solution is always in contact with the roots. While the nutrient solution is circulated, the root surface is exposed to the air. This helps the roots to breathe. Numerous modified versions featuring slant /plane feeding, hypertonic feeding, etc. are available. Very good for producing fruit and leafy vegetables. This technique works well both in temperate and tropical regions of the world. In organics, fish tank water or any liquid organic nutrient source is used.

### **6. Gravel Flow Technique (GFT):**

Plants are grown in inert inorganic or organic substrates and the nutrient solution is fed to the roots from beneath the roots. A film of nutrient solution is circulated beneath the substrate. This technique is usually practiced with sand, granite or perlite or other porous substrates which permit free flow of nutrient solution beneath. Commonly practiced in the USA, South Africa, Australia and India for growing lettuces and other kinds of plants. The Bengal System Adopts this technique. In organics, fish tank water or any liquid organic nutrient source is used.

### **7. Sub-Irrigation Technique (SIT):**

Plants are grown in inert inorganic or organic substances and nutrient solution is fed to the roots from beneath the roots through seepage tubes. Though this method of feeding has been practiced in soil cultivation, it has been refined in hydroponics. Nutrients are fed through capillary action of the

growing medium or wicks or any similar water absorbing material that links a pipe or tray containing the nutrient solution to the media surrounding the roots.

### **8. Drip Irrigation Technique (DIT) :**

Like SIT, plants are grown in inert inorganic or organic substrates, and the nutrient solution is fed close to the roots 6-7 times a day in drops or trickles. This technique is called a “Drip Fertigation Technique”. This technique is also referred to as “Surface Watering Technique” if hand watering or flooding is practiced instead of drippers. Deserts in the Middle - East are exporting crop produce because of this technique. Also suitable for the plantation, orchard and landscaping industries.

### **9. Root Mist Technique (RMT):**

A mist of nutrient solution is sprayed every 4-5 minutes on to the roots of the plants that hang from a frame in a rooting chamber. Hydroponic system that are designed using the technique is popularly known as “aeroponics. Good for initiating rooting of cuttings and also for extracting (“milking”) phytochemicals from the roots for medicinal purposes. Also good for growing any type of plants. Selection of nozzles to adjust the droplet size might promote more fine root hairs which in turn might influence nutrient absorption. In organics, fish tank water or any liquid organic nutrient source is used.

### **10. Fog Feed Technique (FFT):**

This is similar to RMT but the droplet size is so very minute (like a cloud) that the nutrient solution can hardly moisten our hand. This technique has yet to be perfected. Good for plants having aerial roots with spongy water absorbing tissues like “valamen”. e.g orchids, anthuriums, etc. In organics, fish tank water or any liquid organic nutrient source is used.





# CHAPTER - 5

## HOME GARDEN FEATURES

Gardens have been established next to homes since time immemorial. The most important characteristics of home gardens are their location adjacent to homes, close association with family activities and a wide diversity of plant species to meet family needs.

**Home gardens are divided based on their features, broadly into:**

1. **Front garden or aesthetic garden:** This is the visual area between the gate of the campus and entry point to the main building. Focus is laid on aesthetic components such as lawns, flower beds, shrubs, trees, edges, hedges, creepers on arches, pergolas, walls, fountains, waterfalls etc. This part of the garden enhances the value of the building, refreshes the mind after hard work outside and makes life more enjoyable both for owners and visitors.
2. **Indoor Garden:** This is mostly a container garden in any part of the house like verandah, balconies, living room, kitchen, bedrooms and bathrooms etc. There is scope to showcase the entire house as a garden and allow one to be close to nature. It is easy to maintain and enjoy an indoor garden especially foliage plants. Potted plants can be placed on pot stands, window-sills, on the floor in pot trays or in corners or can be hanged on specially made hooks.
3. **Back yard or Kitchen Garden:** This is mainly used for growing fruits and vegetables for personal use and also to have some lawn area for a family sit out. Functional value is of prime concern.

4. **Roof Garden:** A rooftop garden is when you build a garden on the roof of a building which is usually done in urban areas. It is an easy way to have a garden experience without needing the land to create the garden. The plants are usually grown in pots or planters especially constructed for the purpose. Flowers & vegetables grown in pots on the roof top provide coolness to the building and also help in creating a habitat for birds. Light pots and pot media are preferred. Water proofing the roof floor is very important. Lawns can also be raised with light soil media and by providing proper drainage.

### HOME GARDEN COMPONENTS

This can be broadly divided into soft and hard landscape components. Soft landscape components consist of various types of plants and hard landscape components comprise of civil works including metallic structures such as arches pergolas etc.

#### **(A) Softscape Garden Components:**

- i. **Trees:** Trees are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, medium or small canopy trees can be grown. Trees can be evergreen and deciduous, based on their leaf shedding character or they can be flowering and non flowering foliage trees.
- ii. **Palms:** Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for

- their symmetrical growth which makes an avenue look beautiful. They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.
- iii. **Shrubs:** Shrubs can be classified as flowering and non flowering. Flowering shrubs need full sun light, and foliage shrubs can grow well under partial sunlight and shade. Location has to be decided based on the height and canopy of the shrubs. Pruning of shrubs helps to get bushy growth.
  - iv. **Climbers:** Climbers are plants which require support to grow. They can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces, over grills and wire meshes.
  - v. **Flower beds :** Seasonal and perennial flower beds can be laid in various shapes and sizes. Flowers in all colours of the rainbow are available. Some species are specific to winter; summer or rainy season and some can be grown throughout the year.
  - vi. **Ground Covers:** These are used to cover the soil surface as an alternative to lawns for avoiding dust and to add colour through flowers or foliage. They also check soil erosion.
  - vii. **Hedges and edges:** Hedges are used for providing privacy, concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc... Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.
  - viii. **Roses :** Many people consider a garden incomplete without rose plants. These are grown for attractive and scented blooms, in beds or as standards and climbers.
  - ix. **Potted plants:** Potted plants are displayed both indoors and outdoors, as groups or in singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give a very good effect.
  - x. **Lawns:** Lawns are areas planted with various types of grasses. They are a major component in any garden. They can be planted in turf form and also as grass slips. The following varieties are available either in carpet or loose form- Korean, Mexican, Fescue, Calcutta doob, Bermuda, Paspalum and St. Augustine.
  - xi. **Rockery:** A rockery is a retaining or protection structure that consists of stacked rocks without mortar, concrete or steel reinforcement. The rocks are stacked in an “interlocking” pattern, and rely on the weight, size, shape, and interface friction of the rock elements to provide overall stability. Selected plants are grown to give an effect of a rocky terrain. Plants best suited to rockeries are those which grow slow and low and are happy in dry areas. These plants usually prefer well-drained soil and less water.
  - xii. **Special garden features:** Special features include Bonsai, Topiary, tray gardens, bottle gardens and specimen plants etc. that are used especially to create an aesthetic effect in a garden.

## (B) Hardscape Garden Components :

- i. **Arches:** These are used at entry points to the house or a lawn and are covered with creepers. Arches are of different shapes and sizes and can be made of iron pipes/ flat rods, wood, cement bars etc.
- ii. **Pergolas:** Pergolas are umbrella shaped iron or wooden structures covered with



creepers to provide shade over sit-outs and also for elegance.

- iii. **Statues:** These can be art statues or memorials.
- iv. **Pathways, steps, curbs, benches etc:** Functional elements introduced in a garden which are very much essential and practical.
- v. **Water features:** Ponds, flow channels, waterfalls, fountains, sprinklers and swimming pools are essential water

features which can be used in a garden to provide a feeling of peace, calmness and beauty.

- vi. **Tools and Implements for Watering, Drainage and Lighting Systems:** These are the basic needs for any garden. Tools and implements like a pruning Shear, Rake, watering can, drip systems etc. can be used. Nowadays, to showcase a garden, a variety of lighting systems can be designed.







Hydrangea Flowers





Kalanchoe





# CHAPTER - 6

## ROOF GARDENS

### Tips for Roof Garden:

1. Suitable for people living in apartments or buildings without much open area around the house.
2. Ensure the structural strength of the building, before embarking on the project.
3. Provide water proofing to roof top before under taking any construction of planter boxes with the required water proofing material. Use drain cells and geo textile fabric for improving the drainage for lawns, flower beds and planters, before filling with red soil and manure.
4. Try and use materials which are light weight like plastic pots and trays, aluminum pots, fiber glass planters and earthen pots. This helps in reduction of dead load on the terrace.
5. Use of light weight material like peat or sphagnum moss, coco peat, vermi-compost etc. in the soil mixture will help in reduction of weight.
6. For plant propping, provide light supporting structure.
7. Keep the plant growth under check by regular pruning.
8. For shade loving plants provide shade net.
9. Use limited quantity of water daily. Care should be taken to avoid water stagnation.
10. With proper planning, care and precaution, a full-fledged roof garden can be developed and maintained with many Garden features.



# CHAPTER - 7

## PLANT PHYSIOLOGY

### Fundamentals of Plant Physiology and Soil Moisture:

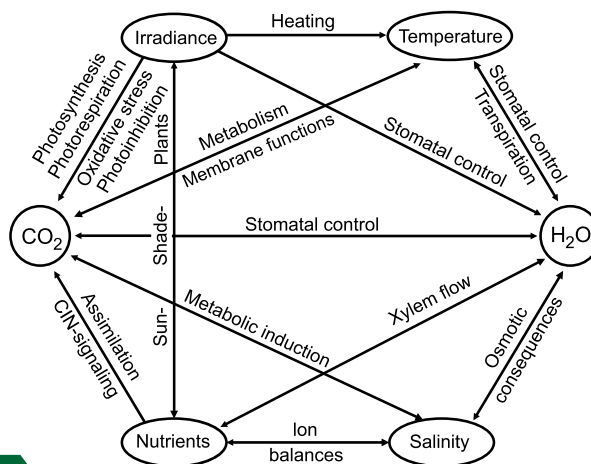
- i. **Photosynthesis:** Photosynthesis is the process of converting light energy to chemical energy and storing it in the bonds of sugar. Plants need only light energy, Carbon-di-oxide and water to make sugar while releasing oxygen. The process of photosynthesis takes place in the chloroplasts using the green pigment chlorophyll. This is essential for survival of life on earth.
- ii. **Osmosis:** The process of absorption of dilute plant nutrients through the roots is osmosis. If the nutrient solution around the absorbing roots is more concentrated than that of plant sap, then such solutions suck plant sap and the plant dies, this process is called as reverse Osmosis.
- iii. **Transpiration:** The process of evaporation of moisture from the plant through leaves is transpiration. This depends on the surface area of the leaf, atmospheric temperature, humidity and wind speeds. If the rate of evaporation is more than absorption of moisture from the soil through roots, the plant wilts and dies.
- iv. **Respiration:** Plants respire through leaves and roots. Periodical loosening of soil near the root zone helps in better aeration and respiration of the plant and it helps in maintaining plant vigour.

### Factors Responsible For Better Plant Growth:

1. **Light:** Plants need light for photosynthesis and growth. Intensity and duration of light needed by a plant differs from species to species. Poor light results in pale leaves or loss of colour. If proper distribution of light is not available on all sides of the

plant, pots need to be rotated regularly. Bright artificial light can substitute natural light.

2. **Humidity:** 40-60% RH is ideal for plant growth. It is very low during summer months. Low humidity leads to tip burn in leaves. Protect the plants from dry winds during summer. To increase humidity, spray fine mist on foliage, sponge the leaves with water or place pots on moist sand, cover the soil around the plant with sphagnum moss/wet paper.
3. **Temperature:** Ideal temperature for indoor plants varies from 15-30°C for different species. Plants prefer uniform temperatures, which can be achieved with good aeration by keeping the doors or at least windows open.
4. **Soil moisture:** Indoor plants need lesser water than outdoor plants. Succulent and thorny plants need water less frequently. Soil in small pots dries quickly than in larger pots. Clay pots need water more frequently than plastic or ceramic pots. For retention of water in the pots loosen top soil, apply mulches, and add charcoal, brick crumbs, and coco peat and water absorbents. Do not over water the plants as this may create anaerobic conditions for the root system.





# CHAPTER - 8

## TREES

For us a tree means flowers, fruits and shade. For a person in a village it means fuel wood, timber, fodder and lots more. For children it is a wonderful place to climb on to and watch animals in action. For elders it is a religious symbol and a pharmacy at home. For some people it is a leaf shedding machine that fills the yard with leaf litter. In urban areas, they are of immense value as they are the only source of greenery amidst the concrete jungle, adding beauty to the city surroundings with their lush foliage, colorful flowers and beautiful shapes. Beside the aesthetic value, they help in controlling pollution, regulating temperature and as wind breakers. Trees are dominant elements of a garden and contribute substantially to the garden atmosphere. They are available in many shapes, sizes, foliage and blooms. The selection of trees depend on the architecture of the building, the purpose for which they are planted whether a single plant as a focus of attention, or a cluster of plants for mass effect, the position available, whether in shade, semi-shade or open sunshine, waterside, rock areas etc.,

Tree are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, large or small canopy trees can be grown. Trees can be classified as evergreen (which do not shed leaves) and deciduous (which shed leaves during a particular season of the year) or as flowering and foliage trees.

### **Trees are an important component of a garden.**

- They Provide shade during summer and shelter during rainy season.

- Help in preventing soil erosion.
- Provide good nesting places for birds.
- Check air and sound pollution.
- Obstruct entry of dust and smoke into the house.
- Create required privacy.
- Generate fragrance in and around the house with scented flowers.
- Make the campus colourful with multicoloured flowers and foliage.
- Improve environment by creating humidity and coolness.
- Act as a background to the lawns and other garden features.
- Act as natural protection system for shade loving potted plants.

### **Tips for Planting & Maintaining Trees:**

- Plant the trees and water them properly. Next day press at the base and stake the plants. Pressing is done to remove the air pockets created during planting. If air pockets are not removed, they will act as precursors to infections.
- Pruning and training by removal of lower branches results in a balanced plant growth.
- Regular weeding, mulching and watering in the plant basins during first three years of planting are essential.
- Periodic pruning of dried branches carefully with a pruning saw is desirable.

Apply copper oxi-chloride paste to the cut ends.

- Trees help us in many ways. Plant & protect them.
- Trees hold the soil with their roots and prevent it from getting eroded by heavy rains and winds.
- Trees in upland areas trap rainwater and prevent flooding of lowlands during heavy rains.
- Trees help to reclaim wastelands by improving soil texture and fertility.
- Tree roots create paths into the soil, through which water percolates down for use as ground water.
- Tree roots and leaf litter act as barriers to runoff water, and when stored for a period of time, it decomposes to form leaf mold manure which is excellent for the growth of plants.
- By releasing water in the atmosphere from tiny pores in their leaves, trees cool and refresh the air; this process also reduces dust pollution as the dust particles in the air stick to the water vapor thus released.
- Trees produce oxygen through the process of photosynthesis

S. No.	Name	Colour	Height	Flowering Season
1.	Bauhinia Var	White, pink, purple	Small to medium	Nov-Mar
2.	Cassia fistula	Yellow	Small	Feb-Apr
3.	Cassia javanica	Pink, white	Medium	Jly-Sep
4.	Cassia nodosa	Orange -Scarlet	Medium	Jly-Sep
5.	Colvillia racemosa	Pink	Tall	Jly-Sep
6.	Erythrina indica	Scarlet	Medium	Mar-Apr
7.	Erythrina crista-galli	Scarlet	Small	Year round
8.	Jacaranda	Blue	Medium	Oct-Feb
9.	Lagerstroemia floriregine	Purple, pink	Medium	Jul-Aug
10.	Delonix regia	Orange	Big	Mar-July
11.	Peltophorum	Yellow	Big	Year Round
12.	Plumeria sp.	White	Medium	Oct-Mar
13.	Spathodea companulata	Orange	Tall	Oct-Mar
14.	Tecoma argentia	Yellow	Small	Feb-Mar
15.	Tecoma gaudi chaudi	Yellow	Small	Year Round
16.	Tabebuia rosea	Pink	Small	Feb-Mar
17.	Saraca indica	Orange	Small	Apr-Jun
18.	Cordia sebestena	Orange	Small	Year Round



Magnolia Grandiflora



Callistemon Pollandi



Aegle Marmelos



Pithecelobium SP



Saraca Indica



Cordia (Yellow)



Cordia Sebestena



Golden Melaleuca



Artabotrys



Azadirachta Indica Vergated



Opercularia Decary



Delonix Regia



Spathodea Campanulata



Melaleuca Linearlifolia



Cassia Spectabilis



Millettia Reticulata



Terminalia Mentaly



Cochlospermum Religiosum  
(Double)



Erythrina Cristagalli



Lagerstroemia





Bamboo (Black)



Simarouba Glauca



Brassaia Actinophylla



Alstonia Scholaris



Plumeria Obtusa



Leucophyllum Frutescens



Dillenia Indica



Gauva



Ficus Carica



Bauhinia Alba



Citharexylum Spinosum



Melaleuca Armillaris (White)



Couroupita Guianensis



Artocarpus Hetrophyllus



Erythrina Blackiena



Chorisia Speciosa



Sterculia Alata



Colvillea Racemosa



Solanum Vergated



Mango





Cassia Marginata



Giant Bamboo



Ficus Createrisperma



Tabebuia Pallida



Sterculia Foetida



Millingtonia Hortensis



Anthocephalus Cadamba



Thespesia Populnea



Mesua Ferrea



Jacaranda



Ficus Bengalensis



Crataeva Religiosa



Agathis Robusta



Cassia Fistula



Bauhinia Purpurea



Tabebuia Rosea



Markhamia Lutea



Pachieia Aquactica



Ficus Roxburghii



Cassia Alata





Cananga Odorata



Kigelia Pinnata



Callistemon Pollandi



Swietenia Mahagoni



Plumeria Singapore Dwarf



Crescentia Cujete



Clusia Rosia Variegata



Clusia Rosea



Solanum Macranthum



Bombax Ellipticum



Nyctanthes Arbortristis



Pterospermum Acerifolium



Cochlospermum Regligosum



Bixa Orellana



Madhuca Latifolia



Schizostachyum Brachycladum



Thevetia



Plumeria Pudica



Guaiacum Officinale



Aphanomixus Polysytachya





Milletia Ovalifolia



Cattleya Orchid



Quisqualis Indica



Portulaca Oleracea



Kadamba Dwarf



Monstera Deliciosa Variegated



Hanging



Hanging



Angelonia Serena Pink



Angilonium Red



Kalanchoe Variegated



Kalanchoe



Aquatic Plant



Philodendron Magestic



Canna Dwarf



Episcia Cupreata



Bamboo Variegated



Neodypsis Decaryi



Phoenix Sylvestris



Podocarpus





Ficus elastica



Ficus elastica



Ficus lyrata



Ficus macrophylla  
hillii



Ficus macrophylla



Ficus mysorensis



Ficus nitida



Ficus pumila  
wall creeper



Ficus pumila  
variegeta



Ficus religiosa



Furcraea foetida  
variegated



Furcraea foetida  
variegated



Gardenia  
jasminoides



Galphimia glauca



Hamelia patens  
variegata



Hamelia patens



Heliconia caribaea



Heliconia latispatha  
Starwiz



Heliconia  
psittacorum



Heliconia rostrata



Heliconia stricta  
huber



Heliconia  
wagneriana



Hibiscus rosa  
sinensis



Hibiscus rosa  
sinensis pink



Hibiscus rosa-  
sinensis hawaiian  
variety



Hibiscus rosa-  
sinensis hawaiian  
variety



Hibiscus rosa-  
sinensis hawaiian  
variety



Hibiscus rosa-  
sinensis viceroy  
variety



Hibiscus rosa-  
sinensis hawaiian  
variety



Hibiscus rosa-  
sinensis hawaiian  
variety





Cordea lutea



Crossandra  
infundibuliformis



Crossandra regular



Crossandra yellow



Datura metel



Cycus revoulta



Cycus circinalis



Duranta variegated



Duranta golden  
speciosa



Eranthemum  
laxiflorum



Euphorbia  
Cotinifolia



Euphorbia  
leucocephala



Euphorbia milii  
visofflora



Euphorbia milii  
Desert rose



Euphorbia milii  
Hybrid



Euphorbia-  
pulcherrima White



Euphorbia-  
pulcherrima red



Excoecaria bicolour



Ficus benjamina  
(black)



Ficus benjamina  
bushy king



Ficus benjamina  
Panda



Ficus benjamina  
rigenold



Ficus benjamina  
variegata



Ficus bnjamina  
variegata



Ficus benjamina  
variegata



Ficus benjamina



Ficus binnendijkii  
yellow (long island)



Ficus binnendijkii



Ficus carica  
(Angeer)



Ficus elastica  
burgundy





Cannas dwarf red



Caesalpinia pulcherrima Pink



Caesalpinia pulcherrima (Yellow)



Calliandra deep red



Calliandra protoricensis (Milk way)



Cassia alata



Cassia gluca



Cassia biflora (Bicapsularis)



Cestrum elegans (Night queen red)



Cestrum (Night queen pink)



Cestrum aurantiacum (Night queen yellow)



Clerodendron inerme



Clerodendron inerme variegated



Clerodendron thomsonae



Clerodendron bungei



Clerodendron variegata



Chrysanthemums Kanchil



Chrysanthemums Kargil



Chrysanthemums Karnal Pink



Chrysanthemums Kundan



Chrysanthemums Lalit



Chrysanthemums Lalpani



Chrysanthemums Little Darling



Chrysanthemums Little Orange



Chrysanthemums Little Pink



Chrysanthemums Haldighati



Chrysanthemums Thaichin Queen



Chrysanthemums Queen



Chrysanthemums Ranbil



Chrysanthemums Red Stone





Abutilon  
hybridum



Acalypha  
wilkesiana philippine



Acalypha  
wilkesiana inferno



Acalypha  
wilkesiana ceylon  
lime



Acalypha  
wilkesiana tahiti  
plain



Acalypha  
wilkesiana hoffmannii



Acalypha  
wilkesiana lousiana  
red



Acalypha  
wilkesiana dwarf



Acalypha  
wilkesiana brazen



Acalypha  
wilkesiana moorea  
chocolate



Acalypha  
wilkesiana moorea  
twisted



Acalypha  
wilkesiana  
bourbonstreet



Acalypha  
godseffiana  
heterophylla bronze



Acalypha  
godseffiana  
heterophylla variegata



Acalypha  
godseffiana  
heterophylla / kilauea



Acalypha  
hispida indica



Acalypha  
hispida rubra



Acalypha wilkesiana  
microphylla



Allamanda  
nerifolia



Allamanda  
violacea



Adenium  
arabicum



Adenium  
obessum grafts



Adenium  
obessum grafts



Adenium  
obessum  
variagatged



Angelonia  
angustifolia



Angelonia  
angel mistwhite



Artemisia  
arborescens lavender



Bambusa balcooa  
(giant bamboo)



Bamboo salsa  
maquonia



Bambusa variegated  
new





Prosopis juliflora



Sterospermum suberifolium



Putranjiva roxburghii



Samanea saman  
rain tree



Santalum album  
sandal wood



Saraca asoca  
ashoka tree



Saraca cauliflora



Sesbania grandiflora  
avisa



Simarouba glauca



Spathodea campanulata  
tulip tree-yellow



Spathodea campanulata  
tulip tree-orange



Sterculia foetida  
china badam



Swietenia macrophylla



Swietenia mahagoni



Syzygium cumini  
kala jamun



Tabebuia argentea



Tabebuia palmeri



Tabebuia chrysantha



Tabebuia pallida



Tabebuia avellanedae



Tabebuia rosea



Tamarindus indica  
tamarind



Tectona grandis  
teak wood



Terminalia arjuna



Terminalia catappa



Thespesia populnea



Thevetia peruviana  
(Orange)



Thevetia peruviana  
(white)



Thuja orientalis



Tipuana tipu





*Juniperus chinensis*



*Kigelia pinnata*



*Lagerstroemia speciosa rosea*



*Lagerstroemia speciosa*



*Lagerstroemia thorelli*



*Mangifera indica*



*Magnolia grandiflora*



*Markhamia platycalyx*



*Melia azedarach*



*Michelia champaca alba*



*Michelia champaca*



*Millingtonia hortensis*



*Mimusops elengi variegata*



*Mimusops elengi*



*Muntingia calabura singapore cherry*



*Murraya koenigii curry leaf*



*Nyctanthes arbor-tristis parijatham (coral jasmine)*



*Parkia biglandulosa*



*Parkinsonia aculeata*



*Peltophorum pterocarpum*



*Pinus longifolia*



*Plumeria lutea Frangipani*



*Plumeria obtusa Frangipani*



*Plumeria rubra forma tricolour Frangipani*



*Plumeria rubra Frangipani*



*Podocarpus macrophyllus*



*Polyalthia longifolia pendula variety*



*Polyalthia longifolia*



*Pongamia pinnata white flowers*



*Pongamia pinnata light pink flowers*





Cassia siamea



Casuarina  
equisetifolia



Chorisia speciosa



Cochlospermum  
religiosum



Colvillea racemosa



Cordia sebestena



Couroupita  
guianensis



Crataeva religiosa



Crescentia cujete  
beggars bowl



Cycas circinalis



Cupressus  
sempervirens



Dalbergia sissoo



Delonix regia



Dillenia indica



Diospyros  
peregrina



Erithrina crista-galli



Erythrina indica



Eucalyptus  
citriodora



Ficus benghalensis  
krishne



Ficus benghalensis



Ficus craterostoma



Ficus hispida



Ficus infectoria



Ficus religiosa



Filicium decipiens



Gardenia latifolia



Gliricidia sepium



Grevillea robusta



Jacaranda filicifolia



Jacaranda  
mimosifolia





*Adansonia digitata*



*Aegle marmelos*



*Agethis robusta*



*Albizzia lebbek*



*Alstonia scholaris*



*Amherstia nobilis*



*Anthocephalus indicus Kadamba*



*Araucaria cookii*



*Artabotrys*



*Artocarpus altilis*



*Azadirachta indica*



*Barringtonia acutangula*



*Barringtonia asiatica*



*Bauhinia blakeana*



*Bauhinia purpurea*



*Bixa orellana*



*Bombax ceiba*



*Brassaia actinophylla*



*Brownea ariza*



*Brownea coccinea*



*Butea monosperma*



*Callistemon citrinus*



*Callistemon pollandi*



*Calophyllum inophyllum*



*Cananga odorata*



*Cassia excelsa*



*Cassia fistula*



*Cassia javanica*



*Cassia marginata*



*Cassia nodosa*





Jasminuim  
Compact disc



Jasminuim



Jasmine



Jasmine



Jatropha  
panduraefolia



Jatropha  
panduraefolia  
varigata



Jatropha  
panduraefolia  
varigata



Jatropha  
panduraefolia



Jatropha  
panduraefolia  
varigata



Kopsia  
singapurensis



Kopsia



Leea coccinea  
green



Leea coccinea  
rubra



Lagerstroemia  
indic Pink



Lagerstroemia  
indica Red



Lagerstroemia  
indica White



Malpighia  
coccigera



Malpighia glabra  
West indian cherry



Manihot Esculenta  
Green



Manihot Eseulenta  
varigeta



Melaleuca golden  
crest



Murraya exotica



Murraya paniculata



Mussaenda  
erythrophylla  
Scarlet



Mussaenda  
erythrophylla rosea



Mussaenda  
Frondosa mustard



Mussaenda  
Frondosa



Mussaenda  
Philippica aurorae



Nerieum olender



Nerieum olender  
variegata





Nerium olender  
Dwarf soft pink



Nerium olender  
Tall-Roseum



Nerium olender  
Tall-Carnicum flore-  
eleno



Nerium olender  
Tall Yellow



Nerium olender  
Tall-Carnea



Nerium olender  
Tall-Album



Nerium olender  
Tall-variegatum  
plenum



Pachystachys lutea



Pachystachys  
Coccinea



Pandans mini



Pennisetum  
setaceum Fountain  
grass red (Rubra)



Pennisetum  
setaceum Fountain  
grass white



Pentas flower



Plumbago  
auriculata Blue  
flower



Plumbago  
auriculata White  
(alba)



Plumeria Singapore  
dwarf



Russelia juncea



Tabernaemontana  
coronaria



Tabernaemontana  
coronaria White  
wing



Tabernaemontana  
coronaria Flore-  
pleno (multi petel)



Tabernaemontana  
coronaria Variegata



Tabernaemontana  
coronaria Dwarf  
compact



Tecoma  
gaudichaudi



Tecoma stans



Tecomaria capensis



Thevetia peruviana  
Yellow



Thuja orientalis



Thunbergia erecta



Thunbergia alata  
white



Vinca rosea





Ageratum  
houstonianum floss  
flower



Althaea rosea  
Holly hock



Alyssum Madwo



Amaranthus  
tricolor Joseph's  
cost



Antirrhenum majus  
Snap dragon



Calendula  
Calendula flower



Calliposis Corepis



Celosia Cocks  
comb



Centaurea cyanus  
Cornflower



Chrysanthemum  
coronarium Annual  
Chrysanthemum



Cosmos Mexican  
aster



Delphinium spp  
Larkspur



Digitalis purpurea  
Fox glove



Dianthus  
caryophyllus Fairy  
queen



Gaillardia pulchella  
Blanket flower



Gomphrena  
globosa Bachelor  
button



Helianthus  
annuus Sunflower  
ornamental



Helianthus annuus  
Straw/paper flower



Iberis sempervirens  
Candytuft



Impatiens balsam



Flax



Pansy



Petunia grandiflora  
Picoti variety



Phlox drummondii  
Phlox



Salvia splendens  
Salvia red



Tagetes sp  
marigold



Torenia sp  
Torenia



Verbena Flower  
Verbena



Zinnia elegans red  
Youth and old



Zinnia linerals  
Perennial zennia





Alternanthera  
amoena



Alternanthera  
bettzickiana  
variegata



Alternanthera  
bettzickiana



Alternanthera  
snowball



Asystasia gangetica



Lantana camara red



Lantana camara red



Lantana sellowiana  
purple



Lantana sellowiana  
white



Porchulaca



Verbina



Wedelia trilobata



Aspidistra elatior



Begonia  
semperflorens



Callisia Repens



Chlorophytum  
comosum milky  
way



Chlorophytum  
comosum  
vittatum



Euonymus  
japonicus  
albomarginatus



Hedera canariensis



Hemigraphis  
colorata



Impatiens  
linearifolia



Liriope muscari  
variegata



Liriope platyphylla



Liriope platyphylla



Pelargonium  
hortorum



Pilea cadierei



Rhoco spathacea  
vittata



Syngonium  
podophyllum white  
butterfly



Tradescantia  
albiflora albiovittata



Zebrina pendula





*Aechmea chantinii*



*Aglaonema colour*



*Aglaonema commutatum elegans*



*Aglaonema commutatum maculatum*



*Aglaonema commutatum*



*Alocasia amazonica*



*Alocasia korthalsii*



*Alocasia macrorrhiza variegata*



*Alocasia macrorrhiza*



*Alpinia sanderae*



*Alpinia zerumbet*



*Anthurium andraeanum*



*Aphelandra squarrosa*



*Asparagus densiflorus myers*



*Asparagus densiflorus myriocladus*



*Asparagus densiflorus sprengeri*



*Asparagus plumosus*



*Asparagus setaceus pyramidalis*



*Aspidistra elatior 'variegata'*



*Begonia rex*



*Begonia semperflorens red pearl*



*Bromelia balansae*



*Caladium hortulanum canbidum*



*Caladium hortulanum attala*



*Calathea insignis*



*Calathea rufibarba*



*Codiaeum variegatum gold dust*



*Codiaeum variegatum mammy*



*Codiaeum variegatum petra*



*Codiaeum variegatum*





Coleus



Cordylone  
terminalis



Cordylone  
terminalis 'miss  
andrea'



Cordylone  
terminalis red ti



Cordylone  
terminalis rubra



Cordylone  
terminalis va baby  
doll



Cordylone terminalis  
fruticosa



Cryptanthus  
bivittatus



Cryptanthus  
bromeliades



Cryptanthus  
zonatus



Cyclame persicum



Cyclamen persicum



Dahlia



Dianella tasmanica  
variegata



Dianella tasmanica



Dieffenbachia  
amoena



Dieffenbachia  
bausei



Dieffenbachia  
maculata



Dizygotheca  
elegantissima



Dracaena fragrans  
massangeana



Dracaena marginata



Dracaena  
sanderiana gold



Dracaena  
sanderiana green



Dracaena  
sanderiana white



Dracaena  
sanderiana



Dracaena song of  
india



Dracaena song of  
jamaica



Dracaena tricolour



Epipremnum  
pinnatum



Euonymus japonicus  
yellow queen





Hedera canariensis  
variegata



Hedera canariensis



Hypoestes  
sanguinolenta



Impatiens  
linearfolia



Impatiens  
walleriana



Maranta leuconeura



Monstera deliciosa



Monstera obliqua



Nautilocalyx  
frogetii



Neoregelia  
carolinae



Nephrolepis  
biserrata furcans



Nephrolepis  
biserrata 'macho'



Nephrolepis  
cordifolia



Nephrolepis  
exaltata



Nephrolepis green  
lady



Pelargonium  
hortorum



Peperomia  
clusiifolia variegata



Phalaris  
arundinacea  
variegata



Philodendron  
bipinnatifidum



Philodendron  
congo



Philodendron  
lacerum



Philodendron  
xanadu



Sansevieria  
cylindrica



Sansevieria  
guineensis



Sansevieria  
trifasciata



Schefflera  
arboricola variegata



Schefflera  
arboricola



Scindapsus aureus  
marble queen



Scindapsus aureus



Spathiphyllum  
wallisii





Acanthocalycium  
violaceum



Carnegiea gigantea



Echinocactus  
grusonii



Hatiora  
salicornioides



Mammillaria  
hahniana



Notocactus  
leninghausii



Opuntia cylindrica



Opuntia falcata



Opuntia ficus  
indica



Pachycereus  
pringlei



Pereskia aculeata



Pereskia bleo



Schlumbergera  
bridgesii



Schlumbergera  
russelliana



Zygocactus  
truncatus



Adenium obesum



Agave angustifolia



Aloe abyssinica



Aptenia cordifolia



Beaucarnea  
recurvata



Butea monosperma



Cissus  
quadrangularis



Euphorbia milii



Furcraea gigantea



Kalanchoe  
blossfeldiana



Pachypodium  
lamerei



Pedilanthus  
tithymaloides



Sedum  
morganianum



Senecio radicans



Yucca  
aloifoliana





KLN Yadav Park Erragadda



Chacha Nehru Park, Masab Tank



Japanese Garden, Jubilee Hills



Clock Tower Park, Secunderabad



Lotus Pond, Jubilee Hills



Krishna Kant Park, Yousufguda



Krishna Kant Park, Yousufguda



Krishna Kant Park, Yousufguda



Krishna Kant Park, Yousufguda



Indira Park, Tankbund



Indira Park, Tankbund



Dr. Marri Channareddy Memorial Rock Garden, Indira Park



Road Island near G.H.M.C. Head Office



Tirumala Tirupathi Devasthanam Temple, Himayathnagar, Road Median



Herbal Garden, Ashwini Layout, Jubilee Hills



Colony Parks



Road Median at Gachibowli



Hitex Road Median, Hi-tech City





Golconda Textiles, Manneguda, Vikarabad



Green Valley Farm, Yenkapally Village, Vikarabad



Dr. V. Venkat, Villa No. 446, Pragati Green Villas, Proddutoor, Shankerpally



Pragati Green Meadows and Resorts Ltd.



Pragati Green Meadows and Resorts Ltd.



Pragati Green Meadows and Resorts Ltd.



Aparna Kanapy Tulip Apts, Owners Association



Trendset Winz Owners Welfare, Association Serilingampally



Aparna Sarovar



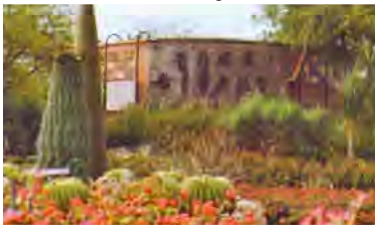
Aalankrita Resorts & SPA, Thumkunta, Shameerpet



Adansonia Digitata (Boabab Tree) 500 Years Old Tree near Golconda Fort



Aalankrita Resorts & SPA, Thumkunta, Shameerpet



Rock Garden, Sanjeevayya Park



Basava Tarakam Indo-American Cancer Hospital Research Institute Banjara Hills



AFTON Chemicals Hyderabad Pvt. Ltd.



Potted Plants on Road Island near Cyber City Towers



Lahari Resorts, Bhanur Village



Road Island at Minister Road Junction



Nagpur National Highway Road Median



Mr. K Bhoopal Reddy, Villa No.-15, Micasa Sterling Kompally



Raheja Mindspace Hi-tech City





Telugu Thalli Island



Telugu Thalli Island



Telugu Thalli Flyover



NTR Gardens



Kohinoor Garden, NTR Gardens



NTR Gardens



Japanese Garden, NTR Gardens



NTR Gardens



NTR Memorial Garden



Indira Gandhi Island, Necklace Road



Road Median at Kothaguda Junction



P.V. Gyana Bhoomi, Necklace Road



P.V. Gyana Bhoomi, Necklace Road



Lumbini Park



Buddha Purnima, Project Office



Road Island Opp., Shilparamum



Zen Garden, Kothaguda Junction



KBR National Park Walkway



KBR National Park Walkway



Railway Station, Necklace Road



Garchibowli Stadium

# CHAPTER - 9

## PALMS

Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for their symmetrical growth which makes an avenue look beautiful.

They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.

**Note:** Tips for planting can be adopted as in trees.

### PALMS : 1

S. No.	Plant Name	S. No.	Plant Name
1.	Adonidia merrillii green	16.	Borassus aethiopum (African palmyra palm)
2.	Adonidia merrillii golden (Christmas palm)	17.	Borassus flabellifer (Palmyra palm)
3.	Archontophoenix alexandrae (King palm)	18.	Brahea armata (Blue hesper palm)
4.	A. cunninghamiana (Piccabean palm)	19.	Butia capitata (Wine palm)
5.	Archontophoenix myolensis (Myola palm)	20.	Butia paraguayensis
6.	Areca catechu cv.alba	21.	Caryota mitis (Clustering fish tail palm)
7.	Areca catechu dwarf (Dwarf betel nut palm)	22.	Caryota urens (Fish tail palm)
8.	Areca catechu (Betel nut palm)	23.	Chameadorea costaricana (Pacaya palm)
9.	Areca macrocalyx (Kawiwi palm)	24.	Chamaedorea elegans (Parlour palm)
10.	Areca triandra (Triandra palm)	25.	Chamaerops humilis (European fan palm)
11.	Areca vestiaria (Langlois palm)	26.	Coccothrinax argenata (Silver thatch palm)
12.	Arenga obtusifolia (Langkap palm)	27.	Cocos nucifera (East coast tall)
13.	Arenga pinnata (Black sugar palm)	28.	Cocos nucifera (Ceylon orange)
14.	Arenga tremula (Dwarf sugar palm)	29.	Cocos nucifera dwarf (Dwarf coconut)
15.	Bismarckia nobilis (Bismarck palm)	30.	Cocos nucifera (Malayan golden yellow)



## PALMS : 2

31.	Copernicia hospita (Cuban wax palm)	46.	Livistona chinensis (Chinese fan palm)
32.	Cyrtosrtachys renda (Sealing wax palm/ lipstick)	47.	Livistona rotundifolia (Foot stool palm)
33.	Dypsis decaryi (Triangle palm)	48.	Nypa fruticans (Mangrove palm)
34.	Dypsis leptocheilos (Red neck palm)	49.	Phoenix dactylifera (Date palm)
35.	Dypsis lutescens (Golden cane palm)	50.	Phoenix roebelenii(Pygmy date palm)
36.	Elaeis guineensis (African oil palm)	51.	Phoenix sylvestris (Indian date palm)
37.	Euterpe oleracea (Assai palm)	52.	Pritchardia pacifica (Fiji fan palm)
38.	Howea forsteriana	53.	Pritchardia thurstonii (Thurston palm)
39.	Hyophorbe lagenicaulis (Champagne palm)	54.	Pseudophoenix ekmanii (Cacheo palm)
40.	Hyophorbe verschaffeltii (Spindle palm)	55.	Ravenea rivularis (Majestic palm)
41.	Latania loddigesii(Blue latan palm)	56.	Rhapis excelsa (Lady palm)
42.	Latania lontaroides (Red latan palm)	57.	Rhapis humilis (Slender lady palm)
43.	Latania verschaffeltii (Yellow latan palm)	58.	Roystonea regia (Cuban royal palm)
44.	Licuala grandis( Licuala palm)	59.	Washingtonia filifera (Petticoat palm/ desert fan palm)
45.	Licuala peltata (Giant fan palm)	60.	Wodyetia bifurcata (Foxtailpalm)











**Cycad dioon**



**Lalania lontaroides (red)**



**Cycas Circinalis**



**Ravenea rivularis**



**Veichia merilli golden**



**Nolina Recurvata**



**Washingtonia filifera**



**Hyophorbe lagenicaulis**





*Bambusa vulgaris vittata* (Golden bamboo)



*Bambusa multiplex* (Hedge bamboo)



Bamboo golden



*Bambusa vulgaris wamin Strita* (Buddha belly variegated)



*Bambusa vulgaris* Back bamboo



*Bambusa* Bamboo grass



*Bambusa ventricosa* (Buddha Belly)



*Bauhinia galpini*



*Bauhinia tomentosa*



*Bauhinia acuminata*



*Barleria cristata* Candida (White)



*Barleria cristata* Candida (Pink)



*Beloperona gutatta* (Yellow)



*Beloperona gutatta* (Red)



*Brunfelsia americana*



*Bougainvillea glabra*



*Bougainvillea thimma*



*Bougainvillea* Dr. Rao



*Bougainvillea*



*Bougainvillea* rosevelt delight



*Bougainvillea* lady mary baring



*Bougainvillea* subra white



*Bougainvillea* gold capalio



*Bougainvillea* glabra variegated



*Bougainvillea* Chitra



*Bougainvillea* mahara Coopacta red



*Buxus*



*Beaucarnea recurvata* Nolina variegated



*Beaucarnea recurvata* Nolina



*Cannas* variegated





Adonidia merrillii  
Golden vitegia  
palm

Adonidia merrillii  
Green vitchia palm

Archontophoenix  
Alexandrac (king  
palm)

Archontophoenix  
Cunninghamiana  
piccabeen palm

Archontophoenix  
Myolensis (myola  
palm)

Areca catechu  
cv.alba Betel nut  
palm



Areca catechu  
Dwarf betel nut  
palm

Areca catechu  
Betel nut palm

Areca macrocalyx  
Kawiwi palm

Areca triandra  
Triandra palm

Areca vestiaria  
Langlois palm

Arenga obtusifolia  
Lang kap palm



Arenga pinnata  
Black sugar palm

Arenga tremula  
Dwarf sugar palm

Bismarckia nobilis  
Bismarck palm

Borassus  
aethiopum African  
palmyra palm

Borassus flabellifer  
Palmyra palm

Brahea armata  
Blue hesper palm



Butia capitata  
Wine palm

Butia  
paraguayensis

Caryota mitis  
Clustering fish tail  
palm

Caryota urens  
Giant fish tail palm

Chamaedorea  
costaricana Pacaya  
palm

Chamaedorea elegans  
Parlour palm



Chamaerops  
humilis European  
fan palm

Coccothrinax  
argentata Silver  
thatch palm

Cocos nucifera  
Coconut (east coast  
tall)

Cocos nucifera  
Coconut (ceylon  
orange)

Cocos nucifera  
dwarf Coconut

Cocos nucifera  
Coconut malayan  
golden yellow









# CHAPTER - 10

## SHRUBS

Shrubs are usually woody or semi-woody perennial plants with branches arising from the base of the plants and growing up to heights of 1-4 meters. Most of the shrubs are hardy and grow in all types of soil.

Shrubs can be classified into three groups according to the requirement of sunlight for growth and flowering.

- Plants that show normal growth and flowering in full sun,
- Grow only in partial shade,
- Can grow well both in sunny and semi-shady conditions.

Shrubs are usually grown for their showy flowers or beautiful foliage. Pruning of plants helps to get bushy growth. The practice of clipping shrubs into ornamental shapes, known as topiary, has been in vogue for centuries. Flowering shrubs need sun light and foliage shrubs grow well under partial sunlight and shade. Location can be decided based on the height and canopy of the plant.

### Tips for Planting & Maintaining of Shrubs:

- Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
- Maintain 2' to 6' distance between pits, depending on the growth potential of the plant.
- Fill the pits with dug out soil; 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ Kg super phosphate and 100 gms of folidol dust.
- Plant the selected shrubs or creepers, water well, stake the plant next day. Regular watering is required thereafter.
- Run and train the shrubs and creepers for controlling plant size, shape and giving a bushy growth.
- Take up weeding and mulching in the basin on a regular basis.
- Regular care is required to protect the plants against pests and diseases.

### Common Shrubs:

Drought Resistant				Water Loving			
1.	Allamanda	11.	Jasmine	1.	Dambeya	1.	Crotons
2.	Bougainvillea	12.	Justicea	2.	Gardenia	2.	Coleus
3.	Caesalpineia	13.	Lantana	3.	Murraya exotica	3.	Phyllanthus
4.	Cassias	14.	Lagerstromia	4.	Mussaenda	4.	Eranthemums
5.	Cestrum	15.	Plumeria	5.	Plumbago	5.	Acalyphas
6.	Euphorbia	16.	Tecomas	6.	Ixora	6.	Aralias
7.	Hamelia	17.	Thevetia	7.	Lemonia		
8.	Hibiscus			8.	Pentas		
9.	Holmskoildea			9.	Bottle Brush		
10.	Roses			10.	Calliandra		



## FLOWERING AND FOLIAGE SHRUBS

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Achania malvaviscus	Malvaceae	Cutting	A quick growing medium-sized shrub. Produces red mauve colour half opened hibiscus-like flowers throughout the year.
2	Acalypha sanderiana	Euphorbiaceae	„	A small shrub with dark broad green leaves. Produces drooping catkins of crimson flowers. Flowers throughout the year. Prefers shady places. A wilkesiana have copper coloured leaves.
3	Artabotrys odoratis-simus (Hara Champa)	Annoniaceae	Seed	A small evergreen hardy shrub. Produces strongly fragrant flowers of green colour turning yellow on ripening.
4	Barleria cristata	Acanthaceae	Cutting	A bushy small shrub growing up to a height of 1.5 —1.8 m. produces blue flowers almost all the year round.
5	Caesalpinia pulcherrima (Poinciana pulcherrima) (Peacock flower)	Leguminosae	Seed or layers	A medium-sized shrub growing up to a height of 2.4-3 m. Produces red and yellow flowers almost all round the year with profuse flowering during rains and summer.
6	Caryopteris mastacanthus	Verbenaceae	Cutting	A medium-sized shrub reaching up to a height of 2.4-3 m. with dark green leaves. Produces handsome blue flowers.
7	Codiaeum variegatum	Euphorbiaceae	Cutting and goote	Handsome, medium sized shrub with numerous shades of leaves. Leaves may be twisted, thin or very broad.
8	Cestrum nocturnum (Rat ki Rani)	Solanaceae	Cutting	A soft wooded shrub growing 1.5 m. in height. Produces small pale green flowers. Flowers open at night and are highly fragrant. Flowers during March-April and in July-August. C. drummondii, produces white scented flowers throughout the year.
9	Euphorbia pulcherrima (Poinsettia)	Euphorbiaceae	Cutting	A tall shrub reaching up to a height of 2.4-3.0 m. Produces light yellow or yellow flowers on the terminals. Flowers throughout the year.
10	Duranta repens	Verbanaceae	Seed or Cutting	A small thorny shrub with light yellow leaves. Bears blue or white flowers in clusters during rains. The berries are also very attractive, makes an effective hedge variety with variegated leaves look more pretty.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
11	Gardenia florida	Rubiaceae	Air-layering Cutting	A tall evergreen shrub with shining green leaves. Produces white highly fragrant flowers during summers and rains.
12	Gossypium spp.	Malvaceae	Cutting	Produces white flowers during rains.
13	Hamiltonia-suaveo-lens	Rubiaceae	„	A medium-sized shrub with coarse leaves. Produces sweet scented white or blue tinged flowers during winter months. Responds well to pruning.
14	Hamelia patens	„	„	A strong bushy shrub attaining a height of 3.0-4.5 m with attractive foliage of small green and greenish bronze leaves. Produces orange yellow tubular flowers during winters. Good as an ornamental hedge.
15	Hibiscus mutabilis	Malvaceae	„	A large deciduous shrub of 3-4.5m height with large leaves. Produces large handsome double flowers of white, pink and yellow shades during September—October.
16	Hibiscus rosa-sinensis	Malvaceae	Cutting	Flowers are single or double and appear throughout the year. Colour ranges from deep red, bright red, white red with white strips.
17	Hibiscus syriacus	Malvaceae	Cutting	White or purple blue flowers white single or double forms.
18	Ixora rosea (Rukmini)	Rubiaceae	Layering	A medium-sized shrub with handsome foliage. Produces pink fragrant flowers during March-April. I. lutea produces yellow flowers of large size.
19	Ixora coccinea	Rubiaceae	Layering	A medium shrub with handsome foliage. Produces abundant bright red flowers during rains.
20	Jasminum humile (Yellow Jasmine)	Oleaceae	Cutting	A dwarf shrub reaching up to a height of 1.5-1.8 m. Produces bright yellow flowers in April--June.
21	Jasminum sambac (Mogra Bela)	„	„	A dwarf spreading shrub growing up to 0.9-1.2 m height. Bears creamy white flowers during May to August which are sweet scented.
22	Jasminum sambac (var. Motia Bela)	„	„	A dwarf spreading shrub reaching to a height 0.6-0.9 m. Bears pure white highly fragrant flowers in May to August. The flowers open loosely and look like a star in shape.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
23	Lagerstroetnia app (Sanwani)	Lytharaceac	„	A medium-sized deciduous shrub. Bears flowers of pink, mauve and white colour during May to August. Responds well to pruning.
24	Murraya exotica (Kamni)	Rutaceae	Seed	A medium-sized, evergreen shrub with glossy green pinnate leaves. Produces sweet scented white flowers during May – August. Makes an excellent shrub and hedge.
25	Nerium indicum	Apocynaceae	Cutting	A tall, evergreen shrub reaching a height of 3.0-4.5 m. Bears white pink flowers in single double during May– November. Well suited for dry localities. Scented flowers appear on top of branches.
26	Russelia equisetifolia	Scrophulariaae	„	A dwarf, spreading, evergreen and graceful shrub. Produces bright red flowers. Well suited for rockeries and for hanging baskets R. coccinea produces red or scarlet flower. Plant is erect and leaves are small.
27	Stachytrpheta rosea	Verbenaceae	Cutting	A medium-sized, soft wooded shrub. Produces spikes of rose red colour flowers almost throughout the year.
28	Tecoma stans (Yellow elder)	Bignoniaceae	Seed	A tall, erect, globrous shrub growing up to a height of 3– 4 5 m. Produces flowers of yellow colour in panicles during rains and summers. Well suited for dry localities, can be used as a hedge
29	Tabernaemontana divaricata (Chandni)	Apocynaceae	Cutting	An evergreen, hardy shrub with glossy foliage. Produces pure white scented single cr double flow ers during summers and rains.
30	Thevetia neriifolia	„	Cutting or Seed	A tall, evergreen shrub attaining a height of 3-3 6 m. Produces yellow white and bronze funnel-shaped flowers all the year round.
31	Thanbergia ereeta	Acanthaceae	Cutting	Dwarf, hard shrub produces blue funnel shaped flower all the year round.





Plumeria acuminata  
Grove farm



Plumeria acuminata  
Hon kong



Plumeria acuminata  
Incarnation



Plumeria acuminata  
India



Plumeria acuminata  
India



Plumeria acuminata  
Kane sun burst



Plumeria  
acuminata Kaiulaia



Plumeria acuminata  
Kaneohe



Plumeria acuminata  
Kaneo ho sunrise



Plumeria acuminata  
Keywest-elizabeth



Plumeria acuminata  
Kona hybrid



Plumeria acuminata  
Keywest red



Plumeria acuminata  
Lisa marie



Plumeria acuminata  
Madam pon



Plumeria acuminata  
Madison white



Plumeria acuminata  
Mary susan



Plumeria acuminata  
Miami rose



Plumeria acuminata  
Mori



Plumeria acuminata  
Nebel gold



Plumeria acuminata  
Petersons gold



Plumeria  
acuminata Plastic  
pink



Plumeria acuminata  
Pink pansy



Plumeria acuminata  
Powder pink



Plumeria acuminata  
Puu kahea



Plumeria acuminata  
Rin wheel



Plumeria  
acuminata Ruby le



Plumeria acuminata  
Samoan fluff



Plumeria acuminata  
Singapore plumeria



Plumeria acuminata  
Tangerine



Plumeria acuminata  
Temple tree/Frangi  
pani





Heliconia Mathiasae



Heliconia Caribaea Bihai



Heliconia Carubaea Purpurea



Heliconia Pedro Orteiz



Eltingera Elatior



Heliconia Bihai Lobster Claw



Heliconia Indica Spectabilis  
Var Rubra



Alpinia Pink



Heliconia Strkta Firebird



Heliconia Orthotricua



Heliconia Orthotricua Tricolor



Heliconia Orthotricha



Etlingera Elatior (White)



Torch Ginger (Red)



Torch Ginger (Pink)



Torch Ginger Rose



Water Lily



Water Lily



Water Lily



Bulrush





Quisqualis Indica Double



Passiflora Incarnata Hybrid



Passiflora Vitifolia



Pyrostegia Venusta



Stictocardia Macalusoi



Ipomoea Horsfalliae



Ipomoea Morning Glory  
Indica



Ipomoea Wood Rose



Thunbergia Grandiflora



Thunbergia Mysorensis



Petrea Volubilis



Strophanthus Gratus



Bougainvillea



Bougainvillea



Bougainvillea



Bougainvillea



Annuals



Annuals



Annuals



Annuals





Duranta



Duranta



Erythrina Variegata



Nerium Oleander



Mussaenda



Bauhinea Galpini



Buxus



Crinum Black



Agave



Agave



Cryptanthus



Cryptanthus



Agave



Agave



Agave



Agave



Sansevieria



Sansevieria



Sansevieria



Echinocactus Gursonii





Juniperus (New Variety)



Juniperus



Juniperus



Juniperus



Phalaris Arundinaria Variegata



Pennisetum



Hypoestes



Chlorophytum



Ananas



Manihot Esculenta



Jatropha Variegated Inteferrima



Jatropha Hybrid Inteferrima



Clivia Miniata



Pandanus Baptistii



Asparagus Meyrii



Gardenia Jasminoides



Rhododendron Azalea



Desmodium Pulchellum



Dillenia Suffruticosa



Combretum Constrictum





Codiaeum



Codiaeum



Codiaeum



Codiaeum



Codiaeum



Codiaeum



Adenium



Dracaena Angustifolia



Arundingacea



Calathea - Majestila  
Rosea - Lineata



Calathea - Majestila  
Uaralbo - Lineata



Stromanthe Sanguinea  
Varigated



Zingiber Zerumbet



Alpinia Zerumbet



Calathea Zebrina



Calathea Makoyana



Anthurium



Aralia



Aralia



Nandina Domestica





Asplenium



Asplenium



Pteris Cretica



Platycerium



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Adiantum



Adiantum



Dracaena



Dracaena



Dracaena



Dracaena





Aglaonema



Aglaonema



Aglaonema



Aglaonema



Dieffenbachia



Dieffenbachia



Dieffenbachia



Dieffenbachia



Aglaonema



Cordyline



Cordyline



Cordyline



Spatiphyllum



Spatiphyllum



Aphelandra



Alocasia



Philodendron



Philodendron



Philodendron



Philodendron





Plumeria Rubra



Plumeria Hanging



Plumeria Singapore White



Heliconia



Veitchia Merrilli



Bauhinea Variegated



Amarylis Variegated



Coccoloba Uvifera



Cryptostegia Grandiflora



Alpinea (Pink Ginger)



Ornamental Banana Variegated



Agave Variegated



Caronda Carambola



Elaeocarpus Angustifolia



Cordea Lutea



Spathoglottis Chameleon



Bombax Ellypticum



Passiflora



Ficus Topiary



Melleleuca Topiary





Bougainvillea



Bougainvillea



Bougainvillea



Bougainvillea



Bauhinia Blackeana



Alocasia Blackmagic



Clethra



Spathiphyllum Sensation



Allamanda Peach



Anthurium Veitchii



Anthurium



Staghorn Fern



Pandanus



Mandevilla Bolivienensis



Colvillea Racemosa



Schefflera



Cordia Sabastena



Triplaris Surinamensis



Acocanthera Oblongifolia



Oncoba Spinosa





Haemanthus Multiflorus



Adansonia Perrieri



Dioon Edule



Mucuna Benetti (Jadevine Red)



Michelia Champaca



Datura Arborea



Ornamental Chinese Orange



Codiaeum



Gardenia Dwarf



Combratum



Combretum Constrictum



Filicium Decipiens



Solanum Macaranthum



Barringtonia



Schefflera Haicolour



Ochna Kirkii (Tom & Jerry Plant)



Water Lily



Water Lily



Water Lily



Water Lily

# CHAPTER - 11

## HEDGES & EDGES

Plants grown in series in straight line or a smooth wave to serve as a barrier or screen are termed as hedges. They provide a natural background to a garden, like a frame to a picture which maybe external or internal. An external hedge is tall and may replace the compound wall. It also serves as a protection against wind. It may be 1.5 to 2.5 meters (5 to 9 feet) height. The internal hedge separates different parts of the garden and is not so tall. It may vary from 30 to 90 cm (1 to 3 feet). Hedges may be of deciduous or evergreen plants. They may be flowering or non flowering plants. Hedges are generally created with fast growing plants so as to get the effect immediately as screen, or wind-break. They have a capacity to grow tall and are evergreen.

### Essentials of a good hedge:

It needs to be thick and dense; it should have evergreen foliage from bottom to top; it should withstand regular pruning and be trim and neat. If it is a flowering hedge its bloom should not clash with the colour scheme.

Hedges are used for concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc and for providing privacy. Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.

### Tips for Laying Hedges and Edges:

1. Dig trenches of 1' width and 1' depth. Loosen the bottom of trench and expose to sun for about 15 days.
2. Fill the trench with dug out soil if it is good or red soil. Mixed with 25 kg compost or 10 kg vermi-compost, 2.5 kg Neem cake and 1 kg Super Phosphate per 10' length of the trench; 25 Gms of foliol dust., and water the filled trench for settling.
3. Plant rooted cuttings of the selected plant material at 4" - 6" gap and water. During rainy season with high humidity, uprooted cuttings can also be planted, at close range of 2"-3" spacing in two rows.
4. Water well thereafter.
5. First shearing should be done at 9" - 1' height for edges and at 1' - 1.6" height for hedges to get bushy growth right from ground level. Further shearing at regular intervals to maintain desired height, shape and compactness. Shearing can be done for maintaining desired shapes.
6. Manure once in six months or whenever growth and vigour retards at the base of the trench and regular mulching also needs to be undertaken

## Ornamental Hedges /Edges:

S. No.	Name	Planting Distance (cm)	Stands Pruning	S. No.	Name	Planting Distance (cm)	Stands Pruning
1.	Aclypha sp.	30-45	Poor	9.	Lantana sp.	30-45	Well
2.	Bougainvillea sp.	90-120	Well	10.	Murraya exotica	45-60	Well
3.	Cuphea	15-20	Poor	11.	Mynea erecta	15-45	Well
4.	Duranta sp.	30-45	Well	12.	Pedilanthus	15-20	Well
5.	Konocarpus	30-45	Well	13.	Ashoka pendula	90-100	Well
6.	Hemelia Patens	30-45	Well	14.	Tecoma stans	60-90	Poor
7.	Clerodendron inerme	15-20	Well	15.	Phyllanthus	30-45	Poor
8.	Justicia sp.	20-30	Well	16.	Crasulla (Jade)	20-30	Well

## Protective Hedges:

1.	Carissa Carandas (Karonda)	20-60	Light
2.	Inga dulcis	90-100	Well
3.	Lawsonia inermis (Mehendi)	45-60	Well
4.	Parkinsonia aculeata	90-100	Light

## A-ORNAMENTAL HEDGES

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
1	Acalypha	Aclypha sunderiana Euphorbiaceae	30-45	Cutting	Makes a good hedge because of attractive coloured leaves ; can be trained up to a height of 0 9-1.2 m. Does not stand trimming well and is susceptible to low temperature.
2	Bougainvillea	Bougainvillea spp. Nyctaginaceae	90-120	Cutting air & ground layering	Most of the varieties make an effective beautiful and hardy hedge, produces pretty flowers almost all the year round. Stands trimming well. Can be trained up to a height of 0 9-1.2 m.



S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
3	Cupressus	Cupressus macro carpa	30-45	Seed Cutting	Makes an excellents, evergreen dense hedge. Stands trimming well. Does better in cool area.
4	Duranta	Duranata plumeri Rubiaceae	30-45	Cutting and Seed	Beautiful, effective and hardy hedge. Stands trimming well. Variety with variegated leaves is better.
5	Hamelia	Hamelia patens Rubiaceae	30-45	Cutting	Makes a good attractive hedge with coloured foliage. Stands trimming well. Can be trained up to a height of 1 2-1.8 m.
6	Hibiscus	Hibiscus rosasinensis Malvaceae	30-45	Cutting	Makes an excellent hedge, stands trimming well. Can be trained to a height of 0 9-1 2 m. Produces attractive tubular flowers almost throughout the year.
7	Justicia	Justicia grandus Acanthaceae	22.5-30	Cutting	Makes dwarf hedge. Stands trimming well. Can be trained up to a height of 0 3-0 6 m
8	Lantana	Lantana spp. Verbenaceae	30-45	Cutting	Several varieties of Lantana make vigorus hardy and drought resistant hedge Produces flowers of different hue. Stands trimming well. Should not be planted close to residence.
9	Dadonia	Dadonia viscosa	22-30	Cutting and Seed	A quick-growing and ornamental hedge. Stands clipping well. Requires attention during summers.
10	Murraya (Kamni)	Murraya exotica Rutaceae	45-60	Seed	Makes a pretty hedge, because of its deep green compound leaves. Produces white highly fragrant flowers during July—Aug. and Feb.—March. Stands trimming very well.
11	Mayenia	Meyenia erecta Acanthaceae	15-45	Cutting	Makes pretty dwarf hedge. Produces beautiful purple flowers. Can be trained to a height of 0.6-0.9 m.



S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
12	Ashok	Polyalthia longifolia Anonaceae	90-100	Seed	Makes an effective hedges when properly trained and trimmed. The foliage is very attractive.
13	Surinam Cherry	Eugenia uniflora Myrtaceae	60-90	„	Makes a hardy, beautiful and effective hedge. Red berries look very attractive. Fruits can be utilized for making jam and jelly. Can be trained to a height of 1.2-1.5 m. Does not require much irrigation or trimming.
14	Jaint	S sbenia sesban Leguminosaceae	22.5-30	„	A quick-growing and short-lived hedge Stands trimming well. Produces yellow flowers during rains and summers.
15	Mehndi	Lawsonia inermis Lythraceae	30-45	Seed and Cutting	A slow-growing drought resistant and effective hedge. Stands trimming very well. Can be trained to a height of 1.2-1.5 m.
16	Tecoma	Tecoma stans Bignoniaceae	60-90	Seed	Makes an ornamental hedge. Produces bright yellow flowers almost throughout the year. Does not stand trimming well. Can be trained to a height of 1.2-1.5 m.
17	Chandnee (Single)	Tabernaemontana coronaria Apocynaceae	60-90	Cutting	A fairly quick growing beautiful hedge Produces white flowers in abundance. Foliage very shiny. Stands trimming nicely. Can be trained to a height of 0.9-1.2 m.
<b>B-PROTECTIVE HEDGES</b>					
1	Karounda	Carissa carandas Apocynaceae	120-150	Seed	It is slow growing, drought resistant plant. It makes a very effective hedge due to long thorns. Light annual pruning is needed. Fruits make excellent jam and jelly.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
2	Natal plum	Carissa grandiflora Apocynaceae	60-90	Seed and gootee	A low, slow growing and drought resistant plant. Follage deep green. Produces fine white flowers almost through-out the year. Closely planted, hedge is almost impenetrable. Fruit can be utilized for making jam and jelley. Can be trained up to a height of 0.6-0.9 m.
3	Jangali karounda	Carissa bispinosa Apocynaceae	120-150	Seed	A tall, vigorous, thorny and drought resistant plant. Makes a dense and compact hedge. It makes a better hedge than Karounda. Well cared plants make almost an impenetrable fence, because of big stout thorns. Fruits can be utilized for making jam, jelly and refreshing drinks.
4	Karna Khatta	Citrus karna Rutaceae	60-90	Seed	A useful plant for hedge purposes Single row planting makes a very effective hedge. Can be trained to a height of 1.2-1.5 m.
5	Turanj	C. medica Rutaceae	90-100	Seed and cutting	Same as above.
6	Madras Thorn	Inga dulcis Leguminosae	60-90	Seed	Makes a beautiful and effective hedge when planted in double row. Stands trimming well. Can be trained to a height of 0.9-1.2 m.
7	Parkensonia	Parkensonia aculata	60-90	Seed	A quick-growing effective drought resistant hedge plant. Effective up to a height of 1 2-1.5 m. Double row planting is much more effective.

# CHAPTER - 12

## GROUND COVERS

Plants which are used to cover the soil surface as an alternative to lawns are termed as ground covers. They help in preventing dust pollution and to add colour through flowers or foliage. They also check soil erosion.

They enhance the aesthetic appearance of any garden. They can be classified into three groups according to the requirement of sunlight for growth and flowering.

- Plants that show normal growth and flower in full sun

- Grow only in partial shade
- Grow well in full sun and semi shade conditions.

Groundcovers are useful in the garden for covering bare patches of soil beneath trees or shrubs or for covering steep banks where access is difficult. Their roots also help to stabilize soil on steep slopes and check erosion. Ground cover plants brighten up otherwise dull areas and will suppress weeds, making them ideal for a low-maintenance garden.

### Groundcovers:

S. No.	Plant Name	S. No.	Plant Name	S. No.	Plant Name
1.	Alternanthera sp.	11.	Verbena	21.	Impatiens linearifolia
2.	Asystasia gangetica	12.	Wedelia trilobata	22.	Liriope muscari variegata
3.	Senecio confucius	13.	Aspidistra elatior	23.	Liriope platyphylla
4.	Zebrina pendula	14.	Begonia semperflorens	24.	Liriope platyphylla
5.	Ruellia sp.	15.	Callisia Repens	25.	Dianella tasmanica
6.	Syngonium sp.	16.	Chlorophytum sp.	26.	Aptenia caudifolia
7.	Rhoeo spathacea vittata	17.	Pelargonium hortorum	27.	Scindapsis sp.
8.	Lantana sellowiana	18.	Euonymus japonicas	28.	Sansiveras
9.	Pilea sp.	19.	Hedera canariensis	29.	Setcreasea
10.	Portulaca	20.	Hemigraphis colorata	30.	Spathyphyllum





# CHAPTER - 13

## CLIMBERS

Plants which have special structures to climb on supports are defined as climbers. These special structures may be tendrils, modified leaf stalks, rootlets or hook like thorns. The name rambler is usually used for climbing forms of roses which produce clusters of flowers.

Climbers can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces over grills and wire meshes.

### Tips for Planting & Maintaining of Climbers

1. Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
2. Maintain 4' to 6' between pits.
3. Fill the pits with dug out soil, 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ kg super phosphate and 100 gms of folidol dust.
4. Plant the selected climber, water well, stake the plant next day. Regularly water thereafter.
5. Prune and train the climbers for controlling plant size, shape and giving a bushy growth.
6. Take up weeding and mulching in the basin on a regular basis.
7. Regular care is required to protect the plants against the pests and diseases.

### Common Climbers:

S. No.	Name	Common Name	Flower colour	Flowering season	Type	Propagation
1.	Agamosma caryophyllata	Maiati lata	White	Rainy	H	C
2.	Allamanda cathartica	.....	Yellow	AYR	L	CL
3.	Antigonon leptopus	.....	Rosy	AYR	L	S
4.	Aristolochia grandiflora	Birth wart	Purple	Summer, Rainy	L	CL
5.	Beaumontia purpuria	Nepal Trumpet	White	Winter	H	CL
6.	Bougainvilles sp.	.....	Multi	Summer	H	CL
7.	Bignonia purpuria	.....	Purple		L	L
8.	Bignonia venusta	Golden Shower	Orange		L	L
9.	Cleorodendron splendence	.....	Scarlet	Winter	L	C,S
10.	Ficus repens	Wall creeper	...	....	L	C,L
11.	Areca vestiaria (Langlois palm)	Madhavi Lily	Yellow	Winter	L	S,L
12.	Ipomea horsfolliae	.....	Crimson	Winter	H	G,L
13.	Jacquemontia	.....	Blue	AYR	L	C,L
14.	Jasminum SP.	Motia	White	Summer	L	C,L



## Climber

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Allamanda cathartica var. grandiflora	Apocynaceae	Ground Layering	A climbing plant with bright green leaves grandiflora Layering leaves. Produces big showy yellow flowers from June—Nov. A violacea produces violet-purple flowers.
2	Antigonon alba	Polygonaceae	Seed	A quick growing climber. Produces lovely spray of white flowers during rains and in winter. A. leptopus bears flowers of rose colour.
3	Asparagus plumosus	Liliaceae	„	A highly ornamental evergreen dwarf climber. The foliage finely divided. Prefers shady places. A. spengri is a dwarf climber with white fragrant flowers.
4	Adenocalymma alliaceum	Bignoniaceae	Ground Layering	Produces pale mauve flowers in large clusters all the year round.
5	Banisteria laurifolia	Malpighiaceae	Ground Layering	A strong extensive climber with dark olive coloured leaves. Bears abundance of bright golden yellow flowers from December to March.
6	Bignonia venusta (Pyrostegia venusta)	Bignoniaceae	„	A quick growing evergreen creeper. Produces in abundance rich yellow tubular flowers from December to March.
7	Bignonia gracilis	„	„	A slender, creeper with pretty yellow flowers. Flowers are seen from Nov. till March
8	Bougainvillia spp.	Nyctaginaceae	Ground and air Layering	Bougainvillas are the most colourful garden plants. They are vigorous growing heavy creepers. Cultivated for showing brightly coloured bracts. Can be trained as standard, hedge and pergola. The important spp. are the following. Budding is possible.
9	B. Spectabilis	Nyctaginaceae	Ground and air Layering & Cutting	A quick-growing creeper. Bears rosy purple colour bracts from Jan. to March.
10	B. Mahatma Gandhi	„	„	Bears pink and purple bracts.
11	B. Louis Wathen	„	„	Bracts bright orange turning pinkish on maturity.
12	B. Mrs. Butt	„	„	A free bloomer with deep crimson bracts.
13	B. Mary Palmer	„	„	Rose pink and white bracts are borne on the same branch.



S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
14	B. Sannet	„	„	Bright rosy purple bracts. Plant makes a compact growth.
15	B. Magnifica	„	„	Produces bright large mauve Colour bracts.
16	B. Snow queen	„	„	A beautiful variety bearing white bracts green veins.
17	B. Thima	„	„	Similar to Mary Palmer except the leaves are varigated.
18	B. Shubhra	„	„	Produces white large bracts on the terminals.
19	Clerodendron splendens	Verbenaceae	Layering	A dwarf evergreen creeper with dark green foliage. Bears profuse beautiful flowers from Dec.-Feb. of vermilion colour.
20	Ficus ripens	Urticaceae	Cutting	A creeping species of fig foliage. Evergreen, without much branching.
21	Ipomea pulchella	Convolvulaceae	Seed	A quick growing, evergreen ex-tensive green creeper. Bears purple flowers during winters.
22	Jasminum grandifloram	Oleaceae	Layering	A small evergreen climber with bright green leaves. Produces pure white star-shaped frag-rant flowers during summer months.
23	Lonicera japonica	Caprifoliaceae	„	A rambling evergreen creeper. Bears white fragrant flowers which turn yellow later.
24	Porana paniculata	Convolvulaceae	„	A strong evergreen creeper. Produces very small white flowers in great abundance during October–November.
25	Quisqualis indica (Rangoon creeper)	Combretaceae	„	A strong, evergreen, bushy, climber. Produces shining scarlet and white flowers in abundance throughout the year. Suitable for training on buildings and walls.
26	Tecoma grandi flora	Bignoniaceae	„	A strong woody creeper. Bears orange coloured flowers in abundance almost throughout the year.
27	Thubergia grandiflora	Acanthaceae	„	A strong evergreen extensive climber. Bears large bell-shaped blue coloured flowers from October till December.
28	Jacquemontia pen antha	Convolvulaceae	„	Produces bell- shaped flower of ultramarine blue colour all year the round.
29	Passiflora recemosa (Passion flower)	Passiflorae	„	Large flowers with whitish green sepals during winter.



Allamanda  
cathartica  
Hendersonii



Allamanda  
cathartica violacea



Allamanda  
cathartica  
Williamsii



Allamanda  
cathartica



Anemopaegma  
chamberlaynii



Aritigonon  
Leptopus Alba



Antigonon  
leptopus



Aristolochia  
elegans



Arrabidaea  
magnifica



Beaumontia  
grandiflora



Campsis  
grandiflora



Campsis radicans



Clematis flammula



Clematis gouriana



Clerodendrum  
splendens



Clerodendrum  
thomsonac



Clitoria ternatea



Clytostoma  
purpureum



Combretum  
coccineum



Cryptostegia  
grandiflora India  
rubber vine



Echites  
caryophyllata



Ficus pumila (wall  
creeper) variegata



Ficus pumila (wall  
creeper)



Ipomoea horsfalliae



Ipomoea learri



Ipomoea pes-  
caprae



Jacquemontia  
violacea



Jasminum  
angustifolium



Jasminum  
auriculatum



Jasminum nitidum





*Jasminum sessiliflorum*



*Lonicer japonica*  
Japanese honey  
suckle



*Lonicer sempervirens*  
Trumpet honey  
suckle



*Odontadenia grandiflora*



*Pandorea jasminoides*



*Passiflora violacea*  
Purple passion  
flower



*Passiflora caerulea*  
Blue passion flower



*Passiflora coccinea*  
Red passion flower



*Passiflora decaisneana*



*Petrea volubilis*  
purple wreath



*Phaedranthus buccinatorius*  
Splendent flower



*Podrancia ricasoliana*



*Pseudocalymma alliace* Garlic vine



*Pyrostegia venusta*  
Golden shower



*Quamoclit coccinea*  
Star ipomoea



*Quamoclit pinnata*  
Cypress vine



*Quisqualis densiflora*



*Quisqualis indica*  
double Ragoon  
climber



*Quisqualis indica*  
Ragoon climber



*Senecio confusus*  
Mexican daisy



*Stephanotis floribunda*



*Stigmaphyllon periplocifolium*



*Thunbergia alata*



*Thunbergia grandiflora*



*Thunbergia mysorensis*



*Trachelospermum jasminoides*



*Vallis heynei*



*Tristellateia australasica*



*Vernonia elaeagnifolia*



*Wisteria sinensis*

# CHAPTER - 14

## ROSES

### I. Introduction

The rose has been loved and cherished from very ancient times. In modern age, its importance has become still greater because rose breeders have been increasing its range of colours while at the same time adding valuable characters like disease resistance and a longer period of flowering. It is a versatile plant and the fantastically large number of types available is one of the reasons for its great popularity. There are now roses for every purpose and even the person with only a tiny plot of land will find there are varieties available to him which will provide a welcome splash of colour to a wall or furnish quantities of exquisite cut flowers. Now-a-days, roses are grown throughout the country and perhaps no flower is more loved in India. The rose is valued for purposes of worship and for making garlands in our country. Recently the Rose Society of India has laid out a beautiful National Rose Garden in New Delhi.

### II. Climate

The climatic conditions of India are well suited to rose cultivation. Roses need bright sunshine and free ventilation. Sunshine for six hours is ideal for better growth and flowering.

In the northern plains, roses flower best during winter whereas in the temperate hilly regions of the Himalayas in summer. Western part of India have excellent agro-climatic conditions for rose growing. The plains of eastern India are suitable for the cultivation of many rose cultivars. Bangalore

has mild climate Where roses can be grown for flowers throughout the year.

### III. Soil

Although any soil is good for rose cultivation provided it has proper drainage, the ideal soil should be medium loam having sufficient organic matter, pH of 6.0 -7.5. The land where the external drainage is poor and water stagnates during monsoon should not be selected for rose growing. In very heavy soils, gravel and sand may be mixed into the bed to allow drainage. The land with high water table is not suitable for rose beds.

### IV. Layout of Beds

The plan of rose garden and design of the beds should be simple and informal. Rose beds may be of various design, depending upon the liking of the grower. However, rectangular beds are advantageous for maintenance. The width of the beds should be such that operations like weeding, hoeing, forking, cutting of flowers etc, can be done from both the sides of the bed, without stepping into the bed. A plot size of 6.0 x 1.2m or 6.0 x 1.65m is suggested for better management of rose plants. The length can be increased to a limited extent depending upon the specific situations.

### V. Growth and Flowering

Factors like genetic or inherent factors, climatic or environmental factors such as light, temperature, moisture, aeration and managerial factors like nutrition and soil conditions influence growth and flowering.



## A. Genetic factors

Like other plants, growth and flowering behaviour of roses is governed by genetic factors. The range of variability in roses is very great. There are tall cultivars growing several metres high and are suitable for planting in backdrop and as hedges. On the other hand, miniature roses with dwarf habit and producing small flowers are also available. Several cultivars are bushy in nature while many are climbers and ramblers. A wide choice of cultivars with long sturdy stems having nice flower forms suitable for cut-flowers are also available today. Similarly, there are cultivars blooming in different periods and producing varied yield and quality of flowers. Some possess high quality perfume.

## B. Environmental factors

Along with genetic factors, environmental factors play an important role on growth and flowering.

### 1. Light

Light is one of the most important factors influencing the growth and flowering of roses. This may vary with intensity, duration and quality of light. The total plant weight may be reduced by the decrease in light intensity, and the number of flowers produced increases with increased radiation.

Plants growing under shade produce thinner leaves with low chlorophyll content. However, because of high light intensity and the consistent rise in temperature, summer grower apply a light shading material on the roof of the glasshouse. Colour of rose flowers is also influenced by the high intensity of light. The influence of duration of light is most marked and spectacular on growth and in inducing or suppressing flowering.

### 2. Temperature

Temperature affects the quantity and quality of the plant and the flower. At a

night temperature of 15.5°C the quality and quantity of roses produced are considered to be satisfactory. Low temperature also brings about the development of pigment in the leaves stems or flowers. The stem and flower buds need an exposure to cool temperature for their expansion. Winter chilling is necessary for flower bud formation.

### 3. Humidity

Humidity plays an important role in the incidence of pests and diseases affecting the growth and flowering. Certain diseases like mildew's are associated with high relative humidity. Its importance, however, lies in the internal water conditions of the plants. By maintaining reasonably high humidity, the internal deficiency of water will be less. Enlargement of cells is caused by water and, therefore, we should prevent the loss of water from the plants so that leaves and flowers would be larger and stems longer.

### 4. Aeration

Proper soil aeration and an exchange of air in green house are also desirable for the normal growth and development. Compact soils have restricted aeration which impedes the activity of roots affecting the plant growth. Air circulation ensures an adequate supply of carbon dioxide and oxygen for physiological processes occurring in the plant and also reduces the relative humidity which may cause serious infections. Carbon dioxide is an important factor in photosynthesis in increasing the stem length and dry matter.

## C. Plant management practices

Pruning, pinching, disbudding, deshoots, defoliation and deflowering are the plant management practices done for rose cultivation.

### 1. Pruning

Pruning is an important operation regulating the growth and flowering of roses. Pruning

in roses is explained in detail the cultivation section. Following are some other plant management practices which influence the vegetative growth and production of flowers.

## **2. Pinching**

Removal of a part of terminal growing portion of stem is called pinching. It reduces the plant height but promotes auxiliary branching and also prevents maturity of flower bud.

## **3. Disbudding**

Removal of undesirable buds is known as disbudding. Keeping only the central bud and removal of others cause development of a quality bloom.

## **4. Deshooting**

Deshooting is generally followed in Hybrid Tea roses. Young vegetative shoots developing from the axils of leaves of basal and lateral shoots are removed to allow only one terminal shoot. In several rose cultivars such side shoots develop from the eyes down the stem below the terminal flower bud. If these shoots are not inched off at the initial stage, plants become much branched and produce a number of small flowers.

## **5. Defoliation**

Although defoliated plants produced about twice as many shoots as un-defoliated, many of them are blind and the total number of flowers is less. Complete defoliation causes atrophy of almost all flower buds. Removal of only mixture leaves causes about 50% blindness. Removal of only young leaves, however does not cause blindness.

Leaf removal on dormant shoots results in the production of short and nonflowering shoots. Removal of the upper most leaf at the time of pinching results in highly significant increase in flower production. Leaf removal from semi mature shoots is more effective on flower production than from young shoots. Flower quality, is also not reduced by this practice.

## **6. Deflowering**

Removal of faded flowers is called deflowering. If the spent blooms are not removed in time, there is a chance of developing fruit bearing seeds. Once the hips are formed and reach the advance stage of development, growth and flowering are severely reduced during the season. Cutting of faded flowers forces strong laterals which produces a good quality flower.

## **VI. Propagation**

Among propagation methods, budding is most popular in our country because it produces better quality flowers and faster growth of plants. Other methods like, seed propagation, layering, grafting are also important. For more details on budding and grafting refer booklet No.6, "Propagation of Fruit Trees".

### **1. Budding**

Budding is the most popular and successful method for multiplying roses. It provides larger number of plants than cuttings, layering or grafting, as a single shoot of the desired scion furnishes a number of buds for budding. Shield or T- budding is the method ordinarily used. On the selected rootstocks, the buds are inserted into a T-shaped incision and then tied with suitable wrapping material. It takes 3-4 weeks for the buds to unite. The side branches of the stocks are removed which compete with the scion for supply of nutrients and water.

### **2. Grafting**

Inarching or grafting is another method of propagating roses but the cost of a grafted plant in the long run may be higher than that of budded plant. The rootstocks are raised in small pots or polythene bags. The scions are selected and the stocks are brought near the selected scion shoots. The scion shoot should be of medium texture, free from pests and diseases and 1-3 eyes in length. Larger



scions are not recommended. A strip of bark, about 3 cm long with a part of wood, is removed from the stock as well as from the scion, and the latter is attached properly on to the stock and wrapped. After union the scion shoot is cut below the graft and the rootstock above the graft union.

### 3. Layering

This type of vegetative propagation is usually practiced in climbing and rambling roses during the monsoon or early spring season. Layered plants thrive and bloom quite well as budded or grafted plants. This method has two types, ground layering and air layering.

#### a. Ground layering

It is performed by bending shoots to the ground and covering it with soil, leaving the terminal end exposed. A wooden peg or stone and a bamboo stick can be used to hold the bent shoot and exposed shoot in their position. Rooting at nodes usually takes place in a month or so and the layered shoot is detached 15-20 days after root formation.

#### b. Air layering

It consists of removing a ring of bark, about 2.5 cm long, from around the shoot to be rooted and covering it with a rooting medium. The use of damp sphagnum moss around the ringed portion and covering with polythene film have been found beneficial. Application of some root promoting substances may further improve the root formation in air layers.

### 4. Cutting

Propagation of roses by cuttings is normally done to raise stocks for grafting or budding. Climber, Rambler, Polyantha and Miniature roses respond quite well to this method. Although cuttings are almost always prepared from shoots, root cuttings have also been found to form shoots and ultimately a new plant.

#### a. Root-cutting

Some rose species like *Rosa blanda*, *R. nitida* and *R. virginiana* can be propagated by root-cuttings. The cuttings should be taken from young and healthy plants and it is important to maintain polarity when planting. The proximal end (nearest to the crown of the plant) of root piece should always be up. The cuttings should be inserted vertically with the uppermost level of the rooting media.

#### b. Stem-cutting

Raising plants by stem-cuttings is one of the least expensive and easiest method of rose multiplication. Usually, stem cuttings give satisfactory results when rooted during the period from late June to November. Cuttings should normally be taken during the monsoon or spring. Each shoot should be cut clean just below the node and lower leaves removed.

Sand is the best rooting medium but vermiculite or perlite also gives satisfactory results. Addition of peat moss to the sand in proper proportions is useful as it increases the water-holding capacity of the medium. In case of Miniature roses, a mixture of perlite and peat moss in the ratio of 1 : 1 is good for rooting of cuttings. The cuttings are usually planted 3 cm apart in a row and 8 cm between rows and watered as per the need. Within a month or so, roots and shoots will develop from the cutting and in about a fortnight, the plants may be transplanted in another well prepared bed or in pots.

Regeneration of rose plants from cuttings is influenced by various factors such as type of cutting, treatment of cuttings, the age and physiological condition of the stock plant, type of wood selected for cuttings and environmental conditions during rooting. Hardwood cuttings are widely used in the propagation of rose rootstocks. Cultivars of Miniature roses are easily propagated by cuttings of soft-wood or semi- hardwood

under mist. Hardwood cuttings taken from basal and mid portion of the shoot shows much better rooting than those taken from apical cuttings.

### 5. Seed propagation

This method of propagation is generally adopted by breeders for developing new cultivars with desirable characters. When the fruits are fully ripe, they are harvested and thoroughly dried before the extraction of seeds. Most rose seeds when mature are in a resting condition requiring an after-ripening period before germination. Stratification of seeds at 1.6-4.4° C is required after harvest. Stratification for 6 weeks is sufficient for *Rosa multiflora*, *R. rugosa* and *R. hugonis* require 4-6 months, and *R. blanda* requires 10 months. Warm stratification followed by cold stratification has also been found beneficial in *Rosa canina* seeds which requires warm treatment at 26.6°C for 2 months followed by 3 months at 4.4°C for better germination. Hybrid rose seeds usually respond best to a stratification temperature of 1-4.4°C for 69-90 days.

Clean seeds are sown about 5 cm apart in pans or in small plots to raise the seedlings. Soil used for this purpose should be prepared adding a good quality of well rotten farm yard manure. Though the time of sowing mainly depends upon temperature, sowing in the months of October- November is ideal in most of the places. Seeds may take several weeks to germinate. Germination is probably pre-vented in rose seeds by inhibitors occurring in the seed coat, as well as by the mechanical restriction imposed by the massive pericarp. The stage of ripeness is an important factor effecting germination. Temperature is another very important factors influencing the germination. Treatment of seeds with sulphuric acid and for 1-2 hours before sowing was found to improves the germination.

Rose seedlings tend to flower even when they are very small and this exhaust themselves. Therefore, the flower buds should be pinched off as soon as they appear, until the plants are reasonably large and sturdy. It is important to keep the seedlings growing continuously without any check in development. A continuous moisture and nutrient supply, control of weeds and of diseases and pests contribute to successful seedling growth.

### VII. Root Stocks

For grafting or budding, proper selection of rootstock is of immense importance. Rootstocks are known to impart marked effects on the vigorous, precocity, productivity, quality of flowers, longevity of bushes, disease resistance, adaptability to soil climatic conditions etc, and therefore, it is necessary to choose the most suitable rootstocks for budding or grafting roses. The rootstock should have the following qualities.

- i. It should produce fibrous root system.
- ii. It can easily be propagated from cuttings.
- iii. It should have vigorous growth habit, be healthy and resistant to diseases and frost.
- iv. Plants should have uniform growth.
- v. It should have a bark, thick enough to hold the bud firmly and provide sap to the budded plant.
- vi. It should be reasonably free from suckers
- vii. It should support the budded plant for a long time.
- viii. It should withstand a wide range of soils and climatic conditions.
- ix. Some of the commonly used rootstocks are given here.

#### **a. *Rosa barboniana* (Edward rose)**

It is one of the most popular stock and used extensively in the northern plains of India. Plants are hardy, vigorous, propagated easily by cuttings, provide straight stems of suitable length and is found useful for budding standards.

#### **b. *Rosa canina* (Dog rose)**

It is usually propagated by seed since the cuttings do not root easily. However, the seeds are difficult to germinate. The prominent thorns make it difficult to handle. It also tends to produce sucker.

#### **c. *Rosa indica***

This is a large climbing shrub and is used extensively as rootstock for greenhouse forcing roses. It is easily propagated from cuttings and under suitable conditions produces a large symmetrical root system. It is well adapted to both excessively dry or wet soil conditions and can withstand high soil pH. Since it is not cold hardy, it should be used only in areas with mild winters. Plants raised on this rootstock are vigorous and produce flower with longer stems. The rootstock is also quite tolerant to powdery mildew and insect pests. In India, it has been recommended for northern plains.

#### **d. *Rosa laxa***

This is well adapted to rich heavy soils and plants budded on it have vigorous growth. It can be propagated both by seed and cutting and have a very good root system.

#### **e. *Rosa manetti***

This is a very old stock used for propagating dwarf roses and for planting in sandy soils. It is easily propagated from cuttings, produces plants of moderate vigour, and is resistant to some strains of verticillium wilt. This rootstock has, however, proved unsuitable for the production of cut flowers in greenhouse.

#### **f. *Rosa multiflora***

This is a widely used rootstock for outdoor roses. Several strains are available, some giving better bud unions and bud development than others. Cuttings of this species root easily, develop a vigorous, nematode resistant root system, and do not sucker excessively. It is adaptable to a wide range of soil and climatic conditions. In India, it does well in Bihar, Bengal and in the hills when used as rootstocks.

### **VIII. Preparation of Beds**

Preparation of soil is the key to success with roses. It should be rich, porous and well drained. The initial preparation of rose beds should preferably be started during summer season, so that soil gets exposed to sun and air and during the monsoon it gets a chance to settle down before planting. The area selected for rose growing should be cleaned of weeds. According to the plan, the borders of the proposed beds should be properly marked.

If the soil is light, sandy and stony, the top 30 cm of the soil in the bed should be dug up to make trench. The dug up soil is heaped on the ground. The next 30 cm of soil in trench should be dug as deep as possible, and properly pulverized and levelled in the trench itself. After that about half portion of the dug out soil, heaped on the ground surface, should be returned to the trench. This layer needs manuring with organic manure @ 50- 60 tonnes/ha or FYM or compost. The remaining portion of the dug out soil should be returned to the trench. Application of superphosphate @ 30 kg/ha, and Aldrin or BHC (5% dust) @ 100 kg/ha is done, and the beds are irrigated thoroughly.

On the other hand, if the soil is heavy it would be necessary to dig out the second 30 cm layer of the soil and heap on the ground

surface. The next layer of the soil should be deeply dug, pulverized and levelled. The second layer of soil after it is pulverized and sun-dried, should be returned to the trench and manured with organic manure. @ 50 tonnes/ha. The remaining operations will be similar as in the case of sandy soil.

## IX. Cultivation

Planting, pruning, application of manures and fertilizers, irrigation, weed control are some of the cultivation practices that are described here.

### A. Planting

Few important preliminaries for planting are given here.

1. Cut away all immature, dead or diseased shoots and snags. Also as far as possible, each shoot to the next outward growing bud should be cut.
2. Remove all suckers growing below the point of union.
3. Reduce the possibility of loss of moisture, leaves including dried and yellow ones should be removed.
4. If the roses are with shriveled bark, immersing of the plants in water for 24 hours is necessary to plump them.
5. Immerse each plant in a suspension of one gram blitox in one litre of water to lessen the risk of attack of fungi.

At the planting time beds should be thoroughly prepared. At the planting time the soil should neither be too wet nor too dry. At each marked spot, a hole measuring 20-30 cm in diameter and 30 cm deep should be dug, and the plant with earth ball should be lowered into the hole. Then the soil around the plant should be pressed firm to avoid air pockets in the soil. The bed after planting should be thoroughly irrigated.

If the rose plants, are with bare roots, the roots along with stem up to the bud union should be dipped in water for about 6 hours before planting, to restore the loss of moisture during transit period.

Planting should be done with the bud union 2.5 -5.0 cm above the soil level. Roses can be planted any time except in very hot summer and during heavy rains when the soil is very wet. The suitable time for planting roses in most plains of India is during September-October and in the hills it is during October-November or February-March. In general a spacing of 60-75 cm between plants and rows is suggested.

### B. Pruning

Pruning refers to the removal of certain portion of plant. It is an important operation for maintenance of floriferousness and flower quality along with vigour of rose plants. The practice of rose pruning consists of two operations.

- i. Thinning out, i.e. removal of old, weak, dry, twigs and diseased stem and branches from the point of start, and
- ii. Shortening of stems, which aims at cutting down of last years growth to a desirable height.

#### 1. Pruning time

The best time of pruning is the period plant is at dormant or near dormant stage. Pruning time will depend entirely on the climatic conditions of the region. The most usual time for pruning is during October-November after the rains are well over and the cold season is approaching. In Bangalore and around the coastal towns of Madras and Bombay pruning is practised twice in the months of November and June for winter season and monsoon season blooms. Pruning in the hills by the end of March or April.

## 2. Where and how to prune

While pruning a plant a cut has been made at about half- a-centimeter above a vigorous bud and the cut should be slightly slanting, sharp and clean.

All wounds are dressed with cane scaler to protect against attack of fungus and cane boring insects. The cut surface may be painted with fungicide or chaubattia paint( prepared by mixing 4 parts of red lead, 4 parts of copper carbonate, 5 parts of linseed oil, and a small quantity of BHC). Spraying of insecticides like rogor or malathion immediately after pruning.

## 3. Types of pruning

Depending upon the extent and level of shortening, there are 3 types of pruning light, moderate and hard. In light pruning, the healthy shoots, left after thinning of diseased and unwanted portion, are cut. Moderate pruning is done by cutting back the ripe 'main and lateral shoots of the previous years growth at about half the length of the growth. Hard pruning consists of keeping only 3 or 4 shoots of the last year and heading back at about 3 or 4 eyes from the base.

As preliminary to the main pruning operation, all weak, diseased, dead and slender growing and overlapping branches are to be completely removed. In the remaining healthy growing shoots, the amount of pruning largely depends upon cultivar and class of rose, the health and vigour of the plant, space provided for each plant, fertility of soil and the desired flower quality etc. Generally, strong and sturdy plants are pruned lightly moderate growers moderately and weak plants relatively hard. If the soil is sandy, and the nutrient level in the soil is not high, pruning should be light. In case of heavy and fertile soils, pruning may be a little harder. Hard pruning is also advisable to obtain blooms with longer stems.

## 4. Pruning of one-year old plants

Rose plants should never be pruned until they are properly established and adapted to the new environment. In the first year of planting the pruning is done of weak, dead and crowded branches to give a definite shape to the plants. The real pruning starts in the second year of the growth of plants. viz. Hybrid Tea and Floribunda groups.

Climbing and rambling do not require any pruning except the removal of weak, unhealthy, dead and interlaced twigs. The polyanthas are pruned lightly whereas the miniatures are not pruned.

## 5. Pruning of established rose plants

### i. Hybrid teas

The established Hybrid Teas should have all dead, weak, damaged and crossing shoots removed from their point of origin, leaving only 4 or 5 healthy basal shoots. It has been observed that hard pruning, reduces the number of flowers per bush but increases the flower size and the length of stem.

### ii. Floribundas

The main object of pruning roses of this class is the production of abundant flowers with mass effect in the bed. It is necessary to remove the mass of twiggy growth at the ends of the main stems and extra growths should be trimmed. Thus light or moderate pruning is the general recommendation for floribundas.

### iii. Polyanthas

The primary objects of pruning roses of this group are to obtain large number of flowers and to give a good shape to the plant. Thinning of dead, weak and overcrowded shoots and tripping of the end of branches that have already flowered are all that is really necessary.



#### iv. Miniatures

Miniatures roses are generally not pruned except the removal of dead, diseased and overcrowding branches. Some of the older stems may also be pruned to make a well balanced compact bush which is the most desirable character of this class.

#### v. Climbers and ramblers

The hybrid tea climbers hardly need any pruning because it is desirable to promote the growth of the lateral and side branches to bear flowers. The best flowers are produced on the short branches that emerge from older canes. So they require only removal of tips. The climbing Floribunda, Polyanthers and some shrubs of the Hybrid Musk group only bloom in the new wood.

#### vi. Standard

Standards which are generally hybrid teas or floribundas do not need drastic pruning. Growth which comes in the way of its main stem, should be removed to give symmetry to the plant.

#### vii. Shrubs

In general, the majority will not need any pruning but they may be cut back to keep them in shape. The weak and dead shoots should also be removed.

#### viii. Species of roses

Rose species and their allies also need no pruning. Once established and growing strongly, the dead and weak growth of the plants should be removed entirely from the base in the first year itself.

### C. Manuring and fertilization

Rose is a nutrient loving plant and both major and micro nutrients play an Important role for its proper growth.

#### 1. Manures

Organic manures like FYM, oil cakes, bone meal etc. are very essential which supply

plant nutrients and maintains a good soil structure. Green manuring with sunnhemp and dhaincha can also practised. For the light soils, cattle manure and for the heavy soils horse or pig manure are best suited.

##### a. Rate of application

Sandy soils need heavier and more frequent application of organic manure than heavier soils. Application of well decomposed cowdung or FYM @ 8-10 kg/plant (4.5 tonnes/ ha) has been found useful for the growth and flowering of roses.

##### b. Time and method of application

The bulky organic manures in order of preference may be FYM, compost, cow dung slurry from biogas plants, cattle dung and activated sludge. Oil cakes and droppings of poultry, sheep or goat (@ 1 litre/plant) may be used for supplemental manuring. The quantity of these manures is smaller than in the basic manuring. Basic manuring in case of new planting should be done at the time of preparation of rose beds.

Supplementary manuring should be done after the first flush of blooming is over and there is pause for the next flush. The manure should be spread in a band around each rose plant, at least 20-30 cm away from the stem or between the rows of plants.

##### c. Liquid manures

Manures are decomposed in water so that plant nutrients from complex organic forms are converted to simple soluble forms. The liquid when applied to the soil reaches the plant roots directly and provides them with nutrient elements in readily utilizable forms. Excreta of animals and oil cakes after rotting are also used as liquid manure. The diluted liquid becomes lighter than that of tea liquor. The liquid (about 1 litre) is put around each plant, about 20-25 cm away from the stem. The soil should be moist at the time of liquid manuring. The application may be repeated at an interval of 5- 7 days till the flower buds start opening.



## 2. Inorganic fertilizers

For sustained production a plant health it is essential to apply fertilizer to roses. Urea, single superphosphate and both potassium sulphate and muriate of potash are the widely used fertilizers. The most common practice is to apply these fertilizers mixed to the soil in certain proportions, known as fertilizer mixtures. Micronutrients are usually supplied through foliar sprays.

### a. Fertilizer rates

For improving the growth and flowering of roses, some formulae of the mixtures are given here. (by weight)

i) Groundnut cake	-5kg
Bonemeal	-6kg
Ammoniumphosphate	-2 kg
Ammoniumsulphate	-1 kg
Single superphosphate	-2 kg
Potassium sulphate	-1 kg
ii) Nitrate of potash	-6 parts
Ammonium sulphate	2
Superphosphate	-16"
Sulphate of potash	-8"
Magnesium sulphate	-2
Iron phosphate	-1/2

This mixture is applied @ 50-100 g/plant.

### b. Time and method of application

Fertilizers are applied in three split doses and application should be made when there is sufficient moisture in the soil. Normally, the first application of the mixture is given about 15 days after pruning when the new growth has started. After the first flush is over the second does of fertilizer mixture is applied.

The method of application varies according to plant density and size of the plants. If the plant density is low, the requisite quantity of fertilizers mixture can be applied in a continuous band around the plant, 20 -25 cm away from the stem. If the plant population is fairly large, the fertilizer dose should be fixed according to smaller units and placed in continuous band in between the rows of plants, also between the plants and edges of the borders. The applied fertilizers incorporated into the soil but should not be deep.

### c. Liquid fertilizers

A solution prepared by dissolving 0.680 gm KNO<sub>3</sub>, 340 gm ammonium sulphate and 170 gm potassium phosphate in 432 litres of water and applied at the rate of half gallon per plant three times a week for a month and thereafter once a week before slow, produced outstanding blooms suitable for exhibition. Another solution prepared by dissolving ammonium sulphate, 56.6 gm superphosphate and 28.3 gm sulphate in 36 litres of water and applied at 9 litres per plant is also found very useful to improve the quality of flowers.

The advantage of this method is that the nutrients in solution reach the plant roots immediately for utilization. The disadvantages are the extra cost of application, the risk of toxicity and fixation of phosphates to soil, rendering it unavailable to plants. As a regular feeding of rose plants this practice seems unnecessary.

### d. Foliar feeding

This is an excellent supplement to root feeding because the leaves can directly absorb the nutrients. At minimizes the amounts of fertilizer mixture used. The concentration of solution should not be very high (not more than 0.3%) it damages the leaves.

For supply of macronutrients, the composition of the spray solution should be 7 gm of potassium sulphate, 14 gm ammonium sulphate, 28.3 gm potassium nitrate in 36 litres of water and is applied @ 1.36 g/litre. Good results can also be obtained by using ammonium phosphate and potassium nitrate in equal proportions by weight, and applying the mixture @ 2.5 g/litre of water.

In case of micronutrient deficiency foliar application of a solution prepared from the mixture containing 15g manganese sulphate, 20 g magnesium sulphate, 109 chelated iron I and 5g borax @ 2g/litre has been found very effective for obtaining brighter colour in flowers and foliage.

e. Combination of organic and inorganic manures

A pot mixture of 14 kg castor-cake, 9.5 kg finely powdered charcoal, 226 gm super phosphate, 113.2 gm carbonate of potash, 113.2 gm nitrate of soda, 283 gm leaf mould and 45.5 kg loamy soil is helpful for obtaining increased yield of flowers.

### D. Irrigation

Adequate soil moisture at all stages of vegetative growth and flowering is essential for the rose plants to meet the water loss through transplantation and evaporation from soil. Water requirement also depends upon the size of the plant and the growth period.

In lighter soil more frequent irrigation is required than that in heavy soil. Rose beds can be watered once a week or 10 days in winter and twice a week during summer season.

### E. Mulching

Mulching conserve soil moisture, supply humus making material and suppress weeds resulting in improved growth and flowering. Mulches also keep the soil some what cooler in summer.

Among the substances used for mulching, well rotten garden compost, FYM, Peat, straw sawdust, ground or whole corn cobs and other similar materials make satisfactory mulches. Mulches can be applied soon after the newly benched plants are established and growing satisfactorily.

### F. Hoeing

Light hoeing is a very effective way to keep the soil porous so that light, air and water may reach the roots better to improve moisture retention capacity and to keep rose beds free from weeds. Roses are shallow rooted plants and roots of established plants tend to grow near the surface. Therefore, shallow hoeing is preferred.

### G. Weed control

Weeds pose a very serious problem in rose cultivation as they not only consume water and nutrients from the soil, but also act as hosts for a number of diseases and pests. Manual weed control is effective if done frequently. Chemical weed control is comparatively economical, convenient and efficient in eradicating weeds. Application of CMU and DCMU four to five weeks after planting in late December and early January controls all weeds, in a rose nursery.

## X. Diseases and Pests

Major diseases and pests on rose are given here.

### A. Diseases

Like any other crop, roses are also prone to many diseases, some of which have been found to be very destructive. The most important diseases and the measures for their control are described here.

#### 1. Die-back

The causal organism is a fungus namely *Diplodia rosarum*. The disease causes death of the plant from top to downwards.

When plants are pruned, sometimes, blackening of twigs starts below the pruned surface which extends further down, killing the whole plant. The older plants are more prone to the attack of the disease.

#### Control

- a. Cut the affected parts and burn it.
- b. The secateur should be disinfected with spirit and the cut ends immediately coated with a paste containing 4 parts of copper carbonate, 4 parts of red lead, and 5 parts of linseed oil.
- c. Add 0.1 % BHC to the paste to check the digger wasp attack.
- d. Grow resistant varieties like white Christmas, royal ascot, blue moon and crimson glory .

### 2. Black spot

This disease is caused by *Diplocarpon rosae* characterized by dark brown, circular spots with fringe borders, present on both sides of leaflets. At a later stage, the leaves becomes yellow and fall. If left uncontrolled, the whole stem is defoliated and the plant becomes weak. Leaf buds and the flower buds are also affected.

#### Control

Since the black spot fungus is located under the protecting cuticle, no fungicide can kill it without destroying the leaf. Hence, cure of this disease is difficult and prevention seems to be the only hope. The infected leaves, as soon as they are observed should be clipped off, taken out of field and burnt. Preventive sprays of fungicides like Zineb reduce the damage to a large extent. Martin Frobrisher, Belaya , John Cabot, and Carefree Beauty are also found to be resistant to black spot disease.

### 3. Rose wilt

It is a viral disease caused by *Marmor flaccumfascines*. The first symptom appears in the form of recurving of leaflets at the tip

of young shoots which are brittle. Defoliation may happen, with leaves turning yellow and falling off. The stem also gets infected and the whole plant dies. In epidemic form, one infected plant could ruin the whole garden within a couple of years.

#### Control

Control of aphids, which transmit the disease, helps to control the infection. The affected plants should be removed and burnt.

### 4. Rose mosaic virus

Chlorotic areas along the midribs of the leaflets and localized distortion are the principal symptoms. Sometimes one finds ring and watermark pattern. Another strain of this virus causes brighter and light yellow patterns.

#### Control

Diseased plants should be destroyed and never used for propagation.

## B. Pests

Roses attract a large number of pests which cause considerable damage. At almost every stage, be in the nursery or in beds, rose plants are prone to attack by various pests. Some of the commonly reported insects and other pests attacking roses are mentioned in detail here.

### 1. White ants

White ants also known as termites cause damage to rose plants even before they are established. Small colonies are formed inside the soil and the insects multiply very rapidly during the rainy season. The insects destroy the underground parts including the roots of the young as well as old plants. Sometimes rose plants wither.

#### Control

Apply .5% BHC or Aldrin in the pits before planting roses. Drenching of rose beds with Aldrin also controls the damage in established gardens.

## 2. Red scales

They infest roses in the green house and in the garden and the affected branches become dry. The insects can easily be detected by the reddish brown encrustations on the lower portion of old stem and at times the younger shoots also which sucks the plant sap.

### Control

The menace can be removed by rubbing the scurfy encrustations with a used tooth brush, or a cotton swab dipped in methylated spirit. Spraying the affected plants with insecticides like malathion or rogor will control the insect. Application of granular insecticides like carbofuron at 1.5 kg a.i./ha and Disulfoton and Phorate at 3.0 kg a.i. /ha also gives good control of rose scales.

## 3. Jassids (Leaf hopper)

These are very small, light grey or pale green insects which suck the cell sap from the leaves. It causes yellowing or whitening of the attacked surface, giving the plants a sickly appearance.

### Control

Jassids can easily be controlled by spraying with 0.03% parathion, 0.1% Metacid or 8% Thimet as soil application. The use of 0.05% Monocrotophos is also effective in controlling jassids.

## 4. Red spider mite

As result of their feeding, white specks appear on the leaves and these specks coalesce and appear as white patches. Ultimately, affected leaves become mottled, turn yellow and fall. Some polyantha and floribunda roses completely lose their leaves prematurely due to the attack of this pest. The damage is more pronounced during warm and dry season.

### Control

Frequent spray with sulphur helps to control this mite. Several mite-killers such as

kelthane morestan, dimite, Tedion have been reported to be very effective in controlling rose mites, 1 ml of kelthane is thoroughly mixed with 10 m of water with 10-15 drops of any sticker and application of this chemical every 5 or 6 days may be sufficient to control the mites. Spraying the affected plants with 0.05% parathion or 0.1 % Metasystox is also suggested.

## XI. Harvesting and Post-harvest Handling

Time and stage of harvesting, storing and transportation of the flowers are the important aspects to be considered.

### A. Harvesting

The stage at which flowers should be cut, either for decoration or for despatch, is the tight-bud stage when the buds show full colour but the petals have not yet started unfolding. If harvested at this stage, they last longer and retain colour and freshness during transportation. If a flower bud of red cultivar cut at a little earlier stage it fails to open later. Pink and red cultivars should be allowed to develop to a stage where one or two of the outer petals begin to unfurl. Loose flowers, used for making garlands, preparing perfumes etc. are harvested only when they are fully open and collected in large open baskets.

The flowers should be cut in the early morning before sunrise or late in the afternoon when the sun is about to set as to avoid damage of buds due to high temperature during the day. Late harvest results in short vase life of cut flowers and low oil content in loose flowers used for preparing perfumes. For cut flowers, stem with two, five leaflet leaves should be cut and immediately dipped into clean water up to the base of the flower buds. The delay in keeping the flowers in a bucket of water will cause air entry and result in vascular blockage. The stems should be cut in water

about 2 cm above the previous cut end. If they are not required for immediate use, the cut-flowers along with stems dipped in water in the bucket should be stored at a cool air temperature of 4.4 -7.2 C for about 6-12 hours to harden the buds and thus enhances their keeping quality. During winter (December-January) a shorter treatment for 6-8 hours is sufficient while a longer duration of 8-12 hours is required in March-April.

### **B. Packaging**

The cut blooms are graded according to the length of stem and then packed in corrugated card-board boxes. The size of box varies with the quality and quantity of roses to be packed. The inside area of the box will be cushioned with polythene or soft materials. The blooms are generally packed in bundles. The upper half of each bundle having flower buds is wrapped in a corrugated paper which is fixed with an adhesive tape. Labeled flower bundles are placed opposite to another in such a way that their flower buds face the sides of the box and their stem ends towards the centre of the box. The inside of the box is finally covered with a sheet of tissue paper before putting on the cover of the box. Along the outer edges of the box, adhesive tapes can be fixed to close it.

### **C. Yield**

The yield of cut-flower depends on a number of factors such as type of cultivar, and cultural practices adopted from time to time. Gold strike and pink garnette, are high yielding cultivars which produces 24-28 flowers per plant. Sonora and Coral princess give low yields (15 flowers per plant per years) of 60% grade. Plant density has much influence on the yield of quality blooms per unit area. About 1,20, 000 cut flowers of exportable quality from an area of one hectare is obtained by close planting and providing plastic cover over the plants during November-February. In an essential oil-bearing rose, a yield of 6977

kg petals per hectare was recorded when planting was done at 2.5 x 0.5 cm apart. One of the best methods for maximization in yield and quality of flower is through balanced application of fertilizers.

## **XII. Importance and Uses**

The rose, because of its utility, occupies a pre-eminent, place amongst the flower crops and is one of the oldest of fragrant flowers to be cultivated by man. Its different types having beautiful flowers of exquisite shape, different sizes, bewitching colours and most delightful fragrance has made it an important flower or its varied uses. The various ways in which rose can be used are mentioned in detail here.

### **A. Exhibition and decorative purposes**

Varieties of roses which are most suitable to a particular type of decoration are given here.

#### **1. Shrub or bush**

Shrub or bush roses are planted in small groups at a height of 5-10cm from the ground level to create excellent mass effect in a rose or flower garden. They may also be mixed with other plants in a shrubbery, e.g. christian, midele double delight, first prize, gladiator, kiss of fire, midle meilland, montezuma, paradise, peace and super star.

#### **2. Standard Rose**

Standard rose or tree rose, is a very important feature in the rose garden. They are allowed to form buds only at the top leaving the entire stem clear of any vegetative growth. According to their height of budding they may be full standard (1.0 -1.5 metres high), half standards (45-60 cm high) or weeping standard (1.6 5m or higher above the ground). Hybrid Teas and few grandiflora are suitable for making the frill standard roses. Floribunda and Polyantha roses are excellent for growing as half standards. For weeping



standards, climbing and rambling roses are used as the long branches of the crown may be allowed to hang down.

### **3. Climbers**

The climbing and rambling roses can be used to cover the walls of houses or fencing or pergolas, arbours and arches. Ramblers produce flowers only once in a year and flowers are in clusters lasting for several weeks. The beautiful climbers and Ramblers like America pillar, Blaze, Delhi Pink Pearl, Don Juan, Golden showers, Lamargue, Mardan white, Mardan Pink, Marechal Neil, royal gold add to the beauty of the garden.

### **4. Hedges and edges**

A rose can also be used for making hedge or edge. Rose hedges except when pruned, remain full of life and colour and give protection due to the presence of thorns. Vigorous Floribundas are suitable for hedge and if necessary the plants can be planted in two rows. Some suitable cultivars are Border coral, Circus, Frensham and Runiba, Climbing or rambling roses may also be used for making tall hedges. Rose cultivars like coral in, Lady Reading, Magic, white Button etc. may be used for making edges.

### **5. Rockery**

Roses may also be grown in rockeries and for this purpose hardy miniature and pompon cultivars such as Fairy Queen and Magic may be selected.

### **6. Pot plants**

Roses can be easily grown as pot plants in suitable containers kept both indoors as well as outdoors. For balconies and terraces which receive limited sunlight miniatures and dwarf polyanthas should be selected. The cultivars like Baby Darling, Cinderella, Starina etc. are quite suitable for this purpose. Bush roses may also be grown in pots for beautifying the compounds around the building and for display in rose shows.

## **7. Hangers**

Miniatures can also be grown in hanging baskets and cultivars suitable for making rose hangers are climbing Miniatures-Red cascade and Yellow Doll.

### **B. Cut-flowers**

Apart from making garlands, bouquets, button-holes their use for worship in temples, rose makes one of the best cutflowers and as such is in great demand in the internal as well as foreign markets. Germany is the biggest consumer and importer of cut-flowers. Rose cut-flowers are being exported from Maharashtra (India) to the Middle East countries.

Rose cut-flowers arranged in flower vases look extremely beautiful and they have a rightful place in the scheme of interior decoration. In general, cultivars with more petalage and opening slowly with long lasting quality are chosen as cut flowers. Some of the cultivars suitable for this purpose are Christian Dior, Happiness, Montezuma, Queen Elizabeth, Sea pearl and Super star. Presently cvs. Belinda, Golden Times, Illona, Laminette, Montreal, Mercedes, Red Success, Sonia Meiland are in great demand as cut-flower in foreign markets. Two Indian or Arjuna and Raktagandha producing flowers with long stems are also suitable for cut-flowers.

### **C. Perfume and allied products**

Oils, perfumes and other products made from rose petals are of superior quality.

#### **I. Rose oil (Rose perfume)**

Rose oil is an important commercial product obtained from rose petals. Apart from sweet fragrance it has medicinal value and is often used in Ayurveda. Bulgarian rose is largely used in perfuming soaps and cosmetics. Limited quantities of the oil are used in flavouring soft drinks and alcoholic liquors.



Rose oil has antibacterial property. The commonly grown rose species for rose oil are *Rosa damascena*, *R. borbonians*, *R. centifolia*, *R. alba* and *R. Gallica*. In India, *R. damascena* and *R. borbourniane* are cultivated for rose oil.

Though France, Cyprus, Greece, India, Iran, Italy, Morocco and the USA are important countries producing roseoil, Bulgaria is a major producer and exporter of the roses and the rose perfumery .The oil is extracted by steam distillation and its quality depends much and cultivars and stage of picking. Generally 1 Kg oil is obtained from 3,000-4,000 kg petals. Among the different species, *R. Damascena* gives the maximum oil yield. *R. borboniana* and *R. teptiz* are also good. The principal constituents of normal rose oil are l-citronellol (40-65%), Geraniol, neroll-linalool, phenyl ethyl alcohol, small quantities of esters, nonyl aldehyde, citral, engenol sesquiter penes and the vaxy constituent stearoptene.

To obtain good quality rose oil, the flowers are to be harvested early in the morning, as the percentage of volatile oil decreases with the advancing day.

## 2. Rose water

Rose water is also an important commercial product obtained from rose petals. It is used as a perfume and in medicines and confectionary. It has the property of cooling the body and is often used in eye lotion and eye drops for its soothing qualities. It is also used in drinking water and social occasions. The roses used for preparing oil are also used for making rose water.

## 3. Gulkand

Rose petals are also preserved for direct consumption by making gulkand which is prepared by pounding equal proportions of

petals and white sugar. It is considered both a tonic and laxative. *Rose damascena*, *R. chinem's.*, *R. Gallica*, *R. ponifera* and some other scented roses. e.g. Edouard are used for preparing gulkand.

## 4. Pankhuri

Dried rose petals are known as 'pankhuri' which is occasionally used for preparing sweetened cold drinks.

## 5. Gul-roghan

It is a rose hair oil prepared from rose petals by enflurage with wet sesamum seeds.

## D. Source of vitamins

Rose hips are a very good source of ascorbic acid, i.e. vitamin C. Every 100g of rose hips syrup contains 150 mg of ascorbic acid as compared with only 50 mg present in fresh orange juice, 20 mg in tomatoes and 5 mg in apples. The ascorbic acid content, however, varies with species and some of the promising vitamin C bearing species are *R. rugosa*, *R. ambhyotis*, *R. aciculari*, *R. davaricas*, *R. pendulina*, *R. glauca* and *R. canina*. Apart from Vitamin C, the hips of *R. roxburghil*, *R. acicularis*, *R. rugosa*, *R. davurica* and some of the species are found to contain vitamins, A, B2, K and E.

## E. Other Uses

In Europe, roses are used for making pot-pouri, conserves, rose vinegar and rose petal wine. Jams, jellies and syrups have been made for centuries in Bulgaria and exported. Rose aids in digestion and has certain curative properties. In Czechoslovakia, fruits of wild roses are used for preparing a hot drink like tea and a popular wine. In America, bushes of *R. multiflora* are utilized as shock absorber or crash barrier.



Hybrid tea Black tea Brownish red



HT rose Hotel california Yellow



HT rose scandia Mauveblend



HT rose sweet water Salmon orange



HT rose sungodess Golden



HT rose scentsation Peach blend



Hybrid tea White arrow White



Hybrid tea Kanchan Yellow



Hybrid tea Norma Red



Hybrid tea Majestic Pink



Hybrid tea Maria shriver White



HT Rose Mother of pearl Pink with apricot



HT Rose Marcel pagnol Red



HT Rose Hot romance Orange blend



HT Rose Elvis White



HT rose Shanghai autumn Yellow blend



HT rose Sweet promise salmon orange



HT rose Delicate beauty White



HT Rose Ashwini Blackish crimson



HT rose dream come true Bicolour



HT Rose Celebration day Pink blend



HT Rose Espresso Chocolate vermilio



HT Rose lco delight sport White



HT Rose Rose osaca Deep red



HT Rose Ksg manas Salmon yellow blend



HT Rose Lily the pink Pink



HT Rose Reba mcintire Deep Orange



HT Rose Fire and ice Bicolour



HT Rose Janice Kellog Red



HT Rose Blue time Mouve





Floribunda cream abundance Creamy pink



Floribunda Lavaglut Blackish red



Floribunda bewitched Fuchsia pink



Floribunda living fire Bicolour



Floribunda raven Red



Floribunda deep purple Deep lavender



Floribunda remembrance Scarlet



Floribunda Harkness marigold Peach blend



Floribunda Clara Silvery white



Floribunda Home & Garden Pink



Floribunda Gebruder grimm Bicolour



Floribunda Irene Apricot blend



Floribunda Embrsement Scarlet crimson



Floribunda Autumn spray multi colour



Floribunda For your with love Orange vermillion



Floribunda Roserarses de chatlet Pink



Floribunda Red hot Red



Floribunda Ebbtide Purple



Floribunda Cubana Brilliant apricot



Floribunda Love struck Pink



Floribunda Neon Multi colour



Floribunda Red Finess Red



Floribunda Profumo Rosso Red



Floribunda Gisella Coral pink



Floribunda Fairy White White



Floribunda Bad Worishofen Rosepink



Floribunda Bad brambach Pink



Floribunda Careless Beauty Pink



Floribunda Silvina Donvito Yellow blend



Floribunda Golden memories Yellow





Miniature Phoenix  
Bright red



Miniature Candy  
free Pink



Miniature yellow  
fairy Yellow



Miniature Baby  
love Yellow



Miniature Lupo  
Bright pink



Miniature  
Petitefolie  
Vermillion Orange



Miniature Incognito  
Lavender gold



Miniature Red  
beauty Dark red



Miniature Red fairy  
Scarlet red



Miniature Magic  
carrousal White &  
pink



Miniature Spray  
delight Scarlet



Miniature Choo  
Choo Soft pink



Miniature Libby  
White & pink



Miniature Wild  
plum Lavender



Miniature Flower  
power gold Yellow



Miniature George  
best Red



Miniature Janna  
sport Bright pink



Miniature Pink puff  
Pink



Miniature Cindy  
Carmine pink



Miniature Ice fairy  
Ice white



Miniature Sanjit  
Pink



Miniature Hot &  
howler



Miniature Happy  
trail Bright pink



Miniature Tear  
drops White



Miniature Hula girl  
Orange



Miniature Don don  
Red



Miniature Careless  
moment Bicolour



Miniature Blue  
blood Red



Miniature Orange  
flame Orange



Miniature Over the  
rainbow Pink blend

# CHAPTER - 15

## LAWNS

### Some facts about Lawns:

Lawns and yards transform strangers into neighbors, neighbors into neighborhoods, and neighborhoods into communities.

Rainfall, Erosion and Recharge:

- Lawns are ten times better at soaking up rainfall than crop farms, they serve as rainwater harvesting pits.
- Grass is exceptionally good at preventing erosion. Rain will remove up to 2200% more top soil from bare earth than from a lawn. Properties of Grass:
- Grass is the only plant which responds to severe cutting with increased growth.

### Cleaning up pollutants:

- The microorganisms in a turf grass/soil ecosystem can clean up petroleum products, metals such as lead, copper, zinc, and cadmium, and a variety of organic chemicals, including pesticides.
- An acre of grass will absorb hundreds of pounds of sulfur dioxide every year.
- Lawn grass can be used as the last step for treating domestic wastewater.

### The Lawn Ecosystem:

- A turf grass ecosystem the size of a football field can support up to 13 lakhs earthworms.
- Grass enriches the soil by adding over 2600 kgs of organic matter each year to an area the size of a football field.

### Watering:

- Lawns require less water than shrubs or trees.

- Excessive usage rates for watering are a people problem, not a plant problem.
- Restrictions on watering and irrigation during local drought conditions can save potentially significant amounts of municipal water with no lasting harm to lawns that are allowed to go dormant. But the restrictions have to be done right.

### Lawns & the Environment:

- A 50' x 50' square of healthy lawn supplies enough oxygen for a family of four.
- More and more homeowners are leaving grass clippings on the lawn where they belong and where microorganisms can recycle the nutrients.
- Lawn pesticides are not harming the environment. Lawn fertilizers properly applied at the right times will stay in the lawn. They will not be washed away by rain or leached down into the subsoil.
- They stay where they are applied, and they are broken down into benign components in short periods of time. They do not accumulate. Where traces are found, they are in harmlessly low concentrations of a few parts per billion.

### Lawns & Health:

- Regularly mowed lawns will produce a minimum of pollen and look green all around the year.
- Nothing beats turf for safety and comfort on play areas of children and recreational areas.
- Majority of the gardeners who do all or part of their own yard work; consider it a healthy physical and mental exercise.

- A well-tended lawn and garden will harbor fewer snakes, rodents, mosquitoes, ticks etc. than untended areas.
- 60% of the garden lovers say that the primary benefit of their avocation is peacefulness and tranquility.
- Horticultural therapy is a recognized therapeutic tool.

### The Economics of Lawns:

- Homeowners say a well-maintained lawn can add 15% to the selling price of a home. Appraisers estimate that attractive landscap-ing adds at least 7% to the appraised value of residential property.

### Grass & Lawns:

S. No.	Name	Common Name
1.	Cynadon dactylon.Sp	Bermuda Grass
2.	Cynodon dactylon.Sp	Calcutta Doob Grass
3.	Festuca.Sp	Fescue Grass
4.	Paspalum notatum	Buffalo Grass
5.	Poa prapensis	Kentucky Blue Grass
6.	Stenotaphrum secundatum	St. Augustine Grass
7.	Stenotaphrum secundatum Ver	St. Augustine Variegated
8.	Zoysia japonica	Jade Velvet Grass
9.	Zoyasia matarella	Korean Carpet Grass
10.	Zoysia teunifolia	Mexican Grass

### Lawns:

1. Turfed lawns give instant garden effect. Even the dibbled lawns take good shape within 2-3 months time.

2. Lawns prevent dust rising and avoids slushiness during rains, and provide good pavement effect.
3. Walking bare footed on lawns gives best satisfaction and health.
4. Will act as backdrop for other garden features like flower beds, edges, shrub, ground covers.
5. Lawns are the best permanent ground covers.
6. Lawns provide excellent sit out place for the family and small gatherings.
7. It is cool and refreshing in summer. It is pleasant and relaxing in winter.
8. For children lawns provide an excellent space for playing.
9. Any home garden is incomplete without a lawn, smaller or bigger.

### Tips for Lawn Laying:

1. Dig out the soil for 16" depth.
2. Pick out weeds, stones, Bricks etc.,
3. Give required shape as gentle slope, terraces, mounds etc.,
4. Spread 4"-6" thickness of weed free red soil, break clods.
5. Wet the land and if there are any shrinkages cover with extra red soil.
6. Turfing or dibbling of selected lawn species such as Calcutta doob, Fescue, Burmuda varieties like Sun bird, transcontinenta I, Mexican or Korean Carpet etc.,
7. Immediately after dibbling sprinkle water, followed by regular daily watering.
8. Rolling of lawn may be done for better set.
9. Application of neem cake, urea, vermi-compost and water whenever lawn become pale green or sickly.
10. Periodic lawn mowing and spraying. (Mow Fescue or Burmuda grasses every 15 days and carpet grass every 60 days).



## Turf Varieties



### Hybrid Bermuda Selection 1 (*Cynodon Dactylon*)

Fast growing soft variety, suitable for well drained areas with moderate rainfall. Easy to mow, suitable for very large areas. Repairs itself quickly from damage. Suitable for sports fields, party lawns and public parks. Requires frequent mowing to be kept in top condition.



### Korean (*Zoysia Matrella*)

Slow growing dense grass, slightly shade tolerant, requiring infrequent mowing at a level of 1". Useful for small areas, semi-shaded, slightly coarse and a little prickly. Mowing this variety is comparatively difficult.



### Paspalum (*Paspalum Notatum*)

Suitable for all areas including very heavy rainfall and large lawns. Tolerant to shade & temporary submergence. Grows aggressively over-running weeds.



### St. Augustine Green (*Stenotaphrum Secundatum*)

Dark green dense grass, broad flat blades, commonly known as "runners". Used best as ground cover, underneath trees. Tolerates heavy rainfall, most suitable to resolve a difficult situation where grass cannot be put due to shade.





## Turf Varieties



### Centipede (*Eremochloa Ophiuroides*)

Warm-season dense, grass medium to coarse textured grass blade, requires low fertilization & maintenance. Excellent growth in humid climates, withstands water submergence. Ideal for usage in areas with heavy rainfall and humid climates such as the coastal regions.



## Turf Selection Guide

Variety	Color	Texture	Shade Tolerance	Maintenance	Ideal For
Hybrid Bermuda Selection 1	Dark Green 	Very fine and soft	4	Moderate to high	Sports Fields, party lawns, sunny areas of heavy usage
Korean (Zoysia Matrella)	Leaf Green 	Medium coarse, little prickly	6	Moderate	Small areas, light use, semi-shade
Paspalum Notatum	Emerald Green 	Medium coarse	8	Low	Landscape, ground cover, soil conservation, shaded areas
St. Augustine Green	Dark Green 	Semi-coarse	9	Moderate	Landscape, ground cover, soil conservation, shaded areas
Centipede	Medium Green 	Medium coarse	4	Lowest	Heavy rains, humid climate, coastal areas

\*The color reflected above is indicative. The actual grass color may vary depending on soil, fertilizer & climatic conditions.

# CHAPTER - 16

## CHRYSANTHEMUM

Chrysanthemum is next only to rose in importance among the flowers in the world. it is versatile, can be planted in the bed, cultured in the pot, used for garland - making and also as cut flower for flower arrangement.

### Chrysanthemum Blooms are Two Types

- a. Disc-floret situated, in the center, tubular with five united petals. They are usually shorter and contain both male and female reproductive parts; they are called perfect flowers
- b. Ray-floret which surround the disc-florets and are comparatively longer, vary in shape, colour and direction of growth. The ray-florets are called imperfect flowers as they contain only the female reproductive parts.

### Growing Requirements of Chrysanthemum

Chrysanthemum plants are easiest of all perennials to grow

1. Produce large number of flowers if they are planted / placed in full sunshine. They respond to plenty of food and moisture
2. There are hundreds of varieties of Chrysanthemums, Giving you a multitude of options for height, colour, flower size and time of bloom. You can pick and choose to fit your wants and needs when you visit the Nursery.
3. They should be planted into well prepared, fertile, sandy media, they resent 'WET FOOT'.

### Cultivation

1. Chrysanthemum plants have a fibrous root system which is sensitive to waterlogging. prone to attack by diseases and pests, but, fairly tolerant to drought.
2. Ideal soil mixture pH to be 6.2-6.7 is required.
3. Light. Chrysanthemum plants continue to grow vegetatively till the nights are shorter than critical level (9 1/2 hr for most traditium 'l varieties.)
4. Temperature : The growth rate in chrysanthemum remains at low level at or below 100C. As the temperature is raised to 150 C the growth rate increases rapidly.

### Cultural Practices

1. Propagation Age-old method of propagation from suckers, it is easy to establish and almost no mortality and easy take-off due to already persistent roots. However cuttings also root well
2. Feeding : In early stages supply nitrogen using only organic manures. Phosphorus is best applied as basal dressing since it is released slowly. Proportion of Potassium should be increased as the flower buds appear.
3. Water management : The frequency of watering depends on the stage of growth, soil and weather conditions. Avoid water logging during the rainy season. Potted plants are either provided temporary shelter or kept in horizontal position during the constant downpour.

4. Nipping of growing tips encourages multiple branching and results better plant shape and more flowers.

## Plant Protection

### Pests

1. Aphids and Thrips (Sucking pests) : Spraying of mild insecticides like tobacco leaf decoction or malathion 2ml / liter of water is effective against them.
2. Red spider mite : Spraying with Metasystox or Kelthane 2ml/liter of water controls the pest
3. Hairy caterpillar (*Diacrsia obliqua*) : Manual collection in mild attacks and spray of Ekalux 2ml/litre of water at weekly intervals in heavy infestation.
4. Grub (*Holotrichia*) : Soil application of Carbofuran 3G 10gms/cubic feet of soil in the pot.

### Diseases

1. Root rot (caused by *Pythium* spp. or *Rhizoctonia* sp.) : Use sterilized medium, and treatment of cuttings and the medium with Thiram and Captan effectively control it

2. Leaf spot (caused by *Septoria Chrysanthemella*) : Greyish brown spots appear on leaves which turn yellow and ultimately die. The disease spreads from below upwards. It can be controlled by Bavistin 1gms or Dithane M-45 3gms/litre of water
3. Wilt (caused by *Verticillium*) : The leaves turn yellow to grey and the branch or whole plant gradually. The use of disease-free planting material and planting in sterilized medium prevent the infection.
4. Stunt (caused by stunt virus) : Spreads by mechanical means through cutting knife or secateur resulting in the overall dwarfing, paleness in leaf colour and the appearance of small yellow green dots in summer in some varieties.
5. A spermy (caused by aspermy virus) : This virus is transmitted by aphids and results in distortion of flower and reduction in flower size with florets becoming wavy. Heat therapy considerably reduces the incidence and consists of keeping the plant at 40°C for 2 hours and also control of sucking pests



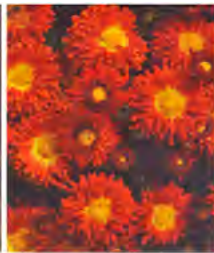








Aloha



Aztec gold



Candy stripe



Cancun



Courtade



Dean conklin



DWF deciduous



Elena



Engle wood



Mother theresa



Neelima



Pink cloud



Purnima



Purnima white



Pusa anmol



Shanti



Shanti



Shukla



Swetasagar



Tata century



Texas gold



Vasastica



Vasnilika-B



Vijay



Vijay karan



White bouquet



White prolific



White star



Yellow gold



Yellow reflex



## CHAPTER - 17

### RARE TREES IN CPWD LOCATIONS



Maha Bodhi Tree at Budha  
Jayanti Park

#### 1. Maha Bodhi Tree (*Ficus religiosa*)

A Bal – Boudh Tree was planted in the Budha Jayanti Park by then Prime Minister Shri. Lal Bahadur Shastri on 25.10.1964, which was presented by Her Highness Sri Mao Bhandar Nayake the then Prime Minister of Sri Lanka. A sapling was planted in this park which was taken from the Holy Bodhi Tree in Sri Lanka. It was during the 3<sup>rd</sup> century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love

and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

A small temple beneath the Bodhi tree, Bodh Gaya, built in 7<sup>th</sup> century, after the original built by King Ashoka in 3<sup>rd</sup> century BCE, c. 1810 The spot was used as a shrine even in the lifetime of the Buddha. King Asoka was most diligent in paying homage to the Bodhi tree, and held a festival every year in its honour in the month of Kattika. His queen, Tissarakkhā was jealous of the Tree, and three years after she became queen (i.e., in the nineteenth year of Asoka's reign), she caused the tree to be killed by means of mandu thorns. The tree, however, grew again, and a great

monastery was attached to the Bodhimanda called the Bodhimanda Vihara. Among those present at the foundation of the Mahā Thūpa

are mentioned thirty thousand monks from the Bodhimanda Vihara, led by Cittagutta.



## 2. Makhan Katori (*Ficus kishnae*)

A small tree with folded leaves joined at the base which appear like containers of ice-cream (kulphis). The legend is that Krishna used to store butter in the leaves.

Propagated from seed, as a curiosity, it should be grown in all public parks and gardens. *Ficus Krishnae* Tree, or Krishna Fig Tree, is known as Makhan Katori or Krishna Badh in local languages. The leaf of the tree is in the shape of a cup – Krishna's Butter Cup. There is an interesting story which narrates how the leaves of the tree got the

shape of a leaf. It is said that in the beginning, the leaves of Krishna Fig tree were straight and it did not have the cup shape. A naughty episode of Krishna was responsible for the leaves taking cup shape. The "Sacred fig tree" probably a form of *benghalensis*, small tree sacred to the Hindu god Krishna, said to have folded its leaves into cups to leathery, irregularly cupped, deep green leaves with raised ivory ribs, finely pubescent inside, on grayish branches. Very interesting collection plant because of its curious leaves.





Kalapvriksha at  
Budha Jayanti Park

### 3. Kalapvriksh (*Adansonia digitata*)

A genus of eight species of tree, six native to Madagascar, one native to mainland Africa and the Arabian Peninsula and one to Australia. The mainland African species also occurs on Madagascar, but it is not a native of that island, and was introduced in ancient times to south Asia and during the colonial era to the Caribbean. A ninth species was identified in 2012, incorporating upland populations of southern and eastern Africa. A typical common name is baobab. Other common names include boob, boaboa, tabaldi, bottle tree, upside-down tree, and monkey bread tree. The generic name honours Michel Adanson, the French naturalist and explorer who described *Adansonia digitata*. *Adansonia*s reach heights of 5 to 30 m (16 to 98 ft) and have trunk diameters of 7 to 11 m (23 to 36 ft). Glencoe baobab – an African baobab specimen in Limpopo



Kalapvriksha at Raj Ghat

Province, South Africa, often considered the largest example alive – up to recent times had a circumference of 47 m (154 ft). Its diameter is estimated at about 15.9 m (52 ft). Recently the tree split up into two parts and it is possible that the stoutest tree now is Sunland baobab, also in South Africa. The diameter of this tree is 10.64 m (34.9 ft), with an approximate circumference of 33.4 m (110 ft). Some baobabs are reputed to be many thousands of years old, which is difficult to verify, as the wood does not produce annual growth rings, though radiocarbon dating may be able to provide age data.



Terminalia Bellirica at Budha Jayanti Park

#### 4. Baheda (*Terminalia bellirica*)

Baheda is a large deciduous tree found throughout India, in areas up to an altitude of 1,000 meters. The tree takes a height of 30 meters, while the bark is brownish grey in color. The alternate, broadly elliptic leaves are clustered towards the end of the branches. They are 10 to 12 cm in length and 7 to 14 cm in breadth. The simple, solitary flowers are in auxiliary spikes, with offensive odor. They blossom in the month of May. The fruits are ovoid grey drupes and the kernels are sweet, but narcotic. The tree is found in abundance in Madhya Pradesh, Uttar Pradesh, Punjab and Maharashtra. It is known as vibhitaki, karshaphala and kalidruma in Sanskrit and bahera in Hindi.

##### Uses & Benefits of Baheda

- Beleric is a rejuvenative and laxative. It proves beneficial for hair, throat and eyes.
- Beleric seed oil or fruit paste is applied on swollen and painful parts.
- The seed oil gives excellent results in skin diseases and premature graying of hair.
- Fruit pieces are baked and chewed for cough, cold, hoarseness of voice and asthma.
- Beleric fruit is powdered and used to dress wounds to arrest the bleeding.
- Beleric fruits and kernels are used in making medicated hair oil, used to alleviate pain and burning sensation, boost hair growth and impart black color to the hair.
- The paste of the fruit is applied on eyelids, in case of conjunctivitis.
- The herb is used in various eye ailments, such as myopia, corneal opacity, pterigium, immature cataract, chronic and acute infective conditions.
- Beleric helps in loss of appetite, flatulence, thirst, piles and worms.
- The ripened fruit acts as an astringent and anti-diarrheal.
- The decoction of the kernels is used in case of excessive thirst and vomiting.
- Beleric plant alleviates cough, relieves blocked phlegm, controls bleeding in the sputum and eases bronchospasms.
- It prevents ageing, imparts longevity, boosts immunity, improves mental faculties and enhances the body resistance against diseases.
- It helps in lowering cholesterol and blood pressure.





Lagerstroemia Lancasterai at Rajpath

## 5. Lagerstroemia (Lagerstroemia lancasterai)

Lagerstroemia, commonly known as Crepe Myrtle, is a genus of about 50 species of flowering shrubs and trees. Native to the Indian subcontinent, South Asia and Oceania, most species of Lagerstroemia are found in Pakistan, India, Bangladesh, China, Australia and parts of Central America.

Lagerstroemia Lancasterai bears beautiful flowers of white colors in summer. In full bloom,

bright green leaves and clusters of flowers make it an excellent choice as ornamental tree for homes and gardens. Lagerstroemia sheds its leaves in a gradual process so you would hardly find it completely bare. Flowers contain six or seven crumpled and wrinkled petals, that is why, Lagerstroemia is also called Crepe Flowers tree.



**Ficus Macdonald at Rajghat**



## **6. Ficus (Ficus macdonald)**

It is a gynodioecious (functionally dioecious), deciduous tree or large shrub, growing to a height of 6.9–10 metres (23–33 ft), with smooth white bark. Its fragrant leaves are 12–25 centimetres (4.7–9.8 in) long and 10–

18 centimetres (3.9–7.1 in) across, and deeply lobed with three or five lobes. The complex inflorescence consists of a hollow fleshy structure called the syconium, which is lined with numerous unisexual flowers.



Olea Europea (Zaitoon) at Rajghat



## 7. Zaitoon (*Olea europea*)

Zaitoon tree is also known as olive tree and produces the gray green flowers in winter season. The plant of olive reaches the height of 3 meters, leaves are bright green and very attractive and the fruits are of bright bluish or violet color, possesses a metallic taste. It is known from old ages. During

the excavation of ancient Egyptian graves, vessels full of olive oil were found with other articles. According to the scholars of Hadith, on subsidence of Toofan-E-Nooh (The Great Flood of Noah), when water level came down, the first thing on the earth that was seen was the olive plant.

Bombax ceiba tree  
at 1 Moti Lal Nehru Marg



## 8. Cotton tree (*Bombax ceiba*)

Like other trees of the genus *Bombax*, is commonly known as **cotton tree**. This tropical tree has a straight tall trunk and its leaves are deciduous in winter. Red flowers with 5 petals appear in the spring before the new foliage. It produces a capsule which, when ripe, contains white fibres like cotton. Although its stout trunk suggests that it is useful for timber, its wood is too soft to be very useful. *Bombax ceiba* grows to an average of 20 meters, with old trees up to 60 meters in wet tropical weather. The leaves are palmate with about 6 leaflets radiating from a central point, an average of 7~10 centimeters wide, 13~15 centimeters in length. The leaf's long flexible petiole is up to 20 cm longer. Seeds are numerous, long, ovoid, black or gray in colour and packed in white cotton. The fruit, which reaches an average of 13 centimeters in length, is light-

green in color in immature fruits, brown in mature fruits. This tree is widely planted in parks and on roadsides there because of its beautiful red flowers which bloom in March/April. This tree is quite common in New Delhi. The cotton fibers of this tree can be seen floating in the wind around the time of early May. This tree shows two marked growth sprints in India- in spring and during the monsoon months. This tree is commonly known as *Semal* (*Hindi*: सेमल). This tree is also found in the eastern parts of Pakistan, especially in the eastern city of Lahore. The local Urdu and Punjabi name for the tree is 'Sumbal'. Plant pacifies vitiated pitta, wounds, ulcers, skin diseases, hemorrhoids, urinary calculus, cystitis, inflammations, cough, bronchitis and dark discolorations on face.





Swietenia Senegalensis Tree at Govt. Sunder Nursery

## 9. Swietenia (Swietenia senegalensis)

Swietenia senegalensis (Khaya, African Mahogany) :- It is tree with shining leaves upto 100ft tall. Leaves are compound drying pale glaucous green. Flowers normally have

four parts. Sepals are pale green, petals and stamina tube are cream colored, fruit is normally very much valuable.





*Celtis Tetrandra* at Govt. Sunder Nursery

## 10. Khirk (*Celtis terandra*)

A medium sized tree up to 30m height. Leaves simple, alternate, obliquely ovate. Margin, serrate from apex to below. Flowers polygamous, yellow born on leafless shoots.

Fruit is hard when dry, edible bitter to taste. Flowering from January to March. Fruiting from Feb. to April a medium sized tree.





Guazuma Ulmifolia Tree at Govt Sunder Nursery

### 11. Guazuma (*Guazuma ulmifolia*)

It is small to medium size tree upto 30m height and 30 to 40 cm in diameter. Leaves are in alternates pattern, ovate, finely saw toothed margin with darker green upper surface and pale green below. The flowers

come in panicles and are short stalked, have brown yellow color and are lightly fragrant. The fruits, which are capsules, have many seeds.





Agathis Robusta Tree at Govt. Sunder Nursery

## 12. Kauri Pine (*Agathis robusta*)

it is a large evergreen trees growing straight. Height 30 to 50m with smooth scaly bark. The leaves are broad, tough and leathery in texture. The seed cones are globose and

mature in 18 – 20 months after pollination. They disintegrate at maturity to release the seeds. The male cones are cylindrical.





Swietenia Mahagoni Tree at Govt. Sunder Nursery

### 13. Swietenia (Swietenia mahagoni)

it is a tall tree 30 m height upto 1 m dia and large spherical crown, dense shade. The bark is reddish brown on large trees. Leaves are shiny dark green, lance shaped, flowers

greenish yellow. The light brown seeds capsule stands upright with 5 valves. Each valve releases about 20 flat brown winged seeds.





**Bolusanthus Speciosus Tree at Govt. Sunder Nursery**

#### **14. Bolusanthus (Bolusanthus speciosus)**

The tree is evergreen may drop leaves in winter. Leaves are lanceolate, shiny green above paler below. Fruit is flat thin light brown to grey, pod, Ofrom Sept. to January.

The dark fissured bark drooping foliage and attractive flower. Low maintenance garden tree.





Atalantia Monophylla Tree at Govt. Sunder Nursery

### 15. Jangli Nimbu (*Atalantia monophylla*)

Indian atalantia is a small much branched tree with single sharp spines. Leaves are bright green above paler and reticulate-veined

below, ovate or elliptical with margins slightly wavy. Flowers are long stalked in clusters. Fruit globose yellowish green when ripe.





*Albizia Lucidor* (Potka Siris) Tree at Govt. Sunder Nursery

## 16. Potka Siris (*Albizia lucidor*)

It is fast growing beautiful trees. The large compound leaves are unique. Flower are

clusters of small powder puff. Fruit pod is flat, dark brown. Flowering June to July.





Caesalpinia Ferrea (Khirk) Tree at Govt. Sunder Nursery

### 17. Khirk (*Caesalpinia ferrea*)

It is a beautiful tree with white and chocolate flaking bark thus called leopard tree. The tree is long, drooping branches with feathery

leave. The flower are yellow small fragrant. The wood is used for finger boards of electric basses, guitars, flooring, fancy furniture.





Mesua Ferrea Tree (Nag Keshar or Nag Champa at Govt. Sunder Nursery

### 18. Nag keshar or Nag Champa (*Mesua ferrea*)

A handsome Indian evergreen tree, of small to medium size upto 13m. Simple oblong green leaves, the emerging young leaves are red to yellowish pink. The flower are white with numerous yellow stamens. The

flower's are used for making incense and used to stuff pillows. The national tree is Sri Lanka. The oil from seeds is used for treating sores, scabies, wounds and rheumatism. The root is used as an antidote for snake poison.





*Bridelia Retusa* Tree at Govt. Sunder Nursery

### 19. Kasai (*Bridelia retusa*)

Tree is identified by rigid leathery leaves, strong spines on the barks of young stems. Flowers are arranged on leafless branches appearing as spikes with small acute bract. Fruit is globose, fleshy, sweetish taste, size of

a pea, purple black. Flowering May- August. The bark is used for the removal of urinary concretions in Ayurveda. Root and bark are valuable astringents.





Dillenia Indica Tree at Govt. Sunder Nursery

## 20. Elephant Apple (*Dillenia indica*)

Elephant Apple (Chalta) is small to medium sized tree upto 15m tall. The leaves are long with corrugated surface. The flowers are large

with five white petals and yellow stamen's. The fruit having seeds with edible pulp. The pulp is used in curries, Jam & Jellies.





*Pterospermum Xylocarpum* (Tada) Tree at Govt. Sunder Nursery

## 21. Tada (*Pterospermum xylocarpum*)

Trees are small 5-8 m tall. Leaves ovate, elliptic base uniquely cordate white wooly beneath glabrous above. Flower's white

solitary, capsules pyriform seeds winged. Wood is used for furniture.





Largerstroemia Microcarpa (Benteak) Tree at Govt. Sunder Nursery

## 22. Benteak (*Largerstroemia microcarpa*)

It is a deciduous tree. Grow upto 10-15m height. The bark is of ash color oppositely arranged leaves. White flowers are borne in

large compound panicles. Seeds are winged. Flowers in May – June.





Markhania Lutea Tree at Govt. Sunder Nursery

### 23. Siala (Markhania Lutea)

The tree is 10-15m high having leaves 20-30cm in length. Bark light brown. Flowers are bright yellow trumpet shaped. Fruit is very

long thin brown capsules borne in clusters, release winged transparent seeds.





Bistendu (*Diospyros Cordifolia*) Tree at Vijay Chowk

## 24. Bistendu (*Diospyros montana*)

Bistendu is a small deciduous tree with spiny trunk and spiny older branches. Leaves are elliptic lanceshaped, somewhat heart-shaped at the base and sharp or blunt at the tip. They are smooth above and velvety on the underside. Male and female flowers grow on separate trees. Male flowers are

borne in 3-flowered clusters, and the female ones singly. Flowers are creamy white or greenish-white, tubular, with 4 petals which are curved back. Sepals are ovate, velvety. Stamens of male flowers are longer than the flower tube. Fruit is spherical, cherry sized, yellow when ripe. Flowering: March-April.



Branch of Rudraksha Tree

## 25. Rudraksha (*Elaeocarpus Ganitrus*)

Rudraksha grows in the area from the Gangetic Plain in foothills of the Himalayas to South-East Asia. Rudraksha seeds are covered by an outer shell of blue color when fully ripe, and for this reason are also known as blueberry beads. The blue colour is derived not from pigment but is structural. It is an evergreen tree that grows quickly. Rudraksha Tree starts bearing fruit in three to four years. As the tree matures, the roots buttress rising up narrowly near the trunk and radiating out along the surface of the ground.

The seeds show variation in the number of grooves on their surface, and are classified on the basis of the number of divisions that they have. Different qualities are attributed to the rudraksha based on the number of grooves, or 'faces' that it has. A common type has five divisions, and these are considered to be symbolic of the five faces of Shiva. It can only be worn with red string or a gold chain.

Rudraksha Tree at 6 Moti Lal Nehru Marg



According to the Ayurvedic medical system, wearing Rudraksha can have a positive effect on the heart and nerves, and relieve you from stress, anxiety, depression, palpitations and lack of concentration. It is also known for its anti ageing effect, and electromagnetic and inductive properties. People with high blood pressure have been found have benefited from the use of Rudraksha seeds.



## CHAPTER - 18

### MIRACLE FRUIT

Miracle fruit, (*Synsepalum dulcificum*), also called miracle berry, of the family Sapotaceae, grown for its mild fruits that make subsequently eaten sour foods taste sweet. The miracle fruit is native to tropical where it is used locally to sweeten palm wine and other beverages. The unrelated sweet prayer plant (*Thaumatococcus daniellii*) is also known as miracle fruit for its similar ability to make sour foods taste sweet.

The miracle fruit plant grows as a dense shrub or small tree, usually not more than 5.5 metres (18 feet) in height in the wild and generally smaller when cultivated. The simple leaves are oval and tapering at the

base with smooth margins and feature a waxy underside; they grow in spire like clusters at the ends of small branches. The small white flowers give rise to red drupe fruits that are about 2–3 cm (0.8–1.2 inches) in length. Plants typically begin producing fruit after three or four years and require acidic soil.

The flavour-altering mechanism of miracle fruit is due to a glycoprotein named miraculin, which was first isolated by Japanese researcher Kenzo Kurihara in 1968. Although miraculin itself is not sweet, it binds to receptors on the taste buds and causes acidic foods to be perceived as sweet. The effect typically lasts from a half hour



Miracle Fruit Leaves and unusual flowers of the Miracle Fruit plant (*Synsepalum Dulcificum*)

to two hours, with the intensity declining over time. The fruit has been proposed as a treatment for the taste changes experienced by some chemotherapy patients, though further studies are needed. In the United States an attempt was made in the 1970s to commercialize the fruit extract as a low-calorie or noncaloric sweetener for use by diabetics and dieters, but the U.S. Food and Drug Administration (FDA) classified the product as a food additive requiring further safety testing, and the venture was abandoned. Similarly, the European Union required a safety assessment before miracle fruit extracts could be used as a food additive, though miraculin has been approved in Japan. The purchase of powdered or whole fruits is legal in most places, and the fruit is commonly consumed as a novelty.

For people looking for a delicious and exotic berry to add to their diet, the miracle fruit is an excellent option. It has a plenty of benefits for your body which include its ability to aid in weight loss, improve vision health and boost immunity, among others. That being said, before adding any new food to your diet, it is critical to understand where it comes from, what it contains, and the possible health benefits it may hold.

Miracle fruit is one of the common names of *Synsepalum dulcificum*, a shrub that is native to western Africa, where it has been in use for centuries. Most notably, miracle fruit has the ability to make sour food taste sweet, thanks to a compound called miraculin. Miraculin is able to bind to the tongue's taste buds, which blocks the receptors when the pH level of the mouth is neutral. However, when we eat sour fruit, the pH of the mouth drops, and miraculin is able to activate the sweet receptors while blocking the sour ones.

Aside from the novel aspects of miracle fruit, also known as miracle berry, sweet berry, and

as this fruit has a number of unique nutrients that can positively affect health. These small berries are the size of cherry tomatoes and each contains a single seed, roughly the size of a coffee bean. The berries are typically consumed raw and are actually tasteless when eaten alone, but the fruit pulp can also be mixed into fruit smoothies or other sweet desserts. Some restaurants around the world use miracle fruit as a complement to their dishes, allowing diners to revel in the strangeness of eating sour food, but tasting a sweet treat instead!

Miracle fruit is not a great source of traditional nutrients, but there are notable amounts of vitamin C, vitamin K, vitamin A, vitamin E and various amino acids that the body requires for numerous functions. The fruit is incredibly low in calories, only 1/2 calorie per berry, and also boasts a number of polyphenolic compounds and antioxidants that make you healthy.

The most notable benefits of miracle fruit include its ability to manage diabetic symptoms, aid in weight loss efforts, improve the strength of the immune system, boost vision health and prevent chronic disease, among others.

By acting as a low-calorie, sugar-free additive in many meals, this fruit is an excellent aid in your weight loss efforts. It will not contribute to your overall calorie intake, nor is it packed with simple sugars and carbs that can lead to weight gain.

Although only trace amounts of vitamin C are present in this fruit, it can still give a small boost to your immune system. Vitamin C stimulates the production of white blood cells, which are the body's main line of defense against pathogens and infections.

There are also trace amounts of vitamin A found in this fruit, which has been directly



linked to improved vision health, specifically a lower risk of macular degeneration and cataract formation as you age.

Perhaps the most important health benefit of miracle fruit is enjoyed by diabetic patients, who can safely replace sugar in their diet with this berry. Apart from the flavor impact, some of the active ingredients in this fruit can naturally lower insulin sensitivity, which is good news for diabetic patients.

The number of polyphenolic compounds found in this fruit will give your body an antioxidant boost, which can lower levels of free radicals and reduce oxidative stress in organ systems.

Miracle fruit is used in various ways around the world, but its use is primarily linked to its flavor-altering properties. It is commonly added to desserts and other foods that may have a tart flavor, or it is used as a replacement for sugar in foods. For example, if you have a sweet tooth but are trying to cut down on your sugar intake, using miracle fruit in conjunction with sour food can give you the sweet burst you're looking for.

Miracle fruit is also used by some for medical purposes, such as changing the flavor of unpleasant medications or lessening the side effect of certain treatments. Miracle fruit is often found as a complementary item in a dish at restaurants that advertise unique flavor experiences.

Despite the potential health benefits and novel abilities of this fruit, miracle fruit does have some side effects that should be considered, such as high acidity and gastrointestinal problems.

**Acidity** – Using this fruit can enable you to eat more sour foods, but only taste them as being sweet. While this is a unique property, it can allow you to eat an excess of sour foods, which could result in elevated acidity levels in the body.

**Stomach Issues** – Similarly, this fruit could also allow you to eat spicy food without feeling the heat, which could lead to heartburn or gastrointestinal distress. Use this berry in moderation, and be aware of what types of food you are eating to avoid unnecessary problems.



Landscape Design

# CHAPTER - 19

## DETAILS OF CPWD PARKS

### 1. Buddha Jayanti Park

Pt. JawaharLal Nehru, pioneer of Modern India and a man of far sightedness had the idea to commemorate the 2500<sup>th</sup> birth anniversary of Lord Buddha by laying a park commiserative to his status and teachings of making the mankind free from sufferings. The Buddha Jayanti Park is seen with a large Statue of Lord Buddha in a sitting posture covered in Gold Coloured paint erected on a flat raised Platform supported by pavilions on all directions. The platform and Statue were established on October 1993 over an artificial Island created within the premises of this park as a respect and tribute to H.H. Dalai Lama the 14<sup>th</sup>. A sapling was planted in this park which was taken from the Holy Bodh Tree in Sri Lanka. It was during the 3<sup>rd</sup> century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

The speech of 1<sup>st</sup> Prime Minister of India Pt. JawaharLal Nehru in UN General Assembly New York in Nov. 10<sup>th</sup> 1961 had also been displayed on a big stone in 1965 on international co-operation year in Hindi and English version. A Bal – Boudh Tree was planted in the park by then Prime Minister Shri. LalBahadurShastri on 24.10.1964, which

was presented by Her Highness Sri Mao BhandarNayake the then Prime Minister of Sri Lanka.

The approximately 70 acres of land for this park was allotted by the L&D.O. long back. A great care has been taken to keep the Buddha Jayanti Park free from all sorts of pollution after preserving the topography of land, rocks and hillocks and flora and fauna of the ridge in which it is located. This Park is being maintained by CPWD . The natural trees, shrubs and other flora and fauna had not been disturbed at all while making the park. Most of the trees planted there are of indigenous nature and ecological balance has been maintained in a nice way. In the last year Colour Garden, Canna Garden, Medicinal Garden, Rose Garden, Palm Garden, Cactus Garden, Bulbous Garden, Bamboo Garden, Rock Garden and Fragrance Garden have been created. The Buddha Jayanti Park is seen crowded with mostly with Youngsters, early morning joggers and Yoga enthusiast; however, most Family along with Friend's are seen here, especially during weekends, where they spend fun time after a good picnic lunch with each other. Young couples mostly visit this park during weekdays as it generally remains quit and free of the usual family crowd and hence gives them a quiet time and ample space to spend private time with each other.

Major part of the Garden is covered by different varieties of Bougainvilleas which gives a very good look during its flowering time and those can be seen in these pictures.





Buddha Statue at Buddha Jayanti Park









## Buddha Statue in the Buddha Jayanti Park

The installation of the statue of Lord Buddha at Buddha Jayanti Park in New Delhi is an historic event. This monument with a canopy is being dedicated as a symbol of the gratitude of His Holiness the Dalai Lama to the people and government of India for their sustained effort in promoting the cause of world peace and understanding. In 1983 His Holiness expressed a wish to erect a monument in Delhi under such a dedication. Following that, Tibet House, the Cultural Centre of His Holiness, approached the Government of India with a proposal to install a statue of the Buddha under a canopy in Buddha Jayanti Park. This would not only be an ornament to the park but also a befitting monument in honour of one of the greatest sons of India, who showed the Universal path to Freedom from suffering through personal example over 2,500 years ago.

Through the sympathetic consideration of the Ministry of Urban Development, the Delhi Urban Art Commission and other authorities, a plot of land was made available to Tibet House for the installation of the statue and canopy in Buddha Jayanti Park. In 1987, the then Prime Minister, Shri Rajiv Gandhi, approved a model of the proposed structure, the design and proportions of which were finalized in consultation with the appropriate authorities in 1988. The design as a whole symbolizes a harmonious union of diversities—racial, linguistic, communal etc. — a unit which has been the core of the message of His Holiness the Dalai Lama. The structure in its entirety may be viewed as a journey through stages to this goal, rising from the base to the topmost spire, of the complete realization of compassion and wisdom. It is a symbol of this process of manifestation, and a representation of non-duality.

Its name, natural topography and pattern of vegetation made Buddha Jayanti Park an appropriate setting for the statue of the Buddha. Placed on an island in the Park, this new monument faces east, exactly as the Kalacakra Mandala is oriented, and the direction in which the Buddha sat under the Bodhi tree at Bodh Gaya when He attained Enlightenment.

The entire structure embodies a cluster of Buddhist symbols and meanings. The base is set within an embankment with five concentric rings representing the five elements — earth, water, fire, wind and space. The design of the base is fashioned after the Kalacakra Mandala, the last system of mandalas introduced to Tibet from India. (Besides their deep spiritual message, the teachings of the Kalacakra were a historical response to the various threats, such as internal riots and external aggression, that endangered the unity of the diverse communities of the India of the time.)

The canopy has a three-tiered base on each of its four sides, which together signify the twelve channels (nadis). Its four pillars represent the four energy drops (bindus), apart from supporting the dome and upper parts of the canopy. The ten directions of the canopy represent the ten vitalities (pranas). The nadis, bindus and pranas are the vital constituents of the human body in the Kalacakra system of Tantra. The parapet and the upper reaches of the canopy are ornamented with intricate Tibetan designs, while the dome symbolizes the vital factors of enlightenment. Above the dome, a square and conical structure represent the constituents of the Noble Path, while thirteen rings on the core are symbols of the ten strengths and three mindfulnesses of an Enlightened being. The chatra represents the all pervasive compassion (mahakaruna) of the Buddha, and the topmost spire the nobility of his attainment.

Altogether, the six parts of the canopy – base, columns, dome, cone – chatra and spire, correspond to the six chakras which form the centres of subtle energy in this human body; but the design of the upper reaches of the canopy follows that of the historic Gyantse Stupa, Palkhor Choten – in Tibet.

The statue of the Buddha has been designed in traditional Tibetan style of Mr Pemba Dorje, a skilled Tibetan craftsman in Dharamsala. It is made from beaten copper glided with gold, and is eight feet high including the pedestal. The right hand of the Buddha is shown in the Bhumisparsa Mudra, and the positioning of the statue on a raised throne symbolizes His message that all beings have the potential to attain the highest goal of Buddhahood.

The statue is placed on a throne which contains an engraving of Bhumidevi, the Earth Goddess. When challenged by Mara to provide a witness to testify to the merits He had attained, the Buddha touched the

earth (bhumisparsa), invoking it to bear witness. Bhumidevi emerged from the earth to testify for Him. It is our responsibility now to care more deeply for Mother Earth, who is depicted in the engraving as pleading for the attention of her children.

The canopy is about forty feet at its highest point and is built in sandstone mined and transported from Bansi Paharpur in Sikar district, Rajasthan. The craftsmen who transformed the stone into a beautiful edifice are also from Rajasthan and belong to communities of traditional temple builders. An initial design of the canopy was done by Kazuhiro Nakahari of Thanka Architects and his team, but that assumed a larger structure and site than ultimately became feasible. The beautiful structure that has now been completed was designed and its construction and landscaping coordinated by M.N. Ashish Ganju Mark Warner Rajiv Narain Architects.

## 2. Bhagwan Mahavir Vanasthali Park

Bhagwan Mahavir Vanasthali Park is situated on the Ridge Road towards the southern ridge which lies close to Dhaula Kuwan or alternatively from Sardar Patel Marg and is easily reachable by local transport. It spreads over the area of 25 acres of land and is seen planted with ornamental and green trees, shrubs, flower beds and lawns that's creates natural effect to the environment. Gardens in Delhi are been constructed since the Mughal Emperor rule over Delhi. The park is seen crowded with mostly young couples, morning walkers and yoga enthusiasts, however most families along with friends are seen here especially during weekends. This park also attracts tourists and sacred for Jain religion.



MAHAVIR VANASTHALI PARK





### 3. Delhi Chalo Park

Delhi Chalo Park is situated behind the Red Fort along the Ring Road, it's approx area is 12.30 acres seen from this park is Musamman

Brij in the centre. Rang Mahal is the right and Deewan-E-Khas on the left. This beautiful park increase the beauty of the Red Fort.



#### 4. Jai Prakash Narayan Memorial Park

The Lok Nayak Jai Prakash Narayan Memorial Park is situated at Bahadur Shah Zafar Marg. This was offered to public in year 2004. This park was developed by CPWD and it has lush greenery. Having more than 4.50 acres of area, this park is having 127 Nos. of trees of 22 different varieties. A number of trees are planted in a circular manner around a circular lawn having a circular bed of Cannas in the centre. There is a huge statue of Lok

Nayak Jai Prakash Narayan fixed on a high rise mound. Garden light, fittings and fixtures are very beautiful at the night. This park was made open for use of public without any ceremonial/opening ceremony. The park has excellent boundary structure and gates etc. The park is having a huge statue of Dr. Shyama Prasad Mukherjee in a side surrounded by a cluster of good looking Thuja plants.



#### 5. Deen Dayal Upadhyay Park

Deen Dayal Upadhyay Park is located at Deen Dayal Upadhyay Marg, near CAG office, New Delhi. The park is designed and developed by Central Public Works Department in the year 2017. This park covered approximate 16.00 acres area and divided with 3 Pockets known as Pocket-7A, 3A and 6B. The park is developed with concept of Rashiphal, Nakshatra, Navgrah, Panchvati, Tirthankar, etc which is unique and probably first of its kind in Delhi.

Recently BJP Chief Shri Amit Shah inaugurated the Deen Dayal Upadhyay Park. Shri Amit Shah was accompanied by Urban Development Minister Shri Hardeep Puri and Party MP Smt. Meenakshi Lekhi.

The redeveloped park has a rich variety of plants and large expanses of grass lined by flower beds with colourful blooms well laid walking tracks and several plant and bushes with their full names put up alongside.





BJP Chief Shri Amit Shah inaugurating the Deen Dayal Park accompanied by Urban Minister Shri Hardeep Puri.

## Nakshatra Garden

One of the attractive areas of Deen Dayal Upadhyay Park is Nakshatra Garden. This garden is developed in Pocket-7A by planting 27 species of plants representing each Nakshatra. List of auspicious plant for nakshtra is:

Nakshtra	Common Name	Botanical Name
Ashvini	Poison nut	Strychnos nux vomica
Bharani	Amla	Embilica officionalis
Krittika	Fig	Ficus racemosa
Rohini	Jamun	Syzygium jambolanum
Mrigashirsha	Kadhira	Acacia catechu
Ardra	Agard wood	Aquilaria agallocha
Punarvasu	Bamboo	Bambusa
Pushya	Peepal	Ficus religiosa
Ashlesha	Naga kesar	Mesua ferrea
Megha	Banyan	Ficus bengalensis



Nakshtra	Common Name	Botanical Name
Purva phalguni	Flame of Forest	Butea monosperma
Uttara phalguni	Juvi	Ficus infectoria
Hasta	Retha	Sapindus mukorassi gaertn
Chitra	Bel	Aegle marmelos
Swati	Arjun	Terminalia arjuna
Vishakha	Wood apple (Kaith)	Limonium acidissimum
Anuradha	Bakul	Mimusops elengi
Jyeshtha	Chir	Pinus roxburghii
Mula	Black dammar	Canarium strictum
Purva ashadha	Jack fruit	Artocarpus heterophyllus
Shravana	Milk weed	Calotropis gigantia
Dhanishtha	Shami	Acacia ferruginea
Shatabhisha	Kadamba	Anthocephalus cadamba
Purva bhadrapada	Neem	Azadirachata indica
Uttara bhadrapada	Mango	Mangifera indica
Revati	Ippe	Madhuca indica

## Nav Garh Garden

This garden developed in Pocket-7A by planting 09 species of plants with every plant symbolically represents or attached with every Graha. It is beautifully designed and maintained. The list of auspicious plants for Nav Graha Garden is:

Garha	Common Name	Botanical Name
Surya (Sun)	Aak	Calotropis
Chandra (Moon)	Dhak, Palash	Butea monosperma
Mangal (Mars)	Kadhira	Acacia catechu
Buddha (Mercury)	Chirchirta	Achyranthes aspera
Brihaspati (Jupiter)	Peepal	Ficus religiosa
Sukra (Venus)	Gular, Udamber	Ficus glomerata
Shani (Saturn)	Shami	Acacia ferruginea
Rahu (Rahu)	Kush	Cynodon dactylon
Ketu (Ketu)	Dev kush	Imperata cylindrica

## Rashiphal Garden

This garden developed in Pocket-7A by planting 12 species of plants each plant represents different Rashiphal. The list of auspicious plants for rashi is:

Rashi	Common Name	Botanical Name
Mesha (Aries)	Red Sandal Wood	Petrocarpus santalinus
Vrishabh (Taurus)	Satwin	Alstonia scholaris
Mithun (Gemini)	Jack Fruit	Artocarpus heterophyllus
Karka (Cancer)	Flame of Forest	Butea monosperma
Singh (Leo)	Wid ber	Ziziphus mauritiana
Kanya (Virgo)	Mango	Mangifera indica
Tula (Libra)	Bakul	Mimusops elengi
Vrischik (Scorpio)	Kadhira	Acacia catechu
Dhanu (Sagittarius)	Peepal	Ficus religiosa
Makar (Capricorn)	Shisham	Dalbergia latifolia
Kumbh (Aquarius)	Khejri Tree/ Shami	Prosopis cineraria
Meen (Pisces)	Bargad	Ficus benghalensis

## Tirthankar Garden

This garden designed and developed with the concept of Tirthankar Van in which 24 species of identical plants of Tirthankar are planted. The list of plants planted in Tirthankar van is:

Tirthankar	Common Name	Botanical name
Shri Rishabhdeva Swami	Banyan	Ficus benghalensis
Shri Ajitnath Swami	Kalpavriksha	Adansonia digitata
Shri Sambhavnath Swami	Sal	Shorea robusta
Shri Abhinandan Swami	Chir	Pinus roxburghii
Shri Sumatinath Swami	Priyangu	Callicarpa macrophylla
Shri Padmaprabha Swami	Banyan	Ficus benghalensis
Shri Suparsvanath Swami	Siris	Albizia lebbek
Shri Chandraprabh Swami	Sultan champa	Calophyllum inophyllum
Shri Suvidhinath Swami	Bel	Aegle marmelos
Shri Shitalnath Swami	Anjeer	Ficus lacor
Shri Sreyanshnath Swami	Ashok	Sara indica
Shri Vasupujya Swami	Lodh Tree	Symplocos racemosa
Shr Vimalnath Swami	Jamun	Syzygium cumini
Shri Anantnath Swami	Ashok	Sarica indica
Shri Dharamnath Swami	Palash	Butea monosperma
Shri Shantinath Swami	Deodar	Cedrus deodara

Tirthankar	Common Name	Botanical name
Shri Kanthunath Swami	Lodh Tree	Symplocos racemosa
Shri Arnath Swami	Mango	Mangifera indica
Shri Mallinath Swami	Ashok	Saraca indica
Shri Suvrat Swami	Golden Champa	Michelia champaca
Shri Naminath Swami	Maulshiri	Mimusops elengi
Shri Neminath Swami	Salix	Salix caprea
Shri Parsvanath Swami	Fire Flame Bush	Woodfordia fruticosa
Shri Mahavir Swami	Sal	Shorea Robesta

### Play Ground

The playground developed in Pocket-7A. It covered approximate 1.00 acre area. Play Ground is developed for children. The lush green lawn along with children playing equipment is developed in this garden.



DEVELOPMENT OF LAWN AT DDU PARK (POCKET-3A)  
DEVELOPMENT OF LAWN AT DDU PARK (POCKET-6B)



DEVELOPMENT OF LAWN AT DDU PARK (POCKET-7A) PARK 3A TRELLIS





PARK 7 A – OPEN AIR THEATRE

## 6. National Police Memorial Park

National Police memorial park is located in chankyapuri it's approx area is 3.93 acre. This park was developed to commemorate the memory of Martyrdom of all the 9 or 10 Police Forces serving the nation. This forces are such as CRPF, ITBP, BSF etc. Its ownership belongs to Ministry of Home

Affairs. In the beginning a huge global structure was proposed to be established at a much high location in the center of the park. But due to some objection raised by different organization this global structure was removed from here & shifted to some other park probably in Noida.



## CHAPTER - 20

### COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI

#### “BONSAI”

Bonsai comprises a tree or shrub planted in a small container for developing as a miniature plant showing the general appearance of that plant species found in nature. It differs from a pot plant where the foliage and flowers are important, whereas for Bonsai the appearance of the plant in a miniature form is to be maintained for many years.

The Government Sunder Nursery is also making Bonsai plants by their trained staff by binding with wire, shaping them, cutting

them, training them, fixing moss grass, using small pebbles repotting, watering and selling to the public also. The Government Sunder Nursery is having specimen collection of bonsai, some of them donated by Shri Agnihotri. These bonsai are preserved in the nursery for imparting training to the scholars as well as to the public. The new bonsai house was also constructed at Government Sunder Nursery and inaugurated by DG, CPWD on 3<sup>rd</sup> March 2012. The specimen bonsai were displayed in various flower shows and won many prize in the flower show.



#### 1. Khirni (*Manilkara hexandra*)

It is a slow growing evergreen tree. The bark is grayish black and rough. The wood is used for big beams. Its fruits are edible.



#### 2. Saptaparni (*Alstonia scholaris*)

The name scholaris means children used the slated made from wood of tree for writing purpose. In October small green fragrant



flower appear. All parts of the trees is poisonous. The dark green leaves form whorls of 4-7 and regular branching gives tree a beautiful shape.



### 3. Pakur/Pilkhan (*Ficus infectoria*)

The trees can grow upto 10mtr. to 12 mtr. The leaves are glossy, green thick, copper new growth. The white flower appears in spring.



### 4. Pipal (*Ficus religiosa*)

It is a semi evergreen tree, normally grown on roadside, near temple. It is a religious tree of India. The leaves are broad cordate in shape. The fruit is a small fig green ripening to purple



### 5. Ficus (*Ficus long island*)

For making bonsai 3 to 5 year old plant is selected . The height of the bonsai can be maintained upto 30cm. The Bonsai plants require 3 to 4 hours sunlight. The leaves are leathery and thick and branches can be easily train.



### 6. Savani (*Largestromia indica*)

It is deciduous tree grows near rivers. The plants have separate male & female flowers appear in summer in white, pink or red color.



Height of bonsai can be kept upto 30cm to 45 cm. The pruning is done in late spring. Wiring is essential. Informal, cascade bonsai forms from medium to extra large size.



### 7. Putranjiva (*Putranjiva Roxburghii*)

Tree with drooping leaves having medicinal properties. Flower yellowish green leaves and fruits used for rheumatism.



### 8. Bistendue (*Diospros Montana*)

It is a small deciduous tree. The stem is having thorns. The male and female flower grow on separate trees. The flower are creamy white. The fruit is cherry became yellow after ripening. Flowering



### 9 Ficus (*Ficus tsiela*)

The tree is large spreading tree without aerial roots. Leaves coriaceous. Fruits when ripe become purple during April to October. A good avenue tree.



### 10 Papri (*Pongamia glabra*)

It is also called pongam oil trees. The oil kept away the insects from the skin. The oil of the seeds beneficial in treating skin disease and antimicrobial.





### 11 Amrood (*Psidium guajava*)

The tree became tall upto 15 mtr. Height having leathery leaves small fruits but very sweet and white flowers in March & October.



### 12 Schefflera (*Schefflera* sp.)

It is having more than one leaflet. Due to the wood and bark it is bit difficult to shape with wire. The cutting of branch a new apex grown on the cut.



### 13 Savani (*Largestromia indica*) dwarf

The plant is attractive to bees, butterflies and birds, due to violet/ lavender color flowers. The plant can be grown by soft wood cutting. Average water requirement bloom in April. The leaves are shiny/ Glossy.



### 14 Ficus (*Ficus panda*)

The Bonsai plant of this plant can be made in one month by using air layering. It is big tree having shining leaves.





### 15 Maulsiri (*Mimusops elengi*)

The plant is having small shiny leaves. The flower are tiny cream colored fragrant star shaped. In the morning the flower spread scent in the air. The flower are offered in temples and shrines. Fruits are eaten fresh. It medicinal value is to prevent the bad breath and keep the gum healthy.



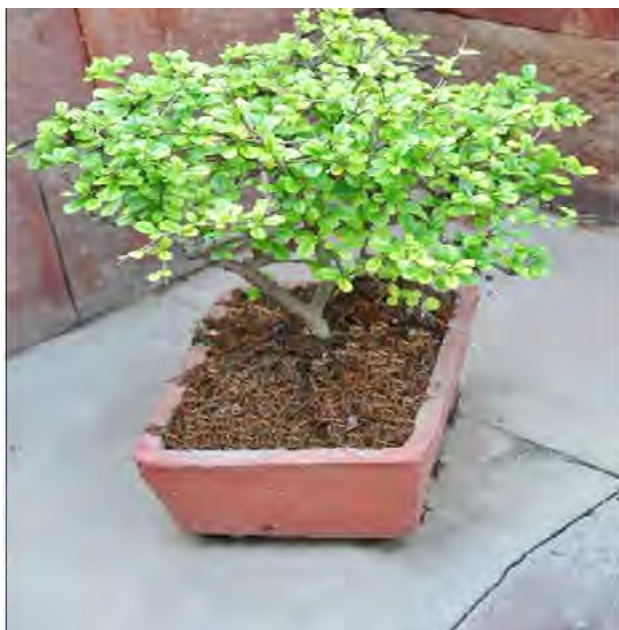
### 16 Limonium (*Limonium* sp.)

It is a herbaceous perennial plant produce from a rhizome. The leaves are simple the flowers are of pink, violet or purple color. The fruits is small having single seed. These are grown "as everlasting flower.



### 17 Jatropha (*Jatropha* sp.)

It is small flowering plants. The plant is resistant to drought and pests and produce seeds. Seed is used for extracting future biodiesel. The flower appear from April to Sept.



### 18 Malpighia (*Malpighia coccigera*)

The plant is having less height, toothed leaves, pinkish/ white flower throughout the year. It makes a beautiful bonsai. It has light fragrance. Height of the plant 15.





### 19 Chiku (*Achras zaptoa*)

It is much branched tree upto 8mtr. Height. Flower are hairy outside. Fruit sare brown and fleshy, having 5 or more shiny blackish brown seeds. The fleshy part is sweet with flavor. Seeds are diuretic, and antipyretic. It contain sapotin ( which is rich source of sugar, protein, vitamins c and mineral).



Landscape Design



## CHAPTER - 21

### DECORATION AT DIFFERENT SAMADHIES

#### 1. Flower Decoration at Shanti Van. Shanti Vana (Samadhi of Late Sh. Pt. Jawahar Lal Nehru, Former Prime Minister of India)

One of the most able sons of India who not only shaped India's destiny but also played an instrumental role in framing the future of the world, Pandit Jawaharlal Nehru was cremated here at the Shanti Vana. <http://www.sodelhi.com/memorials-modern-architecture/337-shanti-vana> Vana. The Campus of Shanti Vana is around 60.00 acres area including forest and lawn area. It has 2776 Nos. of trees of 65 different species.

Shanti Vana or the Forest of Peace truly lives up to its name. Lush greenery, sprawling gardens, numerous trees & saplings keep the atmosphere cool & serene. The stretches of greenery run endlessly and in almost every nook & corner, a beautiful plant stands in humility to welcome you.

All the visiting dignitaries & the heads of the states include a visit to Shanti Vana as an integral part of their itineraries. As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 27<sup>th</sup> May of every year. On 14<sup>th</sup> November of



every year, which is his birth anniversary, he is remembered & honoured by the country's people; and for his ardent love for kids, 14th November has been recognized as National Children's Day.

Certain prayer sessions & cultural programmes are organised in Shanti Vana to celebrate the event. The place provides you with an absolute peace & calm and has a perfect atmosphere for meditation.

## 2. Flower Decoration at Vir Bhumi (Samadhi of Late Sh. Rajiv Gandhi, Former Prime Minister of India)

Vir Bhoomi stands near the memorials of Sh. Mahatma Gandhi (Father of Nation) & other prominent leaders of the country on the Mahatma Gandhi Marg (Main Ring Road) New Delhi. Sh. Rajiv Gandhi was India's youngest Prime Minister when he was sworn in as the Prime Minister of India in 1984. Unfortunately Sh. Rajiv Gandhi assassinated by an LTTE lady suicide bomber in 1991 and India lost one of its most dynamic and visionary Prime Minister. Vir Bhoomi (the land of the Brave) is a memorial dedicated to him, where he was cremated. The campus of Vir Bhoomi is around 22.30 acres. It has 950 Nos. of trees

of 54 different species. The lawns of this site is seen covered with well trimmed green grass and lined with trees, plants and shrubs that add on heavenly look to the entire area and its surroundings.

As a sign of respect, one has to take off his footwear to visit the sacred site and can also attend the special prayer sessions held every 20<sup>th</sup> of August (Birthday) and 21<sup>st</sup> of May (Death Anniversary) every year in order to remind us of the dreams and aspiration he had for his country and admire the fact that after his demise





### 3. Flower Decoration at Kissan Ghat. Kisan Ghat (Samadhi of Late Sh. Ch. Charan Singh, Former Prime Minister of India)

The literal meaning of Kisan Ghat is “Farmer’s Court”. Kisaan Ghat is the Memorial of Chaudhary Charan Singh, was the sixth Prime Minister of India. He was born on 23rd December 1902 and died on 29th May 1987. He was appointed as a prime minister of India for a very short period in 1979. The area of Kisan Ghat has a beautiful park surrounded with trees planted by visiting dignitaries and heads of state. The campus of Kisan Ghat is

around 8.84 acres area. It has 255 Nos. of trees of 19 different species.

As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 29<sup>th</sup> May of every year. On 23<sup>rd</sup> December of every year, which is his birth anniversary, he is remembered & honoured by the country’s people.



#### 4. Sadaiv Atal Samadhi

1. Sadaiv Atal, the Samadhi of Atal Bihari Vajpayee was dedicated to the Nation on the birth Anniversary of the former Prime Minister Atal Bihari Vajpayee 25-12-2018.
2. The Bharat Ratna awardee was born on 25 December. The day is celebrated as 'Good Governance Day' by the BJP.
3. Prime Minister Modi, President Ram Nath Kovind and Home Minister Amit Shah, among other BJP bigwigs, were in the attendance to pay their respects. President Ram Nath Kovind pays his respects to Atal Bihari Vajpayee on his first death anniversary.
4. To emphasise on the unity in diversity, stones from various parts of the country have been used in the construction of Samadhi near Rajghat in New Delhi. The Samadhi has a central platform comprising of nine square blocks, capped with a Diya in the centre. The number nine represents the navarasas, navaratras and navagrahas. The placement of the nine square blocks is in a circular lotus shaped pattern.
5. "Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of," PM Modi said in his tweet.
6. Land was made available for the memorial at Rashtriya Smriti Sthal by the Union Housing and Urban Affairs Ministry.
7. It was constructed by the Centre Public Works Department (CPWD) at a cost of Rs 10.51 crore. The project was funded by the Atal Smriti Nyas Society.
8. The memorial is spread over approx. 10 acres of land at Rashtriya Smriti Sthal, where Vajpayee was cremated on August 17, 2018.
9. Not a single tree was cut down in developing 'Sadaiv Atal' at Rashtriya Smriti Sthal, which also houses samadhis (memorials) of former presidents, prime ministers among others.
10. Sadaiv (always) Atal memorial will be managed by a trust headed by Ex. Lok Sabha Speaker Sumitra Mahajan.

Former prime minister of India Atal Bihari Vajpayee passed away on 16 August 2018. Marking his first death anniversary, a 'Saidev Atal' memorial was organised in New Delhi on 16<sup>th</sup> August 2018.



President Ram Nath Kovind, Vice-President M Venkaiah Naidu and Prime Minister Narendra Modi were among the dignitaries who paid floral tributes to the former statesman at the memorial built near the Rashtriya Smriti Sthal, where his mortal remains were consigned to flames on 17<sup>th</sup> August 2018.





Namita Kaul, daughter of Atal Bihari Vajpayee with her family members and others pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary at his memorial, Sadaiv Atal, in New Delhi. "Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of," Modi.



Prime Minister Narendra Modi pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary, in New Delhi.



A vacant piece of land was made available for the memorial at the Rashtriya Smriti Sthal here by the Union Housing and Urban Affairs Ministry. Spread over approx. 10 acres of land, the memorial was constructed by the Central Public Works Department in a very short period. The project was funded by the Atal Smriti Nyas Society.



President Ram Nath Kovind with Prime Minister Narendra Modi, Amit Shah, JP Nadda & other BJP leaders attend prayer meeting to pay tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.



President Ram Nath Kovind with Prime Minister Narendra Modi pays tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.



Prime Minister Narendra Modi and BJP President Amit Shah arrive to pay tribute to BJP veteran late Atal Bihari Vajpayee at Sadaiv Atal Samadhi, ahead of former's swearing-in ceremony as prime minister for the second consecutive term, in New Delhi.



## 5. Rajghat

1. Raj Ghat is the memorial of Mahatma Gandhi, the Father of the Nation.
2. Black stone platform in an open air complex marks the spot where Gandhi was cremated.
3. A flame constantly burns at one end of the platform and visitors are required to remove their footwear before they enter Raj Ghat.
4. This memorial is located between Ring Road and the banks of the Yamuna River, towards the southeast of Red Fort.
5. His last words, 'Hey Ram,' are inscribed on the marble which is always adorned with flowers.
6. Foreign dignitaries visiting India pay respect to Gandhi by laying flowers on the platform.
7. United State Ex-President Barack H. Obama visited the Rajghat on 25, January, 2015.
8. United State President Donald Trump visited the Rajghat on 25 February, 2020.
9. Horticulture Activity in the Rajghat Complex:-
  - a. Samadhi of Mahatma Gandhi is the well-known place in the world.
  - b. Specially landscaped beautiful and lush green lawn (35.47 Acres).
  - c. It has 1056 numbers of trees of 42 different species
  - d. Large number of tourists and school children visiting every day.
  - e. All the heads of Nations visit this place during their stay in India.
  - f. Flower decoration of Rajghat Samadhi on the occasion of birth and death anniversaries.
  - g. There is also a Gandhi Memorial Museum where a film is shown – between 9:30 am and 5:30 pm except on Thursday – about his life and philosophy. It is also presented on Sunday in Hindi at 4 pm, and at 5 pm, it is shown in English.

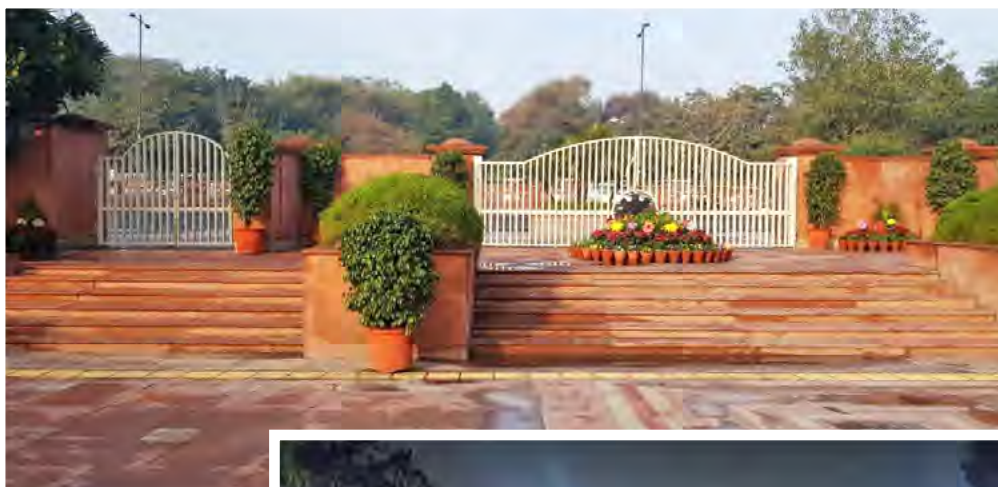
























No. 5- DDR/VIP/2000-DDVI  
Ministry of Urban Development and Poverty Alleviation  
(Delhi Division)

\*\*\*\*\*

Nirman Bhawan, New Delhi

Dated 21<sup>st</sup> July 2000

OFFICE MEMORANDUM

Sub: Environmental damage use to unnecessary and wasteful building exercises undertaken by Municipal agencies – Issuing of guidelines.

The undersigned is directed to state that after considering the view of experts Government agencies local bodies and NGO's the Guidelines for Greening of Urban Areas and landscape have been formulated. These guidelines are issued to all concerned for taking follow up action.

(MAHENDRA KUMAR)

Under Secretary to the Govt. of India

To

8. Principal Secretary (UD) GNCTD, Vikas Bhawan, I.P. Estates, New Delhi.
9. Commissioner, MCD, Town Hall, New Delhi.
10. Chairperson, Palika Bhawan, New Delhi.
11. Vice Chairman, DDA, Vikas Sadan, New Delhi.
12. CEO, Delhi Jal Board, Jhandewalan, New Delhi.
13. Chairman, DVB, Shakti Sadan, New Delhi.
14. DG (W), CPWD, Nirman Bhawan, New Delhi.
15. Engineer –In-Chief PWD(Delhi Admin), GNCTD, K.G. Marg New Delhi.
16. Director of Horticulture, CPWD, I.P. Bhawan, New Delhi.
17. Director of Horticulture, MCD, Under School Lane Fly over. Deen Dayal Upadhyay Marg, Rouse Avenue, New Delhi.
18. Director of Horticulture, NDMC, Palika Kendra, New Delhi.
19. Director of Horticulture, DDA, Vikas Minar, New Delhi.
20. Conservator of Forest, GNCTD, Kamla Nehru Ridge Delhi 110007.
21. Head of Department Floriculture IARI Pusa Road, New Delhi.

Copy to

1. APS to UDM/PS to MOS (UD)
2. SPPS to Secretary (UD)/ PS to JS (UD)/PS to JS(DL)/PS to DS(DD)



## Guidelines for greening of urban areas and landscaping

3. **To avoid use of excessive tiling of payments : porous materials to be used :-** Unnecessary and excessive tiling of the road side pavement should be avoided. The area around trees lined along the road should not be covered with tiling as it hampers the basic necessary function and needs of the trees i.e. root aeration and availability of water get drastically reduced. Whenever tiling is done, porous tiles preserved while taking up civic works Indiscriminate tiling of road dividers and footpaths should be avoided.
4. **Tiling should be done only on pavements with heavy pedestrian traffic:** - Tiling should be only done don't on the roadside which have heavy pedestrian movements. In case of bridges and such areas where there are no pedestrian movement, tiling may be avoided and in case tiling is to be done, preference is to be given to porous tiles as porous materials allows seepage of ground water. The species of trees may be chosen for their pollution reduction abilities including dust trapping to avoid reliance of a single species, a combination of trees, shrubs, grasses should be grown.
5. **Growth of grasses to be encouraged : -** The necessary of grasses playing a vital role in making soil suitable for vegetation should be realized and unnecessary digging of soil should be stopped forthwith.
6. **Excessive pruning to be avoided: -** Practice of excessive pruning of crops should be avoided. Pruning of plants in a well nurtured garden and pruning of roadside plants should be differentiated Excessive pruning may lead to upsetting

the root shoot ratio. Leaf pruning should not be resorted to.

7. **Compost to be made of leaves:** - Leaf is an excellent material for making of compost and burning of leaves causes pollution. A system of composting of leaves in nearby parks should be adopted which will provide water retentive manure to civic agencies. Some fallen leaves may be left near the base as water retentive mulch.
8. **Adequate space to be left around trees:** - An area of 6"x6" around the trees should be left un-cemented. Widening of roads, upto the trunk of trees is to be avoided as roots come under the asphalted roads and will gradually die. In case of storm, these trees can topple down. Activities which adversely affect the roots are to be kept at a minimum.
9. **Digging near trees to be avoided:** - Digging near the trees by allowing telephone, electricity, sewage lines should be avoided to avoid root injury, sufficient space should be left along the ground for the trees. In no case should roots be exposed. Washing avenue trees foliage may be done on a tri-monthly basis to get rid of particulate matter from the foliage.
10. **Use of Organic Compost:** - The dead trees may be replaced by young plants after providing sufficient compost in the pits. Organic manure added with compost FYM mix with nitrogen fixing bacteria culture and neem cake should be spread on the green and poured into the soil before either irrigating the tree basin or before rains.
11. **Planting of second line trees to be encouraged:** - New trees which may be called as second generation trees must be planted preferably 2-3 meters behind

12. the existing road trees in an alternate position or inside the bungalow compounds. A mix of foliage and fruit trees should be planted. Planting of fairly well established large trees should be undertaken as chances of their survival will be more. Cues of species to be adopted may be taken from the old trees lining Delhi's roads.
13. **Initiation of EEC Activities:** - Horticulture department may initiate education/awareness campaign with school students and elders and users of the park where the difficult species of trees are present in the particular park and importance about preservation of eco-systems is explained School Student may be taken for nature walks in a major garden to get them associated with the flora and fauna around them. Also the citizens of an area residing near a park can be involved for this awareness campaign.
14. **Compactness of soil near trees to be avoided:** - Compactness of soil should be avoided within at least one meter around the tree Perforated metallic frame can be used for this purpose. Soil surveys around the trees should be done by removing stones.
15. **Setting up a Central Resource Centre :** - A Central Resource Centre should be set up to aid and **advise** the State Government, Municipal Corporations and other development agencies dealing with matters pertaining to Horticulture and landscaping. A manual on the subject should also be prepared.
16. **Stress on shelter beds of thick trees :-** Around the cities vulnerable to desert winds, shelter- beds of special design of thick trees should be planted.
17. **Updating technology of transplantation of trees:** - Technology of transplantation of trees should be updated to ensure at least 80 percent of the success rate of planted trees. As far as possible, trees grown in the nursery with a height of four to six meters should be planted. Presently, survival rate of trees is less due to animal menace and non-caring of trees. The public participation in caring of trees planted around their houses may be ensured.
18. **Setting up of a tree disease surgery unit in Horticulture Department:** - A small tree disease/surgery unit should be created in all Horticulture departments to cure tree maladies.
19. **Earmarking of some cost of projects for landscaping:** - In any layout plan of land and housing development, at least two and a half percent of the cost of the project should be earmarked for landscaping and green development.
20. **Use of kitchen and garden waste for compost:** - Technology to use kitchen waste to fabricate building and landscaping material should be perfected and made available to all the urban development agencies.
21. **Proper care of water fronts :-** Underground water does not gets recharged sufficiently because of use concrete around them. Efforts should be made to get the water fronts recharged and these fronts kept clean.
22. **Heritage building to be landscape:** - Areas around heritage buildings should be suitable landscaping and beautified.
23. **Greening of void areas not required for minimum construction:-** Urban void areas should not allowed to exist and the area not required for immediate

development or construction, should be made green and fenced with suitable landscaping. Similarly road berm/right of way required for future road widening should be landscaped and maintained as green.-

24. **Encouragement for water harvesting technologies:-** Information regarding water harvesting has to be disseminated in public and its use encouraged. It should be ensured that quality of water does not get deteriorated for which required measures are to be taken.

25. **For maintenance of greens internally :-** Criss-cross paths should be provided for in the gardens and lawns. There should

be connecting gated at all corners so that people do not walk on the grass.

26. **Public participation to be ensured :-** Public participation at present is poor in maintenance of green. This has to be activated and Residents Welfare Association and to be involved in planting of new trees and in their survival. User groups need to be activated, NGO's can play a catalytic role in this. Each NGO may earmark a selected area for its activities thereby dividing the entire net area. Committee with officials from MCD, NDMC, DDA, GNCTD etc. will act as a nodal agency and will review every month or as necessary.



Landscape Design



**DEPARTMENT OF FORESTS & WILDLIFE  
GOVT. OF NATIONAL CAPITAL TERRITORY OF DELHI  
A-BLOCK, 2<sup>ND</sup> FLOOR, VIKAS BHAWAN, I.P. ESATTE, NEW DELHI-110002 .**

F.No.8(193)/CF/TA/07-18/Part file/18-19/8473-80

Dated : 01/10/19

**GUIDELINES  
FOR PRUNING OF TREES  
UNDER DELHI PRESERVATION OF TREES ACT, 1994**

1. The Delhi Preservation of Trees Act, 1994 was enacted to safeguard the forest area in and around NCT of Delhi and to provide for preservation of trees. The Department of Forests & Wildlife, GNCTD has regulatory control for implementation of DPTA 1994 which prohibits felling or pruning/ head backing of trees.
2. The Sec.2 (h) of DPTA, 1994 states that "to fell a tree" with its cognate expression, means severing the trunk from the roots, uprooting the tree and includes bulldozing, cutting, girdling, lopping, pollarding, applying arboricides, burning or damaging a tree in any other manner as factors causing the death of a tree. Thus it would be apparent that its implied meaning does not appear to carry any implicit connotation that pruning of trees which do not cause damage or death of a tree could be termed as a Tree Offence.
3. In the light of above, general guidelines for pruning of trees are prescribed for adherence by all concerned, so that the trees grown with great care and precision over a period of several years are not pruned recklessly leading to their untimely death (which is an offence under Section 8 of DPTA, 1994) or result in reduction of green cover of Delhi which is an essential strategy to combat pollution.
4. Pruning means cutting off or removing dead or living parts or branches of a tree to improve shape or growth. It is a horticultural and silvicultural practice involving selective removal of parts of a plant, such as branches, buds, or roots. Reasons to prune plants include deadwood removal, shaping by controlling or directing growth, improving or maintaining health, reducing risk from falling branches, preparing nursery specimens for transplanting, etc. However, the pruning cut should not be too large so as to damage the tree.
5. For the purpose of clarity and transparency to the meaning of light and heavy pruning, following would constitute as above:

Term	Branches of girth size	Permission required or not	Remarks
Regular Pruning/ General Tending	Upto 15.7 cm.	No	May be got done by Civic Agencies at regular intervals
Light Pruning	Greater than 15.7 cm but less than and equal to 40 cm.	Required	From concerned Tree Officer on submission of prescribed Form B and other documents as prescribed in DPTA, 1994.
Heavy Pruning	Greater than 40 cm	Required	

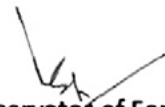
6. The forest department does not get the trees felled or pruned/ head backed directly but only accords permission for the same to the owner of land on which the concerned tree is standing after due inspection/ investigation.
7. The actual pruning of the concerned tree/ trees is got done by Deputy Director (Hort.) of the MCDs/ NDMC/DDA/ PWD/CPWD (whoever is the land owning agency) of the concerned area or by the property owner himself/ herself.
8. For obtaining permission for felling or pruning/ head backing of trees, guidelines are in place for information to all and ease of Public/ Govt. agencies towards achieving their desired objective which are available on the department website "[www.forest.delhigovt.nic.in](http://www.forest.delhigovt.nic.in)".
9. If **Individuals/ General Public/ Society /RWAs** is desirous that any tree inside his house/premises is posing problems to him or the public and needs to be felled or pruned/ head backed, then he may apply for the same in 'Form B' along with photographs and number of tree/ trees in question to the DCF/ Tree Officer of his area for the permission. After inspection, the permission or otherwise is communicated to him/ her within 60 days as per merit of the case.
10. If the tree/trees for which felling or pruning/ head backing is required is standing on **Govt. land/ roads/ Parks/ govt. property in front of the house/ shop/ private property of an individual** and is posing problem to him, he has to apply for felling or pruning/ head backing of such tree on a simple piece of paper to the Deputy Director (Horti.) of the MCD/ NDMC/ DDA/ PWD/ CPWD (whoever is the land owning agency) with photographs of such tree/ trees.
11. It should neither be applied directly to concerned DCF nor Form B submitted directly which has to be filled and signed by the concerned Dy. Director (Horti) of the land owning agency. After inspection, the permission or otherwise is communicated within 60 days of receipt of such completed application/ Form B to the concerned Dy. Director (Horti), as per merit of the case.
12. If a tree is standing on **govt. land but leaning on private land/ building** and is considered dangerous and likely to cause damage to life and property, it should be informed immediately with photograph by the concerned aggrieved person. Permission is granted for its felling or pruning/ head backing within 48 hours of inspection, as per merit of the case. In case permission/ any intimation to the contrary is not received within this time, the person can go ahead and fell or prune/head back the dangerous/ leaning tree and intimate the concerned Tree Officer (DCF) within 24 hours of such felling or pruning/ head backing.
13. There are three (3) Deputy Conservator of Forests (DCFs) who are designated as Tree Officers to look after the cases of tree felling or pruning/ head backing and accord permissions for the same, after inspections, as per merit of the case. Their respective jurisdictions in Delhi are shown in table below.



S.N.	Name of the Division	Name of the Revenue Districts	Name of the Sub-division
1.	North Forest Division	North	Model Town, Narela & Alipur
		North West	Rohini, Kanjhawala & Sarawasti Vihar.
		West	Punjabi Bagh, Patel Nagar & Rajouri Garden.
		North East	Seelampur, Yamuna Vihar & Karawal Nagar.
		East	Gandhi Nagar, Preet Vihar & Mayur Vihar.
		Shahdara	Shahdara, Seemapuri & Vivek Vihar.
		Central	Civil lines
2.	West Forests Division	South West	Dwarka, Najafgarh & Kapashera
		New Delhi	Chankyapuri, Delhi Cantt. & Vasant Vihar
3.	South Forest Division	South	Saket, Hauz Khas, Mehrauli
		South East	Defence Colony, Kalkaji & Sarita Vihar
		Central	Kotwali & Karol Bagh.

14 Pruning/ pollarding/ burning/ lopping/ applying arboricides or damaging a tree in any other manner would be considered as tree offence when, as per ocular estimation of such damage, the Tree Officer, in all his wisdom, holds that such act is likely to lead to the death of the tree, in near future.

15 If a tree standing on any govt. land/ road side/ private land/ building is considered dangerous and likely to cause damage to life or property, or hindrance to traffic signals, it should be pruned immediately by the concerned Civic Agency and informed to concerned Tree Officer within 24 hours and for which no permission is required from Tree Officer.

  
Deputy Conservator of Forests (HQ)/  
Member Secretary (Tree Authority)

F.No.8(193)/CF/TA/07-18/Part file/18-19/8473-80


Dated: 01/10/19

Copy to:

1. All DCFs for information
2. All DROs/ Forest Guards for information.
3. The Director (Hort) of all Civic Agencies viz. MCDs/ NDMC/ DDA/ PWD/ CPWD etc.
4. Notice Board
5. Programmer, Environment Department, GNCTD with a request to upload on the official web site of the Department.

**Distribution:**

1. Secretary to Hon'ble Minister (E&F), GNCTD for information.
2. PS to Principal Secretary (E&F), GNCTD for information.
3. PCCF/ HOD, GNCTD for information.

  
Deputy Conservator of Forests (HQ)/  
Member Secretary (Tree Authority)

Page 3 of 5

**FORM 'B'**  
**(See sub-rule (1) of rule 4)**

The Tree Officer,

.....

.....

Sir,

I apply for grant of permission for felling tree/s located in the property situated in the village ..... and District ..... I furnish below the following details in support of my application:-

- i. Applicant's name and address (In block letters).
  - ii. Name and address of the owner of the property (if different from applicant).
  - iii. Title of the applicant i.e., whether owner/occupant of the property, etc.
  - iv. Name of the village and khasra number of property.
  - v. Total area of the property with description of the boundaries.
  - vi. Total number of trees (specieswise) whose trunk or body is not less than 5cm in diameter at a height of 30cms from the ground and whose height is not less than one metre from the ground.
  - vii. The exact area (in sq. metres) from which felling of trees for which permit is sought (description of the boundaries).
  - viii. Total number of trees to be felled.
  - ix. Trees to be felled are numerically numbered in paint, their girth measured at a height of 1.35 metres from ground level and their details specieswise are.

Species	No.	Girth
---------	-----	-------
  - x. Purpose for which the felling of trees are intended.
  - xi. Intended use of felled trees (e.g.) for sale, for domestic use, etc.
  - xii. Intended use of land after felling of trees.
  - xiii. Number and species of trees intended to be planted after felling (give details of arrangement for raising, planting and protecting trees).
  - xiv. Name /s and address/es of the owners/occupants adjoining property/ies.
2. I am enclosing an affidavit and below mentioned papers in support of my application.

## CHAPTER - 22

# DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS PREPARATION OF FLORAL TABLEAU

Republic day celebration is the responsibility of the Ministry of Defence, Government of India. Ministry of Defence circulates its letter for the preparation of different tableau to the various states and some of the Ministries for the Republic day celebrations in each year. Our Ministry receives this letter in the month of May then this work is assigned to CPWD, and till the month of June, it comes to the Directorate of Horticulture. Director of Horticulture assigns the duty of a particular division for the fabrication of the floral tableau. Normally, six sketches of themes are being submitted to the Ministry of Defence by the month of July as per their guidelines. Then discussion regarding the theme of the floral tableau being discussed before the tableau expert committee. Expert committee suggests their view points regarding the theme, colour scheme and its suitability to the occasion. Then department has to make rectification in the theme, colour scheme, etc. as desired by the tableau expert committee. After they get satisfied with our proposal then we are being asked for the preparation of the model. Then again meeting takes place regarding the selection of model and expert committee suggests their view points regarding the model. After the model being selected by the tableau expert committee then the department is asked to submit music with relevant to the theme and model. Then again meeting takes place regarding the selection of music, if any suggestion comes then music is also modified as per the view points of expert committee. After the theme, model, music and colour scheme being cleared by the tableau expert committee then the department gets ready for the

preparation of floral tableau for the Republic day celebrations.

Director of Horticulture selects the site for the preparation of floral tableau by taking concern of all the sensitivity and security angles of the Republic day celebrations. In the last week of December the department gets a new tractor along with a trailer from the Ministry of Defence (OSD, RR Camp), duly received by the Assistant Director Horticulture and Section Officer Horticulture in-charge of the floral tableau. The whole arena of the fabrication site is being taken by DCP (PM security), Delhi Police and the site is being monitored by CCTV round the clock as per the security norms. Director of Horticulture convenes a meeting of whole department and takes the view points of everyone regarding the availability of flowers and other suggestions regarding fabrication of floral tableau. Thereafter duties are being assigned to all the Horticulture Divisions situated at Delhi. In the first week of January skeleton work starts thereafter wire mesh and mossing works starts. Mossing is done and it is being watered regularly for the conservation of moisture so that longevity of the flowers may be ensured. On 23<sup>rd</sup> onwards collection of flowers starts and the pinning of the flowers starts on 25<sup>th</sup> morning and entire Horticulture department works during this occasion as per the duties already assigned to them and it completes around 11:00 PM in the night. A dinner is also being hosted by the Director of Horticulture for all those who are involved in the fabrication work during this occasion, all the senior officers of the CPWD including Director General and Secretary, Ministry of



Urban Development also grace the occasion with their presence. CPWD floral tableau is continuously winning special prize since year 2007 and in the year 2007 this floral tableau won four prizes i.e. Special prize, Best theme,

Best colour scheme and Best presentation. Probably this floral tableau is one of the longest floral fabrication work where this much infrastructure, floral craftsmanship and skilled man power is involved.

## CPWD TABLEAU- 2000

### Theme : Basant

The theme of the Floral Tableau of the year 2000 is 'Basant' depicting Ideas of rejuvenation, renewal, regrowth. Basant festival is celebrated to mark the preliminary preparations for the arrival of spring. The beautiful Tableau shows the colour yellow represents good fortune, spirituality, the ripening of the spring crops and the recent harvest. Yellow flowers are used in abundance to decorate the places of worship. In the Tableau Garden adornments like Fountain

and patio adding the beauty. This design and concept re beautiful depicted in this tableau.

The Tableau describes plants and animals compliment and supplement with each other and truly depict the quotes i.e. spending time in nature is energizing.

Chrysanthemum, Carnation, Rose, Gladiolus and Marigold are blended on the Tableau in a way that perceives a natural landscape.



2000 (BASANT)

## CPWD TABLEAU- 2001

### Theme : Shanti Sandesh

The theme of the Floral Tableau of the year 2001 was “Shanti Sandesh” showing three monkeys of Mahatma Gandhi depicting moral gestures-see no evil, speak no evil, and hear no evil.

The rear part of tableau shows the portrait of mahatma Gandhi decorated with beautiful white colour chrysanthemum flowers gives the message of peace and purity. The front portion of Tableau shows the Teen Bander of Mahatma Gandhi. These monkeys have

come to resemble our actions or observation, listening, and speaking which depicts don't see flaws in every one, don't listen irrelevant things don't speak any things that hurt others. Always look for the good in people and believe in truth.

The beautiful flowers of different varieties of Lily and Asparagus are used in the Tableau which gives message of renewal, growth, and hope.



2001 (SHANTI SANDESH)



## CPWD TABLEAU- 2002

### Theme : Ghar

The theme of the Floral Tableau of the year 2002 was 'Ghar' depicting Home, a place of happiness, peace and harmony happiness lies within individual but home environment also plays very crucial role this tableau depicts that happy home is one which is surrounded by aesthetic view. Money is not the secret of happiness.

Floral Tableau decorated with beautiful colours of Gerbera flowers. Yellow marigold usage on the Tableau representing passion and creativity. The trees all around the houses keeps the macro environment cool and brings happiness and positively.



2002 (GHAR)

## CPWD TABLEAU- 2003

### Theme : Chatur Khargosh

The theme of the Floral Tableau of the year 2003 was 'Chatur Khargosh' indicates popular story about clever Rabbit and foolish Lion. In this story a greedy lion started killing animals in the forest indiscriminately and to bring an end to this animals decided to sacrifice themselves by volunteering one animals every day. The wise rabbit let the lion towards the deep well and showed his reflection in water as claimed as his competitor. Foolish lion in the well to attack

his competitor and lost his life. Thus the wise rabbit saved the inhabitant of the forest. The story gives the moral 'Wit is superior to brute force'. The front part and the rear part of Tableau shows the Lion stands on the deep well waiting the animals.

On the Tableau the diversity of animals made from the flowers of various colours giving the look of forest whereas other things are given natural colour. All the decorations are made with fresh flowers.



2003 (CHATUR KHARGOSH)



## CPWD TABLEAU- 2004

### Theme : Teej

The theme of the floral tableau of the year 2004 is “Indian Festival Teej”, which showcases Indian Culture and Happiness. The very colourful festival of Teej is presented through tableau by CPWD. The Teej festival welcome monsoon season and monsoon and primarily dedicated to Goddess Parvati and her union with Lord Shiva. It is celebrated throughout the country.

The front trailer has a depiction of an elephant howdah, the throne where king ( Maharaja) used to sit. Two peacocks placed at side of this trailer, representing monsoon season

festival teej. The attached trailer shows a group of womens in traditional costumes, dancing on the folk music and welcoming monsoon.

Blemish- free flowers are selected to create the display, of the theme with floral rangoli two elephants on the sides of the trailer posing in welcome manner. Chrysanthemums, marigolds, gladioli, anthuriums, different varieties and many types of foliage plants are used to bring out this showcase of indian culture and happiness.



2004 (TEEJ)

## CPWD TABLEAU- 2005

### Theme : Chatur Bandar .

The theme of the floral tableau of the year 2005 is “Chatur Bandar”, Intellectual mind of monkey. It depicts the story of clever monkey and foolish crocodile which is believed to be featured in the Panchatantra, folk tales written by an Indian scholar Vishnu Sharma. The crocodile and monkey become friends after the later offers berries to the former. The crocodile’s wife gets jealous of this friendship and demands her husband to bring her the heart of monkey. Being persuaded by her, the crocodile tricks the monkey to come with him for dinner at his place. Once they reach the middle of river, the crocodile spills his plan.

At this point, the monkey stays calm and thinks wisely. He devises a plan, and tells the crocodile that he keeps his heart safe on tree. The crocodile falls for this scheme and takes the monkey back to his tree, for retrieving the heart. Once home, the monkey flees to the top of the tree and bids farewell to crocodile and his friendship.

Different scenes of this story are depicted on the tableau, Blemish- free flowers are selected to create the whole scenery, also shown floral rangoli. Chrysanthemums, marigolds, gladioli, ferns and berry trees are used to bring out the story of ancient wisdom.



2005 (CHATUR BANDAR)



## CPWD TABLEAU- 2006

### Theme : Sagar Sampada

The theme of the floral tableau of the year 2006 is “Sagar Sampada”. The Indian Ocean is the largest which surrounds India from three sides. These ocean has conserved many natural including shall resources coral reefs, fungi, and mineral resources. Ocean provides marine life to abundant aquatic organisms and supports livelihood to millions of people. But due to climate change and global warming , ecosystem of marine life is in danger. Lots of marine species are being extinct due to water. This tableau giving

the message to save the wealth of marine ecosystem.

The front part of tableau showed octopus crafted with flowers. The mid, rear and side portion of trailer showed different types of marine fishes, sharks, coral reef, turtles, marine mammals and many more benthos and planktons. Ocean is depicted by using blue coloured flowers and other marine organisms are beautifully crafted with different types of flowers and foliages.



2006 (SAGAR SAMPADA)



## CPWD TABLEAU- 2007

### Theme : Nanhi Duniya

The Tableau depicts children in moods and is intended to get them identified with the Republic Day Celebration.

Placed on the tractor are a happy boy and a girl with a pet rabbit in the background. A number of slides, swings and children in playful moods have been shown scattered all over the trailer.

On the both side panels of the trolley has been fascinated by showing the famous

Panchtantro story. The story is based of the theme “Slow and Study win the race” In which a rabbit following a tortoise which is leading the race. Other than rest of the animals watching the race.

Natural flowers will be lavishly used to create an eye pleasing experience. Children and Parents characters are live, while the cartoon characters and other things are created out of floral designs.



2007 (NANHI DUNIYA)

## CPWD TABLEAU- 2008

### Theme : 60th years of Independences

This Floral Tableau is depicting patriotism unique cultural heritage made up to colourful and fresh flowers. This Floral Tableau also won special prize among the Tableau which

paraded in the Republic Day Celebration 2008. Natural flowers had been lavishly used to create and eye caching experience.



2008 (60<sup>th</sup> YEARS OF INDEPENDENCES)



## CPWD TABLEAU- 2009

### Theme : Toy and Games

This year CPWD Floral Tableau is depicting Toys and games.

The Tableau leads with first Indus valley Toys. Indus Valley people seem to have loved toys.

They made many toys, such as toy Bird, toy monkeys that could slide down ropes.

On the trailer part has been shown different type of toys like wooden toy, terracotta toys,

and chess, modern Bat and ball kite. Middle part of the trailer shows the children's playing and enjoy with toys.

The tableau would be crafted in flowers in their natural colours.



2009 (TOY AND GAMES)

## CPWD TABLEAU- 2010

### Theme : Global Warming

This year CPWD Floral Tableau is depicting effect and solutions of Global Warming. These days hardly a day goes by without a news story reporting an aspect of global warming. The Tableau leads the reasons of global warming. Hence burning earth has been shown on the front part of the Tableau. Deforestation, industrial and traffic pollution, the land pollution by throwing garbage is shown on the side part of the tractor. On the trailer part has been shown plant new trees and preserves existing trees. Middle part of the trailer shows the activities, a teacher

educating children to grow more trees to keep the environment clean. We educate children to be eco- friendly and to protect our environment. Back part of the trailer show the lovely glaciers where young children are enjoying the nature's beauty. On the side panel it has been shown that animals are moving freely around the protected environment. The tableau would be crafted in flowers in their natural colours.

**WHEN WE HEAL THE EARTH, WE HEAL OURSELVES.**



**2010 (GLOBAL WARMING)**



## CPWD TABLEAU- 2011

### Theme : Save The Tiger, Save Earth

These days hardly a day goes by without a news story reporting an aspect of save tigers. India has been home to Tigers for a very long time. Tigers were found all over India and still as many as 16 States of India are home to the Tigers. The latest census report released on 12th. February, 2008 by the Government of India reports that there are **only 1411 tigers left**.

The population of the Tiger has been reduced by nearly 50% and that too in a period of 6 to 7 years. It is time that emergency and drastic steps are taken to save the pride of jungle and pride of India from becoming extinct. Agriculture, industrialization and degradation and fragmentation of natural habitats, forests and natural grasslands are one of the main reasons for the decrease of Tiger population and for that matter all wildlife in India. The immediate effect of this is lack of natural food and habitat causes the wild animals to come out of the forest area.

If we make sure tigers live, we will have to make sure that deer, antelope and all other

animals that the tiger eats or its prey base live. To make sure that these herbivores live, we must make sure that all the trees, grass and other plants that these prey animals need for food are protected. In short, in this way the whole forest gets saved! Saving the tiger means indirectly saving the forests and in turn saving the environment that is reeling under global warming due to massive deforestation. Not only is tiger a beautiful animal but it is also the indicator of the forest's health. Saving the tiger means we save the forest since tiger cannot live in places where trees have vanished and in turn secure food and water for all. This year CPWD Floral Tableau is depicting the save tigers. The Tableau leads tiger kids playing and enjoying the natural habitats, forest and natural grassland. Shown at the front part of the trailer. The rear part of the trailer the pear of tiger setting on rock in its full wild majesty its natural beauty. The tableau would be crafted in flowers in their natural colour.



**2011 (SAVE THE TIGER, SAVE EARTH)**



## CPWD TABLEAU- 2012

### Theme : Snow Valley

This year CPWD Floral Tableau is depicting SNOW VALLEY a beautiful landscape of north India. These days hardly a day goes by without a news story reporting an aspect of global warming. There is no doubt that global warming is felt in many ways now and this will worsen. Effects are, and will, be increasingly noticeable in these areas.

We educate children and tourist to be eco-friendly and to protect our environment. All the activities show the people are having fun

and enjoying in fresh nature. On an average snowfall patterns have changed across the glaciers are melting rapidly. To stop deforestation and to protect our environment.

The trailer shows the lovely glaciers where young children are enjoying the nature's beauty. The tableau would be crafted in flowers in their natural colours. The tableau is intended to make an extremely eye pleasing experience by using natural flowers lavishly.



2012 (SNOW VALLEY)

## CPWD TABLEAU- 2013

### Theme : Seasons (Ritus)

C.P.W.D. Floral Tableau is depicting the cycle of seasons (Ritus). Front portion of the Tableau displays “Vasant Ritu” (Spring season), Shown by dancing boy and girl. The front part of the trailer is showing “Grishma Ritu” (Summer season). Middle part of the trailer is showing “Varsaha Ritu” (Monsoon season) depicted as dancing peacock

and water fall, after that deciduous tree is shown in “Sharad Ritu” (Autumn season), followed by bonfire by the live characters under “Hemant Ritu” (Pre-winter) and snowy mountain under “Sisir Ritu” (Winter season). The whole Tableau is crafted by beautiful and vibrant colorful fresh flowers.



2013 (SEASONS - RITU)



## CPWD FLORAL TABLEAU -2014

### Theme : Rajpath

The theme of the floral tableau of the year 2014 is “Rajpath” illustrating the landscape beauty of Rajpath. Rajpath which means the Royal Path. It is a ceremonial venue located in the heart of New Delhi, the capital of India. Rajpath runs from the Rashtrapati Bhawan on Raisina Hills on one end to the National Stadium on the other end and passes through Vijay Chowk and Inda Gate. Rajpath is also popularly referred as “The Rajpath”. Rajpath is surrounded by beautiful and lush green lawns, rows of trees and canals on the both sides.

The Front part of the tableau illustrating the India Gate made up of different flowers

and leaves. The flower which is used in front tableau are: orange and yellow (marigold), white and pink (anthurium), pink (carnation), orange (French marigold) and green asparagus. Middle tableau shows the running water in the form of fountain covered with blend of flowers in all around. Boy, girl, man, women, couples are shown in middle of tableau close to fountain to make a picturesque image of Rajpath. On the background the parliament is designed with the use of orange and yellow colour marigold flowers and ferns and green plants on its side. The whole picture of the floral Tableau is a masterpiece.



2014 (RAJPATH)



## CPWD FLORAL TABLEAU -2015

### Theme : Maa Ganga

The theme of the floral tableau of the year 2015 was of “Maa Ganga”. The Ganga is the most sacred and longest river of India. This river originates from Gangotri, and passes through across country and falls into Bay of Bengal. It is lifeline of millions people who live along its course. Govt has launched Namami Ganga programme to clean the Holy Ganga.

The front part of tableau symbolizes kalash decorated with beautiful flowers depicts the Holy Ganga Jal. Middle of trailer showing the peoples enjoying on the bank of river. The rear part of tableau is designed like beautiful Gangotri glacier of Himalayas from which holy river emerges and also Kedarnath temples. The whole tableau were crafted with green foliage and flowers to give picturesque view.



2015 (MAA GANGA)

## CPWD FLORAL TABLEAU -2017

### Theme : Clean India Green India

The theme of the floral tableau of the year 2017 was of “Clean India Green India”. During 2014, Hon’ble Prime Minister launched the Swachh Bharat campaign which is the largest cleanliness drive in the history of India aims to achieve the vision of a ‘Clean India ‘ by 2<sup>nd</sup> October 2019. As a part of Swachha Bharat Abhiyan, Clean India , green India, initiated. cleanliness is a clean habit which is very necessary for all of us. This is also habit of keeping ourselves physically and mentally

clean including our home, pets, surroundings, environment, office, school etc.

The rear part of tableau showed a hermit was doing meditation near mountains area that promotes healthy minds are developed in clean environment. The whole tableau were crafted with green foliage symbolizes to promote the greenery that leads to cleaner and pure air.



2017 (CLEAN INDIA GREEN INDIA)



## CPWD FLORAL TABLEAU -2018

### Theme : Diwali

The theme of the floral tableau of the year 2018 is of “Festival of Diwali portraying lighting festivity” depicting the message of Peace and Happiness. Diwali is the festival of victory of light over darkness, good over evil, joy and happiness. It has been celebrated for welcoming Lord Rama return to his kingdom Ayodhya after staying in exile for fourteen years. To mark the occasion, people lighted lamps and decorated whole Ayodhya with diyas. the ideas behind lighting diyas and fireworks on the day of Diwali is to spread

the light of positivity in the world, despite the darkness of negativity.

The trailer part of tableau symbolizes temple decorated with beautiful flowers lightened with diyas. The middle part symbolizes people were greeting each other with happiness, joy and sweets. the back part of tableau represents Kingdom Ayodhya, decorated with flowers and lightened with diya. Whole tableau beautifully represents peace and happiness. Side of tableau were decorated with blends of different colours of flowers.



2018 (DIWALI)



## CPWD FLORAL TABLEAU -2019

### Theme : Dandi March

The year 2019 is being celebrated as 150<sup>th</sup> birth anniversary of Father of Nation. Therefore the theme of the Floral Tableau of year the 2019 is “Dandi March” movement started by Mahatma Gandhi and Title is **“VANDE MATARAM”**. In this floral tableau different varieties of flowers, foliage and ground covers have been used. Different flowers like chrysanthemum, marigold, liliun, gerbera, china aster and many more have been fixed up by the skilled men to make JHANKI a perfect masterpiece.

Marigold and Chrysanthemum are used to frame the Gandhi Ji figurine which spread the message of “Unity in Diversity” and “Non-violence” during Dandi March (1930). The middle part of tableau is our national flag “Pride of Nation” beautifully decorated with flowers and foligae. The Back Part of tableau is symbolized by Pigeon decorated with white chrysanthemum over the globe, spread the message of peace across the world. The “charkha” was beautifully decorated by marigold represents the Gandhi jis ideology.



2019 (DANDI MARCH)



## CPWD FLORAL TABLEAU -2020

### Theme : KASHMIR SE KANYAKUMARI

Sare jahan se accha, Hindostan hamara hum bulbulen hain is ki , yeh gulsitan hamara.

Indian has different religion, different language, different culture but known for unity  $\frac{1}{4}$  vusdrk esa , drk  $\frac{1}{2}$ - This year the CPWD Horticulture tableau is depicting the nation "KASHMIR SE KANYAKUMARI" and different parts of country are shown at floral decorated tractor and trolley.

On the trailer it represent natural landscape of Kashmir valley, dull lake where tourists are enjoying on "Shikara" which is part of tourist attraction.

On the front part of the trailer represents **Sanchi Stupa**, which is one of the oldest stone structures in Sanchi at Madhya

Pradesh. Spreading the message of peace and love.

The tractor enhances the southernmost point i.e. Kanyakumari surrounded by the sea, a memorial of Swami Vivekananda.

Besides their other part of country lake Rajasthan represents the western part of the subcontinent holds up the side panel of the tractor and binding all these elements with Jahaj of desert.

Apart from this the ground artists will showcase different religion representing unity and integrity.

The tableau crafted with their identical places in flowers in their natural colours.



2020 (KASHMIR SE KANYAKUMARI)

## CHAPTER - 23

### WINTER SEASONAL FLOWERS

The winter season in India starts from the month of October and continue till the month of March. This is the season when the flowering plants bloom and fill the dull landscape with their vibrant and eye soothing colours. It is up to the choice of the gardener, what variety he wants to grow. Definitely he should be aware that the variety that he chooses should be suitable with his land conditions for a perfect bloom. The conditions required for a great bloom may involve different light requirement depending on their variety, i.e. full, semi shaded or shade, most winter annual flowers require full sun and water throughout.

The characteristic feature of every winter flowering plant would be their striking appearances and a colourful display of flowers. Annual flowers and plants live their complete lifecycle in one season and once they start to flowering they continue blooming, some just until they have produced seed other until the weather is incompatible for their growth/ survival. You should intend filling the colourless places in the garden with colourful flowering plants. Winter can be dull if we have not prepared for it with the grey skies and so many plants dormant. Winter annual flowers can be a fantastic way of filling gap in the time between dormancy and spring with sparky colours. Fortunately, North India offers a very rich variety of winter annuals to choose and to arrange them in order to create a colourful display in the garden. There are two ways to grow them, firstly from seedlings which grow in seed pans secondly by directly sowing seeds in beds or pots.

No joy in this world would match the level of joy to gaze upon the seedling sown by you, break first into a bud and then blossom into a riot of colours, an unsurpassed beauty that only Mother Nature can bestow on mankind. Sheer aesthetics apart, growing plants would take care of your contribution towards conserving our environment. This in turn would help save the fast depleting green cover on earth. So go out and plant now. Happy gardening!

Herewith are a few examples of winter annuals which are easy to grow in Indian conditions, easy to maintain and bloom into absolutely stunning flowers.

#### 1. Aster (*Callistephus chinensis*)

Asters get their name from the Latin word for “star,” and their flowers are indeed the superstars of the garden. Some the height of the plants varies from 30 cm to 75 cm according to varieties. Aster has most cheerful different colours. It requires full sun for growth. The flowers attract butterflies and drought tolerance plant and very easy to grow during winter in India.







## 2. Sweet William (*Dianthus barbatus*)

The quintessential cottage flower, pinks are treasured for their grass like green foliage and abundant starry flowers, which are often spicily fragrant. Depending on the varieties of pink, red and other colours flowers appear in late winter and continue till spring. This is used as cut flower in flower vases . Plants height varies from 10 cm to 75 cm approx. The flowers attract the humming bird, butterflies.



## 3. Petunia (*Petunia hybrida*)

Petunias are fail proof favourites for gardeners everywhere. They are vigorous growers and prolific bloomers from mid spring through late fall. Colour choices are nearly limitless, with some sporting beautiful veining and intriguing colours. Many varieties

are sweetly fragrant (sniff blooms in the garden centre to be sure.) Some also tout themselves as “weatherproof,” which means that the flowers don’t close up when water is splashed on them. Height of the plant varies from 15 cm to 45 cm according to varieties . It is more useful in pots and border of the lawn.



## 4. African marigold (*Tagetes erecta*)

There’s nothing subtle about an African marigold, and thank goodness for that! It’s a big, flamboyant, colourful punch of colour for the sunny bed, border, or pots. Mostly it finds in orange, yellow, cream and white. Plants height varies from 30 cm to 90 cm according to different varieties The foliage of the plants dark green fresh and tidy. It require full sun and a common man flower in India.





## 5. Marigold French (*Tagetes patula*)

Shorter and not as upright as African Marigolds, French Marigolds form mounds that are often wider than they are tall. These aromatic annuals are easy to grow and brighten the garden with their cheerful shades of yellow, orange and red. They grow roughly 8-12 inches high with a chic, neat, little growth habit and elegant dark green foliage. They do best in full sun with moist, well-drained soil and will flower all summer long. They may reseed, coming back year after year, in spots where they're happy.



## 6. Phlox (*Phlox drummondii*)

Annual phlox is good choice for gardeners in India because it's easy to grow and puts on such a great display for beginning gardeners who have to tackle a hot, dry spot. Remove the flower clusters as they fade to encourage more blooms and pinch the plants back in summer if they start to get leggy. Plant is grown easily in beds, pots and border etc. Height of the plants varies from 10 cm to 45 cm and has the wider choice of colour white, pink, red, blue, violet, lavender etc.



## 7. Statice (*Limonium sinuatum*)

Old-fashioned annual statice is found more often dried in crafts stores than growing in gardens. But this easy-to-grow plant is a great pick for containers or the middle of a border, especially if you want to harvest it for everlasting bouquets indoors.

The plant is also very drought-tolerant, so you can enjoy its blooms even if you forget to water it from time to time. In fact, statice thrives in hot, sunny spots with well-drained soil. The plants to be planted middle of the border and height goes to 30 cm to 60 cm. This is a wider choice of floweriest because the flowers to be used for cut flowers and dry flower.



## 8. Begonia (*Begonia valvata*)

Annual begonia is about as easy as it gets. It does well in a variety of conditions, but to keep it its most luxuriant best, give it light shade; rich, well-drained soil; and ample water. It also loves plenty of fertilizer, so be generous. The plant can be grown in semi shade or shaded area. The plant height varies from 15 cm to 45 cm according to the varieties. It is specially used in container, border as well as hillock also.



## 9. Black-eyed Susan (*Rudbeckia occidentalis*)

Add a pool of sunshine to the garden with a massed planting of black-eyed Susan. From midsummer, these tough native plants bloom their golden heads off in sun or light shade and mix well with other perennials, annuals, and shrubs. Tall varieties look especially appropriate among shrubs, which in turn provide support. Add black-eyed Susans to wildflower meadows or native plant gardens for a naturalized look. Average soil is sufficient for black-eyed Susans, but it should be able to hold moisture fairly well. The Plant ht. 60-300 cm tall, 3-11 plants, Width: 1-1/2 to 3 feet, Depending on variety flower color: Yellow or Orange Flower, Depending on variety Bloom, Time: Bloom midsummer into fall.



## 10. Calendula (*Calendula officinalis*)

The Calendula is a most common winter annuals after the African Marigold in India. Sometimes grown as an herb, cheerful calendulas look good in every garden. The cream, yellow, apricot, or orange flowers are edible, adding bright colour and tang to soups and salads. And they're great cut flowers, adding a burst of sunshine to bouquets. Cool-season annuals, these plants do best in early flowering.

They like a variety of soils but need good drainage and moderate water. Deadhead them regularly to prolong bloom. Calendula will reseed in ideal conditions. The plant requires full sun it can be easy to grow and uses for cut flowers, border plant and pot plants. Height of the plant varies from 20 cm to 75 cm according to different varieties.







### 11. California poppy (*Eschscholzia californica*)

California poppy, a native wildflower, adds an easy going dose of color hot, dry sites. Beautiful, satiny flowers in sunset colors wave above ferny, blue-green foliage. They like poor soils, especially sandy soils. If soil is too rich and moist, they won't bloom well. California poppies are a cool-season annual, which means they offer great color early in the growing season but fade once the heat of summer hits. The Plant ht. 30 cm tall , width: 1 foot wide Landscape, Easy to Grow. California poppies will reseed easily; for more plants next year, allow some flowers to ripen to seed on the plant and scatter when you tear up those plants. Replant in fall if you like, especially in warmer-climate areas.



### 12. Hollyhock (*Alcea rosea*)

The ultimate cottage garden choice, hollyhock sends up tall spires that cover themselves in flowers in beautiful colors. They're easy to grow from seed -- in fact, that's usually the only way they are found in garden centers. Most hollyhocks are biennials, that is, they grow only foliage the first year, flower the second, and die that fall. However, if you establish a stand of hollyhocks, they'll reseed each year so there will always be plenty blooming. Interestingly, the flowers open from the bottom to the top of the spike throughout the summer. These tall (up to 8 feet) beauties are ideal against fences or buildings where they can get natural support. Red forms are especially attractive to hummingbirds and butterflies. The plant ht. 90-240 cm, width. 30-90 cm, colour available. Red, Pink, apricot, yellow, levender, purple amd near black, Easy to Grow.





### 13. Cosmos (*Cosmos bipinnatus*)

The simple, daisy like flowers appear in cheery shades on tall stems that are great for cutting. The lacy foliage makes a great backdrop for shorter plants, as well. Cosmos often self-seeds in the garden, so you may only have to plant it once, though the colors can appear muddy or odd in the reseeds. The plant ht. 60-150 cm tall, 2-11 plants, width: 30-60 cm wide landscape, Easy to Grow Plant cosmos from seed directly in the ground in spring. Or start from established seedlings. This flower doesn't like fertilizing or conditions that are too rich, which causes the foliage to be large and lush but with fewer blooms.



### 14. Flowering kale (*Brassica oleracea*)

Thank goodness for kale. It's one of the few plants available to add a fresh burst of color and life to the fall landscape! Its leaves come with beautiful variegations in pinks, purples, and reds that blend beautifully with changing autumn foliage. Plant it in spring or in the fall after you tear out tired or frost-damaged annuals such as marigolds and impatiens. It likes rich, well-drained but moist soil. The

flower ht. 12-18 inches tall, width: 12-18 inches wide landscape, Easy to Grow.



### 15. Gazania (*Gazania linearis*)

This tough plant endures poor soil, baked conditions, and drought beautifully and still produces bold-color, daisy like flowers from summer to frost. A perennial in Zones 9-11 -- the hottest parts of the country -- gazania is grown as an annual elsewhere and blooms from mid-summer to frost. A summer plant often grown as an annual, gazania bears boldly colored daisy-shaped flowers from



summer to frost. The flowers appear over toothed dark green or silver leaves between varieties). Plant established seedlings outdoors after all danger of frost has passed. Do not fertilize, and keep soil on the dry side. The plant ht. 30 cm, width: 30 cm, 8-10 plant, Easy to Grow.

## 16. Geranium (Geranium oreganum)

Geraniums have been a gardener's favorite for well over a century. The old-fashioned standard for beds, borders, and containers, geranium is still one of the most popular plants today. Traditional bedding types love hot weather and hold up well to dry conditions; many offer colorful foliage. Regal, also called Martha Washington, geraniums are more delicate-looking and do better in the cool conditions of spring and fall. Though most geraniums are grown as annuals, they are perennials in Zones 10-11. Bring them indoors to overwinter, if you like, then replant outdoors in spring. Or they can bloom indoors all year long if they get enough light. The plant ht. 60 cm & width. 60 cm, Easy to Grow.



## 17. Gerbera (Gerbera jamesonii)

Gerbera daisies are so perfect they hardly look real. They bloom in nearly every color (except true blues and purples) and produce fantastically large flowers on long, thick, sturdy stems. They last for a week or more in the vase, making them a favorite of flower arrangers. This tender perennial will last the winter in only the warmest parts of the country, Zones 9-11. In the rest of the country, it is grown as an annual. It does well in average soil; it likes soil kept evenly moist but not overly wet. Fertilize lightly. The plant ht. 30 cm, width. 60 cm, 10-11 plants, Easy to Grow.



## 18. Brachycome (Brachycome iberidifolia)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking. The plant ht. 60-150 cm tall, width. 30-60 cm wide landscape, 5-8 plants, Easy to Grow.





### 19. Godetia (Clarkia amoena)

This under-appreciated annual bears the most beautiful, satiny pink or white flowers for weeks in summer. It also goes by the charming name farewell-to-spring, perhaps because it blooms just as spring temperatures are rising. Plant it once and you won't want to go a growing season without it.

Native to areas of North America, this plant does best in areas with cool summers and in moist, well-drained soil. It's a great cut flower, too. Although you can sometimes find it as established seedlings, most gardeners will need to start it from seed. Plant directly



in the ground in early spring; it dislikes transplanting. Don't fertilize. If it has too many nutrients, it will have lots of foliage and few flowers. The plant ht. 30-150 cm tall, width 30 cm wide landscape



### 20. Larkspur (Delphinium ajacis)

Larkspur is basically an annual version of delphinium, an all-time favorite perennial. Larkspur produces lovely spikes of blue, purple, pink, or white flowers in spring and summer. They look best clustered in small patches.

Like many cool-season annuals, it's a good winter-blooming plant for the Deep South.



Larkspur is so easy to grow that it often self seeds in the garden, coming back year after year. Plant larkspur from seed directly in the garden in early spring. Larkspur doesn't like to be transplanted. It prefers rich, well-drained soil and ample water. The plant ht. 60-120 cm, width. 6-12 inches, Easy to Grow.

## 21. Shirley Poppy (*Papaver rhoeas*)

The Shirley poppy was created from 1880 onwards by the Reverend William Wilks, vicar of the parish of Shirley in England. Wilks found in a corner of his garden where it adjoined arable fields, a variant of the field poppy that had a narrow white border around the petals. By careful selection and hybridization over many years he obtained a strain of poppies ranging in colour from white and pale lilac to pink and red, and unlike the wild poppies these had no dark blotches at the base of the petals. Further selection has given rise to semi-double and double forms, as well as flowers with a ring of contrasting colour around the edge: the picotee form.



## 22. Nasturtium (*Tropaeolum majus*)

Nasturtiums are so versatile. They grow easily from seed sown directly in your garden's poorest soil and blooms all season until frost and are never greedy about food or fertilizer. Nasturtiums are available in either spreading

or climbing types. Plant spreading types in large containers to spill over the sides. Plant them alongside wide paths to soften the sides for a romantic look. Use nasturtium to brighten a rock garden or between paving stones. Plant them at the edges of beds and borders to fill in between other plants and add soft, flowing color. Train climbing types up trellises or alongside fences. The leaves and flowers are edible; use them as a showy plate garnish or to jazz up salads. The plant ht. Mounding varieties from 9-16 inches, width. 12-18 inches depending on type landscape, Easy to Grow.



## 23. Mesembryanthemum (*Mesembryanthemum crystallinum*)

*Mesembryanthemum* is a member of the family Aizoaceae; like many members of this family, it is characterized by long-lasting flower heads. Flowers of *Mesembryanthemum* protect their gametes from night-time dews or frosts but open in sunlight. There is an obvious evolutionary advantage to doing this; where sun, dew, frost, wind or predators are likely to damage exposed reproductive organs, closing may be advantageous during times when flowers are unlikely to attract pollinators.





#### 24. Paper Flower (*Helichrysum petiolare*)

This plant is attractive to bees, butterflies and/or birds, Average Water Needs; Water regularly; do not overwater Self-sows freely; deadhead if you do not want volunteer seedlings next season. This plant is resistant to deer Flowers are good for drying and preserving Suitable for growing in containers Height: 6-12 in. (15-30 cm) Width: 12-18 in. (30-45 cm)



#### 25. Corn Flower (*Centaurea cyanus*)

The annual blue cornflower is a slender plant of great charm. Its rich shades of blue are much sought after, both for garden

decoration and for flower arrangements. Garden varieties have added red, pink, lilac and white to the colour range, and even bright yellow is available in the closely related sweet sultan *Amberboa moschatus*. The wiry plants may need some discreet support, and deadheading helps to prolong the flowering season, as does autumn sowing, an option that will produce larger, earlier-flowering plants. This fully hardy plant requires a sunny site, growing in most well-drained soil types, even poor soil. The plant Height: 90cm, Spread: 30cm, Time to plant seeds: March to May.



#### 26. Salvia (*Salvia splendens*)

“Annual” salvia is a tender tropical perennial that is typically grown as a warm weather annual bedding plant. It has long been a garden standard, reliably blooming over an extended period. Ever more varieties are being developed, giving a wide range of colors, including white, salmon and purple, as well as the traditional bright red, and heights from about 8 in (20 cm) to nearly 3 ft (0.9 m).



Leaves are bright to dark green, elliptical and toothed. Flowers grow on spikes and are two-lipped, with a flat lower lip and helmet-shaped upper lip.



### 27. Cineraria (*Cineraria longipes*)

These are herbaceous perennials that are often grown as annuals. There are three basic types: the large-flowered; the stellata or Star-flowered; the intermediate, with flowers similar to the stellata and having the compact growth of the large-flowered; and the dwarf intermediate strain, growing 1-foot tall and having a compact, free-flowering growth. They all come in a wide range of colors. There are two main types of the tall, small-flowered Cinerarias. The most popular is the Star-flowered, which produces an abundance of small flowers in blue, pink, salmon, white and other hues. The large-flowered Cinerarias come in a brilliant array of colors. Mixed seeds of a good strain will provide flowers in blue, purple, rose, pink



and other gorgeous colors, many having noticeable white sections.



### 28. Pansy (*Viola tricolor*)

The pansies are a large group of hybrid plants cultivated as garden flowers. Pansies are hardy annuals whose flowers have “faces.” These plants offer colorful flowers for any season in your garden. They have one of the widest ranges of colors and are good for containers, borders, and ground covers.



### 29. Verbena (*Verbena brasiliensis*)

Verbena is a spreading plant ideal for cascading over retaining walls, pots, baskets, and window boxes. As long as the soil is extremely well drained, verbena will reward gardeners with countless clusters of small



blooms all season. It's fairly drought-tolerant, making it a great choice for hanging baskets, rock gardens, planting in cracks between stones, and other tight places. The plant ht. From 9 to 18 inches tall, Width: From 12 to 20 inches Landscape, 7-9 Plant.



### 30. Nemesia (Nemesia violiflora)

Nemesia is a charming cool-season annual with pretty little snapdragon-shape flowers -- often fragrant -- that bloom in a wide range of colors. It does best in spring and fall (winter in mild-winter climates), though



some varieties have better heat-tolerance than others. In cool-summer areas, such as the Pacific Northwest, nemesia will continue to bloom right through the summer into fall. Nemesia prefers moist, well-drained soil that's rich in organic matter. The plant ht. 60 cm, Width: 60 cm blooms best in spring and fall Landscape.

### 31. Candy Tuft (Iberis gibraltarica)

Sparkling white candytuft, with its cool evergreen foliage, brightens any rock garden or wall for several weeks in spring. At bloom time, plants are covered with umbels of pure white flowers that fade to pink. Compact selections are now available. Where happy, this plant will spread. Supply good drainage, and cut back spent flowers to keep plants neat. The plant ht. 30 cm, width 8-16 inches, 5-9 Plants, Easy to Grow.



### 32. Antirrhinum (Antirrhinum majus)



Season Winter Name Antirrhinum Common Name Snapdragon, dwarf Description These are bright, jolly flowers and look great in the garden or in big flower pots. If you look at their flowers carefully they look like a dragon's mouth! They like a sunny position in any garden soil. Seeds can be sown from January to March.

### 33. Tulip (Tulipa tarda)

The tulip is one of the most popular garden flowers. Tulips are hardy and require little care. Some types of tulips bloom for years, once established. Tulips generally are divided into 15 different classes, which vary



in appearance and season of bloom. The early bloomers include single early, double early, kaufmanniana, and fosterana tulips.

### 34. Carnation (Dianthus caryophyllus)

The old-fashioned carnation name pinks comes from the serrated flower edges, which look as if cut with pinking shears. And the name of the color pink is said to come from these perennials, which have been popular in gardens for hundreds of years. The many dianthus species and hybrids come in red, white, orange, purple, cranberry, and of course, many shades of pink. Flower size ranges from less than an inch to several inches wide, and height ranges from just a few inches to several feet tall. How to grow: Dianthus prefers average to rich well-drained soil in full or nearly full sun. Refresh older plantings by dividing and resetting plants every few years.



### 35. Alyssum (Lobularia maritima)

Sweet alyssum, with its dainty, fragrant flowers, is often used in containers and hanging baskets to spill over the edges,



creating a soft, frothy look. It's also a great edging plant because of its tidy, compact habit. Regardless of how you use it, sweet alyssum does best in spring and fall's cool conditions (or use it for winter color in very warm climates). In cool-summer conditions, such as the northern third of the United States, sweet alyssum will bloom steadily through the summer. It halts bloom in summer in warmer areas. The plant ht. 8 inches tall, width 30 cm, Easy to Grow.



### 36. Stock (Matthiola incana)

Stock is best known for its spicy, sweet fragrance and as an excellent choice for flowerbeds and cut flower arrangements. Depending on the variety, stock can grow from about a foot tall to almost three feet, making it a versatile choice for any garden bed. Use taller varieties towards the back of a design to add height, or smaller ones towards the front so you can better admire their scent and their wide range of colors; stock is available in shades of white, yellow, purple, pink, peach, and red. While many varieties are single, meaning that they have four petals per flower, some are double, giving them a softer, more ruffled and romantic appearance.



### 37. Primrose (Primula malacoides )

Take a walk down the primrose path and you'll never look back! Primroses are a classic cottage flower and are popular with collectors. They covet the hundreds of different primroses available, especially some of the tiny rare alpine types. Many are staples of cottage gardens and rock gardens, while others provide spring color to damp places, rain gardens, and bog gardens. Their basal rosettes of oval leaves are often puckered or are very smooth. The colorful flowers may be borne singly or rise in tiered clusters, or even spikes. Provide humus-high soil that retains moisture and some shade for best results. The plant ht. 2 inches, width 4 inches, colour whites, pink, lavender, purple red, yellows, orange and green, 2-8 plant, Easy to Grow.



### 38. Dianthus (Dianthus caryophyllus)

The species are mostly herbaceous perennials, a few are annual or biennial, and some are low subshrubs with woody basal stems. The leaves are opposite, simple, mostly linear and often strongly glaucous grey-green to blue-green. The flowers have five petals, typically with a frilled or *pinked* margin, and are (in almost all species) pale to dark pink. One species, *D. knappii*, has yellow flowers with a purple centre. Some species, particularly the perennial pinks, are noted for their strong spicy fragrance.



### 39. Daisy (Bellis perennis)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking.

Light: Sun, Part Sun Zones: 5-8 Plant Type: Perennial Plant Height: 20-30 cm

tall Plant Width: 1-2 feet wide Landscape Uses: Containers, Beds & Borders Special Features: Flowers, Attractive Foliage, Cut Flowers, Dried Flowers, Attracts Butterflies, Drought Tolerant, Easy to Grow.



### 40. Asiatic Lilies (Lilium chalcedonicum)

Asiatic lilies are one of the most beautiful flowers that you can grow. I love to walk in the garden and see the new blooms and my garden just wouldn't be complete without them. These are my favorite flowers next to daylilies which aren't really lilies at all. Here you will find all the information you need to grow asiatic lilies.

Once you plant lily bulbs or plants they will give you pleasure for years to come and multiply and become even more beautiful. They are grown from a hardy bulb that multiplies quickly and takes little care. They come in many sizes, heights and shapes. Lilies are called bulbs but are really tubers with fleshy scales that never go into



dormancy like other bulbs that you might be familiar with.



#### 41. Gladiolus (*Gladiolus angustus*)

Gladiolus is a perennial favored for its beautiful, showy flowers. Its flowers grow on tall spikes and are often found in cutting gardens or in the back along the border (because they are tall). Gladioli have many different colored flowers, and grow between 60 to 180 cm in height. It's good for cut flowers.



#### 42. Hyacinths (*Hyacinths orientalis*)

Hyacinth bulbs are planted in the fall and borne in spring. The Victorians revered hyacinths for their sweet, lingering fragrance, and carefully massed them in low beds, planting in rows of one color each. The loose to dense racemes of strongly fragrant flowers are closely packed with tubular-bell-shaped, single or double flowers. As well as growing in the ground, colorful hyacinths are excellent for forcing in containers and some are available for early flowering indoors.



#### 43. Dahlia (*Dahlia variabilis*)

Planting dahlias in a spot that gets at least eight hours of direct sunlight a day. In dry, hot-summer climates, choose a spot that provides direct sun from the morning into midday, offering shade or filtered shade by the hottest part of the late afternoon.

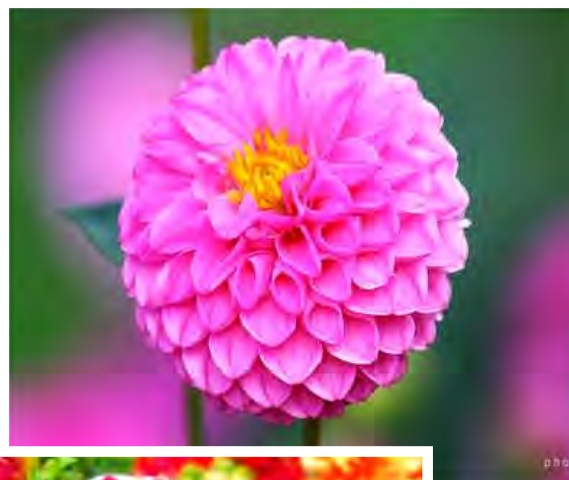
Like potatoes, dahlias grow from tubers so good soil preparation is key to best performance. Loosen or dig soil to a depth of about 10 inches. Your soil should be easily worked and offer superb drainage. If you have heavy soil, amend with peat moss, compost, or aged cow manure.

Planting is a good time to incorporate an organic fertilizer with an N-P-K ratio of 5-10-15 or 5-10-10, 10-20-20, or 0-20-20. The higher middle number -- phosphorous -- assists with bloom production. The third number -- potash or potassium -- helps root development. Any fertilizer recommended for vegetables can be used for dahlias.

Although you can start dahlias from seeds, it's easiest to begin with tubers. After the soil is prepared, dig a hole 4-6 inches deep, lay the tuber horizontally, and cover with soil. If you're planting several dahlias, grow the smaller varieties 9-12 inches apart. Taller dahlias can be spaced 2-3 feet apart, or half their final height (some can grow taller than 6 feet, so be prepared!).

Except in hot climates, don't water the tubers until the first shoots and leaves appear. Because the surface of the ground needs to stay warm (at least 60 degrees F) for the tubers to sprout, avoid mulching until the plants are actively growing.

Once the plants are established, add mulch to conserve moisture and prevent weeds. Because dahlia roots are shallow, pulling large weeds can easily disrupt the roots, so pull weeds only by hand when they are still small. Avoid using chemical weed controls and weeding instruments like hoes because they kill dahlia roots.





## A - Flowering Winter Season Annual

**Sowing time : October - Novemebr except those marked with asterisks**

**All raised by seed - Other methods used are mentioned in column 9 )**

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	2	3	4	5	6	7	8	9
1	Acroclinium	Acracelinum album A roseum (Compositae)	Both	Situ	7.5-15	30-60	White, rose colour	Flowers may be single or double, keeping colour and form even dry.
2	Agreratum	Ageratum houstonianum (Curciferae)	Both	Transplanted	20-25	30-45	White and Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
3	Alyssum (Madwort)	Lobularia maritima Sym Alyssum maritimum (Curciferae)	Both	Transplanted	05-10	15-25	White, yellow and pink	Sweet scented flower as of candytuft. Suits well a long the edge of a flower-bed or a rocky. Suitable for hanging baskets.
4	Anchusa	Anchusa capensis (Boraginaceae)	Both	Transplanted	15-20	45-60	Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
5	Antirrhinum (Snap dragon)	Antirrhinum majus (Scrophulariaceae)	Both	Transplanted	15-30	30-90	Pink, Yellow, rose, orange, crimson, white and mauve	Three distinct strain (a) Tall, (b) Intermediate, (c) Dwarf. Good for mixed borders. Good as a cut-flower.
6	Arctotis	Arctotis grandis (Compositae)	Both	Transplanted	10-15	30-60	Pink	Can alsoe be multiplied by division. Cut-flowers have long keeping quality.
7	* Aster	Callistephus chinesis (Compositae)	Both	Transplanted	20-25	30-75	Expect yellow all colours are met	Important groups, (a) Giant asters (b) Comet, (c) Branching aster, (d) Imbricated pampon. All are very good for pots and borders.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
8	Brachycome (Swan Daisy)	Brachycome iberidifolia (Compositae)	Both	Situ	10-15	20-35	White , blue, rose	Seed should be sown in August-September.
9	Calendula (Pot-Marigold)	Calendula affinalis (Compositae)	Both	Transplanted	20-30	30-45	Yellow or orange	Flower may be single or double. It is good cut-flower
10	Candytuft	Iberis umbellata (Crucifere) l. amara	Both	Transplanted	15-20	24-36	Pure white, rose, purple	Flower may be single or double. Plants have medicinal value.
11	*Carnation	Dianthus spp. (Carpophyllaceae)	Pot	Transplanted	-	30-60	Rose white, pink and spotted	Cuttings. layerings are also possible, flowers are sweet scented.
12	Chrysanthemum (Annual)	Chrysanthemum spp. (Compsitae)	Both	Transplanted	15-30	30-60	Colour depends upon species	Very goof annual for borders. Grows well in poor soil.
13	Calleopsis (Coreopsis)	Calleopsis tinctoria (Compositae)	Bed	Transplanted	15-20	45-60	Golden yellow orange and bronze	Flowers are single or double. Good for pots as well for beds.
14	*Cineraria	Cinceraria spp. (Compositae)	Pots	Transplanted	-	20-46.25	All possible colour and combinations	Very good for pet—sown in July-Aug. Single and double flowers are common. Does better in cool and shady places.
15	Clarkia	Clarkia elegans (Onagraceae)	Both	Transplanted	20-30	30-45	Pink, white, red	Flowers are borne in long spikes, very good for cut flower.
16	Dianthus (indian Pink)	Dianthus nobilis (Caryophyllaceae)	Both	Transplanted	15-20	20-30	Pink, white in various other combinations	Flowers are single as well as double.
17	Dimprphotheca (Capemarigold)	Dimporphotheca pluvialis (Compositae)	Both	Transplanted	-	30-45	Orange, white golden yellow	A good pot annual. Flowers open in bright sunlight. Prefers a sunny situation.
18	Eschscholtzia (Californian poppy)	Eschscholtzia Californica (Papaveraceae)	Both	Situ	-	30-45	Orange light yellow and white	Flowers open in bright sunlight.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
19	Gaillardia (Blanket flower)	Gaillardia drummondii (Compositae)	Both	Transplanted	15-20	30-45	Combination of orange purple yellow and crimson	Flowers may be single or double, some are perennial.
20	Godetia	Godetia grandiflora (Onagraceae)	Both	Transplanted	20-30	30-45	Pure white, rose and red	May be single or double. Does well in partiable shade
21	Heliotrope	Heliotrope Sp. (Borangenaceae)	Both	Transplanted	20-30	20-45	White, blue and purple	Flowers are sweet scented, and are borne in clusters
22	Helichrysum (Everlasting, or straw flower)	Helichrysum bracteatum (Compositae)	Both	Transplanted	20-30	30-60	White, pink, yellow and gold	Very good as cut flowers. Does well in any garden soil.
23	Larkspur	Delphinium spp. (Compositae)	Bed	Situ	15-20	45-60	Purple, white and Blue pink	Single or double flowers are produced in spikes. Requires thinning.
24	Leptosyne	Leptosyne meritema (Compsitae)	Both	Both	20-30	45-60	Yellow	Good for borders and pots. Flowers are borne singly.
25	Linaria (Toadflax)	Linaria bipartite (Scrophulariaceae)	Both	Transplanted	10-15	20-30	Blue, pink and Mauve	Flower spike look like miniature antirrhinum prefers a suny situation.
26	Linum (Flax)	Linum grandiflorum (Linaceae)	Both	Situ	15-20	"	Scarlet	Good for beddings, flowers are five petalled.
27	Lobelia	Lobelia erinus (Campanulaceae)	Pot	Transplanted or Situ	10-15	"	Blue, scarlet	Good for hanging baskets; makes excellent edging.
28	Lupin	Lupinus hartwegii (Leguminosae)	Both	Situ	15-20	30-45	White, yellow and Mauve	Flowers are produced in long spikes.
29	Nasturtium	Tropaeolum majus, T.minor (Geraniaceae)	Bed	Situ	10-15	20-25	Orange and Yellow	Thinning of foliage is essential; good for hanging basket.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
30	Nemesia	Nemesia strumosa (Scrophulariaceae)	Both	Transplanted	5-10	15-20	Yellow with brown stripes	Good for mass effect.
31	Pansy	Viola tricolor (Violaceae)	Both	Transplanted	5-10	15-20	Flowers of different shades and combinations	Single and double kinds are excellent for borders, rockery and for pots.
32	Petunia	Petunia hybrid (Solanaceae)	Both	Transplanted	20-30	30-45	Except yellow all colours with stripes	Can be used for hanging baskets. Produces flowers even in summer months. Very good for mass effect. Double flowering varieties are also available.
33	Phlox	Phlox diumondi (Polemoniaceae)	Both	Transplanted	20-30	15-30	All colours and bicolors	One of the best annuals for beds and pots. Requires well-drained soils and sunny situation for good results.
34	*Salvia (Scarlet Sage)	Schizanthus wisetonensis (Solanaceae)	Both	Transplanted	20-30	30-45	Red, blue, white and yellow	Flower spikes are 15-30 cm. long; good as cut-flower. Seed should be sown in July–August.
35	Schizanthus	Schizanthus wisetonensis (Solanaceae)	Both	Transplanted	20-30	45-60	White with pink shade	Seeds take long time for germination. Good for pots.
36	Stock	Mathiola incana (Cruciferae)	Both	Transplanted	20-25	20-30	Pink and white	Flowers are either single or double, and are scented. Flowers are borne on spikes.
37	Verbena	Verbena hybrid (Verbenaceae)	Both	Transplanted	15-20	20-30	Pink, pale yellow, blue white	One of the best annuals for pots and beds. Good for rockery and edging.
38	Vendedium	Venedium fastuosum (Compositae)	Both	Transplanted	20-30	20-30	Orange and yellow	Flowers are fairly large which are daisy like yellow.



S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
39	Wallflower (Gilli flowers)	Cherianthus cherrii (Cruciferae)	Both	Transplanted	15-20	20-30	Orange and yellow	Flowers are borne in long spikes, good as cut-flowers.
40	*Dahlia	Dahlia varibilis (Copositae)	Beds	Transplanted	30-45	60-1.20	All possible colours and combinations	Varieties true to type, are multiplied by cutting or tubers. The eyes are present on stalk attached with tuber. One of the best winter-annuals. The seeds as well as the tuber should be planted in August - September. Thinning of the flowers buds to 1-2 gives flower of larger size. Requires heavy feeding.

## B - Rainy Season Annual (Sowing Time : June - July)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Amaranthus	Amaranthus tricolor (Amarantaceae)	Both	Transplanted	15-20	31-90	Crimson and red	Leaves are also very attractive as they are coloured. Good for edging and mixed border.
2	Balsam	Imatiens balsamina (Balsaminaceae)	Beds	Transplanted	15-75	30-45	Red, crimson, white, pink scarlet and purple.	Flowers are single as well double, should be trained to clean stem.
3	Celosia (Cockscomb)	Celosia crestata, C. plumose C. chidsi (Amarantaceae)	Beds	Transplanted	20-30	30-45	Yellow, crimson, purple and red	Large compact velvety head of flowers of large size 30 cm x 25 cm. are borne well above the foliage.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
4	Cosmos (Mexican Aster)	Cosmos bipinata (Compositae)	Beds	Transplanted	25-5	90-120	White, crimson, rose purple and orange	Pinching the short is desirable to encourage the branching.
5	Gaillardia (Blanket flower)	Gaillardia grandiflora (Compositae)	Both	Transplanted	20-30	45-60	Orange, purple yellow and crimson	Both single and double kinds of flowers are met.
6	Gomphrena (Bachelor's Button)	Gomphrena globosa (Amarantaceae)	Both	Transplanted	15-20	20-30	Red, crimson and white	Plants in pot are good for verandah and indoor decoration.
7	Helianthus (Sunflower)	Helianthus Sp. (Compositae)	Bed	Transplanted	2.5-5	150-210	Orange and yellow	Flowers are single or double.
8	Marigold	Tegetes Sp. (Compositae)	Bed	Transplanted	20-30	60-90	Orange and yellow	Flowers are single or double, can continue to flower up to winter.
9	Mina lobata	Mina lobata (Convolvulaceae)	Pot	Transplanted	Creeping	-	Red and creamy	Good for training on arches and arbors.
10	Torenia	Torenia speciosa (Compositae)	Both	Transplanted	10-15	20-25	Blue with white spots	Good for beds and rockeries and verandah decoration.
11	Vinca	Vinca rosea (Apocynaceae)	Both	Transplanted	20-25	30-45	Red and white red with white eye	Plant can also be multiplied by cuttings.
12	Zinnia	Zinnia elegans (Compositae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thumb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

## C - Summer Season (Sowing Time - February - March)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Cosmos	Same as given above			20-30	20-30		Cultivated for green leaves, can be trimmed to any desired shape.
2	Kochia (Mock Cypress)	Kochia scoparia var. trichophylla (Chenopodiaceae)	Both	Transplanted	20-25	10-15	Red, white, crimson, yellow and scarlet	The flowers are rose in shape and are single and double, can also be multiplied by cuttings. Flowers open only in the mornings.
3	Portulaca	Portulaca grandiflora (Portulacaceae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.
4	Zinnia	Zinnia elegans (Compositae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

D-Classification of Winter Annuals		
I. White	II. Purple and Mauve	III. Pink and Light Red
Antirrhinum	Ageratum	Acroclium
Aster	Antirrhinum	Antirrhinum
Daisy	Cornflower	Asters
Candytuft	Phlox	Daisy
Gypsohylla	Heliotrope	Candytuft
Phlox	Larkspur	Clarkia
Stock	Sweetpea	Cosmos
Petunia	Lobelia	Godetia
Sweet alysum	Negella	Larkspur
Verbena	Pansy	Lupin
Dahlia	Pentunia	Petunia
Larkspur	Salvia	Phlox
Dimorphoteca	Stock	Poppy
Eschacholtzia	Torenia	Verbena
	Verbena	
	Viola	
	Aster	
	Anchusa	
	Lupin	
	Sweet Williams	
E-Classification of Winter Annuals		
Dwarf		Medium
(Upto 30 cm)		(Up to 60 Cm)
Gamolepsis	Stock	Antirrhinum
Lobillia	Sweet alyssum	Aster
Linum	Torenia	Ageratum
Mimulus	Viola	Anchusa
Nemesia		Acroclium
Nasturtium		Cornflower
Nigella		Candytuft
Phlox		Calendula
Pansy		Daisy
		Gillardia
		Heliotrope



According to their colour		
IV. Crimson and Scarlet		V. Orange and Yellow
Argemone		Antirrhinum
Antirrhinum		Calendula
Aster Candytuft		Calliopsis
Celosia		Dimorphoteca
Salvia		Leptosyne
Phlox		Eschscholtiza
Stock		Marigold
Petunia		Nasturtium
Linum		Pansy
Dianthus		Sunflower
Cosmos		Phlox, Chrysanthemum (annual)
Salvia		Cosmos
Verbena		Minulus
Marigold		
According to their height		
	Tall	
	(Above 60 Cm)	
Larkspur	Antirrhinum	Leptosyne
Petunia	Chrysanthemum	Marigold
Salvia	Clarkia	Sunflower
Wallflower	Calliopsis	Schizanthus
	Cosmos	Sweetpea
	Eshscholtiza	
	Dahalia	
	Dimorphoteca	
	Gypsohila	

## CHAPTER - 24

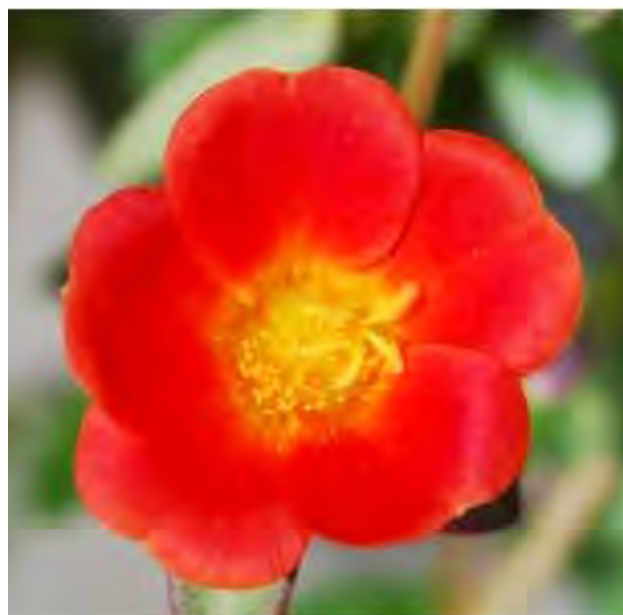
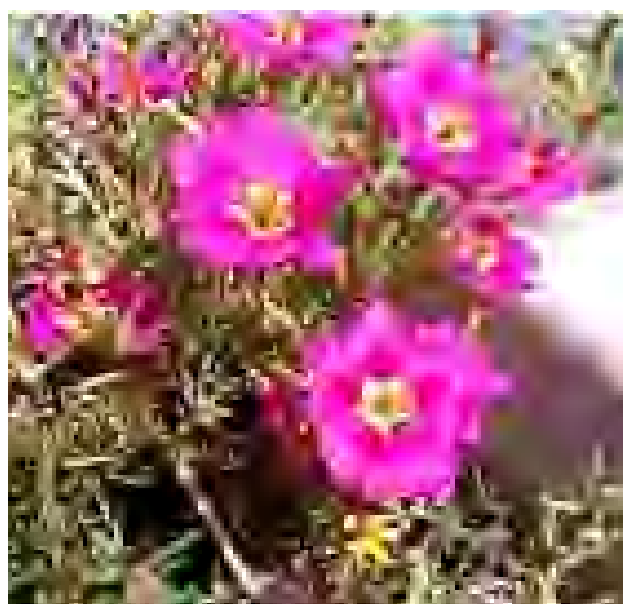
### SUMMER AND RAINY SEASON FLOWERS

The summer season start in India from the month of April and continues till the month of June, from July to September the season is rainy. In summer the temperature rise up to 45 c and winds are dry all around. After the sparky spring, where various choice of flowers are available, in summer season there are very limited variety available because of adverse weather conditions, which the gardener can grow for adding color and flowers in his garden. The way of planting are by grow seedlings and planting them in beds or pots, secondly showing the seed directly in the beds or pots. During propagation for summer flower gardener should keep in mind to add the compost and sand in mixture to maintain the moisture during dry summer before planting seedling or seeds. The gardener should also keep in mind about the availability of irrigation water. Here, we are suggesting some popular summer and rainy season flowers for gardeners to choose from them.

#### 1. Portulaca (Portulaca oleracea)

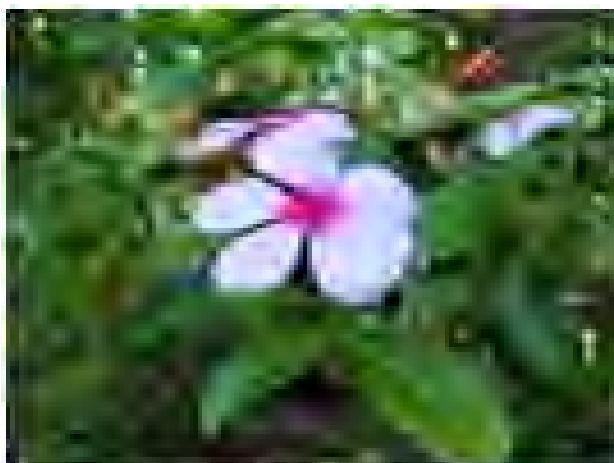
Portulaca also known as Moss roses, they are excellent flowers to have if you live in a dry climate, since they can store water well, and also provide lots of low lying color for your garden. They also are very easy to take care of after you get started. Moss rose is the gardener's choice for the hottest, driest, most problematic spots in the garden. This succulent plant thrives in heat, drought, and lousy soil, rewarding gardeners with nonstop color. Coming in sunny warm reds, oranges, magentas, and yellows, moss rose looks at

home in a sun-drenched area. There's also a whole pastel color palette for moss rose -- creamy white, pink, and peach varieties. It often happily reseeds, coming back every year with gusto. The plant ht. 7-20 cm, width. 30 cm, Easy to Grow.



## 2. Cosmos (Cosmos bipinnatus)

**Cosmos** are annuals, grown for their showy flowers. The flower heads may be bowl- or open cup-shaped and are atop of long stems. Cosmos are easy to grow and make good border or container plants. The cosmos plants are able to flower from early summer and long lasting up to winter season. They make for good decorations in flower arrangements and also attract birds, bees, and butterflies to your garden. The height of the plants should be very from 15 cm to 45 cm according to the variety. Its commonly available in dark orange to yellow colour. It is easy to grow.



## 3. Vinca Flowers (Cartharanthus roseus)

Annual vincas aren't new or flashy flowers on the gardening scene, but recent cultivar developments warrant a new examination of this common bedding plant. Horticulturists have been hard at work bringing us new colors in plants with showier flowers that are easier to start from seed. The height of the plants varies from 15 cm to 45 cm according to variety, the common Vinca plants have only two colours white and dark pink. Now a days various colours in hybrid varieties are available in single colour or contrast. But the hybrid varieties are very susceptible to the water logging and they can not be prolonged during rainy season.

## 4. Sunflower ( Helianthus annuus)

Sunflower is an annual plant, growing up to 4.6 m tall. It has large, rough and hairy leaves, oval to cordate in shape. Flower heads are also large, growing about 20-30 cm in diameter. It consists of numerous, densely arranged florets. Sterile ray florets on the outer side vary in color- they can be yellow, red or orange. The disc florets inside the circular head produce seeds. The florets inside the circular head are called disc florets, which mature into seeds. The florets inside the sunflower's cluster are spirally arranged, which is a most efficient packing of seeds within the flower head. **Parts used:** Seeds, leaves, root.



### 5. Sunflower dwarf ( *Helianthus annuus* )

These dwarf sunflowers are free of pollen, making them perfect as indoor gift plants. They are also tolerant of mildew to perform well in the garden. Miss Sunshine flowers uniformly about 7 to 10 days earlier than Ballad. It is shorter, and flowers are 25% smaller than Ballad's 4 to 5-in.(10 to 13-cm) blooms. Miss Sunshine displays warm golden flowers, and produces secondary blooms more quickly. For larger flowers and bright yellow color, Ballad excels.



### 6. Zinnia (*Zinnia acerosa*)

Zinnias are one of the easiest **annuals** to grow, grow quickly, and bloom heavily. They make a massive burst of color in your garden. Zinnias have bright, solitary, daisy-like flowerheads on a single, erect stem. The most common zinnia is "dahlia-flowered" and grows up to three feet. Other types are "cactus-flowered." Use in an annual or mixed border. Smaller zinnias are suitable for edging, windowboxes or other containers. The narrow-leaf zinnia also works well in hanging baskets. Zinnias are very popular for cut flowers.





## 7. Gaillardia (*Gaillardia aristata*)

Gaillardia, or Blanket Flower, is a group of about 30 species that include both annuals and perennials. With bright and colorful daisy-like flowers it is no wonder this native wildflower has earned a spot on the heart of gardeners everywhere. The most common species for garden use is *Gaillardia grandiflora*. It is this perennial, and some of its most unique cultivars that we will discuss here. Hardy, sun-loving and easy to keep it deserves a place in every garden.



## 8. Gomphrena (*Gomphrena globosa*)

*Gomphrena* easily grown in average, well-drained soils in full sun. Although mature plants exhibit good drought resistance, plants grow best with regular moisture throughout the growing season. Extremely good heat tolerance. Sow seed directly in the garden. Use ample amounts of seed since germination rate can be quite low. Set seedlings or purchased plants out. Pinch young plants to promote more foliage and flowering. The plants ht. 30 to 60 cm. The plant is hardy nature and easy to grow.



## 9. Cladium (*Cladium californicum*)

Cladium is a very popular bulbous plant for rainy and summer season. It can be grown easily from April to September in north India plane. On onset the winter the plants leaves dried and bulb can be collected for the next season and they can be stored in cold storage during dormancy. The Cladium have very decorative leaves of different colours and shapes. It can be easily planted in semi shaded beds or pots. The lower dry leaves should be eradicated regularly for new shoots / leaves. The height of plants very from 15 cm to 40 cm mainly leaves of the Cladium is a combination of red, white and green colour. According to the variety.



## 10. Balsam (Impatiens balsamina)

Balsam is a very favorite rainy season flower this old-fashioned annual adds an exotic, almost gaudy touch to the garden. It offers interesting, trumpet-shape blooms, mostly in shades of pink. Many selections have bicolor flowers. Balsam often self-seeds in the garden and is very easy to grow. Plant established plants outdoors in spring after all danger of frost has passed. Balsam needs rich, well-drained soil to do best, so work in plenty of compost. (It's ideal in containers as long as you don't let the plants dry out for even a second.) Fertilize lightly but regularly. The plant ht. 30-90 cm tall, width 30-60 cm wide and easy to grow.





## CHAPTER - 25

### FLOWER BEDS

Plants which flower profusely, when planted in groups to give a mass effect are termed as flower beds. They may be perennial (living for more than two years), biennials (living for two years) and annuals or seasonal (living for one season or for one year). They enhance the outdoor surroundings and are a good source of cut flowers. They are a good source for attracting pollinators, such as bees and butterflies.

Perennial plants are plants that lives for more than two years. The term is often used to differentiate a plant from shorter-lived annuals and biennials. The term is also widely used to distinguish plants with little or no woody growth from trees and shrubs, which are also technically perennials.

The most popular type of flowers in gardens are annuals which are raised from seed. They grow, bloom, seed and exhaust them selves during a season. It has the advantage of a tremendous variety of colour, size and form and occupies garden space for less time and can be easily replaced. The seasonal flowers allow the gardener to see all the stages of growth in the shortest possible period. This satisfies the “Growth Instinct” of gardener more than any other type.

Seasonal and perennial flower beds in various shapes and sizes can be designed. Flowers of all rainbow colours are available.

Perennials offer a lot of color without a lot of work. Among seasonal flowers, some species are specific to winter; summer and rainy season and some can be grown throughout the year.

#### Laying of Flower Beds:

1. Dig Trenches of 1'- 6" depth of required shape and size.
2. Remove weeds and other unwanted materials.
3. Fill up trenches with dug out soft soil by adding 3 kg compost or 1kg vermi-compost + 0.5 kg neem cake +
4. + 0.25 kg super phosphate per cft. + 25 gms of folidol dust.
5. Water the beds and refill the trench to cover up the shrinkage and form a bund around the bed to form a basin.
6. Plants seedlings at 6'-9" spacing after clipping lower 1/3rd leaves.
7. Water gently with a rose can.
8. Regular weeding, mulching and watering are required.
9. Clipping of primary buds to promote bushy growth and better flowering should be done.

## (a) Seasonal Flower Beds

S. No.	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS
1.	Plant Name Antirrhinum	M	W	12	Dianthus	L	W	23	Pancy	L	W
2.	Aster	L	AYR	13	Gaillardia	L	AYR	24	Petunia	L	AYR
3.	Balsum	M	AYR	14	Gamphrena	L	AYR	25	Phlox	L	W
4.	Callendula	L	W	15	Galdiulus	M	AYR	26	Poppy	L	W
5.	Candytuft	L	W	16	Hollyhock	T	AYR	27	Portulaca	L	AYR
6.	Carnation	M	W	17	Kochia	M	w	28	Salvia	M	W
7.	Chrysanthemum	L	W	18	Lady's Lace	T	w	29	Sunflower	T	AYR
8.	Coreopsis	T	AYR	19	Larkspur	M	w	30	Verbena	L	AYR
9.	Celosia	MT	AYR	20	Marigold- tall	M	AYR	31	Zinnia	M	AYR
10.	Cosmos	T	AYR	21	Marigold-dwarf	L	AYR	32	Zinnia linearis	M	AYR
11.	Dahlia	T	w	22	Nasturtium	L	w				

## (b) Perennial Flower Beds:

S.No	Plants Name	S.No	Plants Name	S.No	Plants Name	S.No	Plants Name
1	Balsam impatiens	5	Gazania	9	Lantanas	13	Tuberose
2	Beloperone guttata	6	Geranium	10	Portulaca	14	Verbena- Perennial
3	Cannas	7	Gerbera	11	Russalia	15	Azalea
4	Daisy	8	Lilies	12	Roses-Miniature	16	Lobelia

## (c) Biennial Flower Beds:

S. No.	Plant Name	S. No.	Plant Name
1.	Onion	5.	Sweet William
2.	Parsley	6.	Colic weed
3.	Lunaria	7.	Carrot
4.	Silverbeet	8.	Hollyhock (some varieties)

H = Height, T = Tall, M = Medium, L = Low

W= Winter Season, AYRV = All year Round







## CHAPTER - 26

### POTTED PLANTS

Potted plants are displayed both indoors and outdoors, as groups or singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give very good effect.

Plants grown in pots are called pot plants. When open spaces are not available, as in the case of apartments, residences and offices, pot plants can be effectively used. Pot plants have the advantage of mobility. For indoor locations and rooftop gardens pot plants can be both indoor and outdoor. Most of the plants can be potted and used as pot plants.

Pot plants are used as indoor plants and also as outdoor plants on terraces, balconies, in driveways & also as decorative plants for display during special functions, conferences and other events. Pot plants comprise of Seasonal plants Flower, Foliage, Fruits, and Specimen plants.

Lot of plants can be grown as pot plants. When a plant is selected for planting in a pot, care should be taken that the nutritional requirements of the plant is fulfilled, as the media in a pot is restricted to the size of the pot. If the nutritional requirement of the plant is high, we have to replenish the same by periodical application of fertilizer and manure

Depending on the growth potential of the plant species, the container or pot size is selected. Plants which are used as ground covers or which like to droop are planted in hanging baskets (such plants have shallow root system). Plants which grown up to a certain height, and which require less area

for spreading can be used in small and medium containers and species which have a tendency to grow big and tall are used in big pots. Generally fruit plants and trees are planted in bigger containers, or in planter boxes.

Whatever the size of the container are size of the plant, pot plants require regular application of manures and fertilizers and pest control measures taken to keep them healthy. It is recommended to apply fertilizers and pesticides at regular intervals of 15 days 30 days, by loosening the top soil. Repotting of plants is recommended once in a year. Whenever repotting is done, it is advised to go in for a bigger pot than the existing pot, for a healthy growth. It is advisable to prune some of the roots at the time of repotting as it allows the plants to develop new roots which help in absorbing the nutrients better. Some plants like Cycads, Adeniums and Beau-carneas etc. Have to be repotted once in 2 to 4 years.

The media for potting should be porous and rich. For making the media porous Cockpit and perlite are used. For making it rich, use Vermicompost. Sand or broken clay pieces are added to media to improve the drainage, before repotting the plant, as improper drainage kills the plant due water logging.

Watering of potted plants should be regulated with care, as excess/ shortage of water can damage the plant. Generally in ground plantation, a plant can tolerate irregularity in watering because of sub-soil moisture which is not possible in pot plants.



## POTTING MEDIA

1. Soil Media or Pot Mixture is prepared for plants grown in containers.
2. Media normally means, soil mixed with other ingredients in a particular proportion as required by a specific group of plants. Presently soil media is available which allows better growth, good moisture retention, thereby preventing diseases and weeds. It contains Vermiculite, Perlite, Sterilized Coco peat etc.
3. Different types of Soil media are available which contain materials like soil, sand, compost, vermicompost, wood Ash, Coco peat, Leaf Mould, Charcoal, Brick Bats, Neem Cake, Bio Fertilizers and Bone Meal etc. which are mixed in different proportions as per plant requirement.
4. Small quantities of fertilizers including micro nutrients and pesticides are also mixed in pot mixture
5. Basic criteria for selection of ingredients are aeration, moisture retention, and availability of nutrients.
6. Soil should neither be alkaline nor acidic; it should be neutral with PH value ranging from 6 to 7.5
7. The media should neither be very sticky due to excess clay content, which causes drainage problem, nor very sandy, which does not allow moisture retention to the required extent.
8. Function of the media is to hold the plant upright, holding moisture for a good period and nutrients for a long period and gradually supply to the plant.
9. For aeration of roots and conservation of moisture in media its top layer of about 4 - 5 cms should always be kept loose by periodic mulching.
10. Media should be changed or enriched once or twice a year for better nourishment and maintain physical condition of the soil media.

S. No.	Plant Name	S. No.	Plant Name
1.	Aechmea chantinii	16.	Asparagus densiflorus sprengeri
2.	Aglaonema colour	17.	Asparagus plumosus
3.	Aglaonema commutatum elegans	18.	Asparagus setaceus pyramidalis
4.	Aglaonema commutatum maculatum	19.	Aspidistra elatior variegata
5.	Aglaonema commutatum	20.	Begonia rex
6.	Alocasia amazonica	21.	Begonia semperflorens red pearl
7.	Alocasia korthalsii	22.	Bromelia balansae
8.	Alocasia macrorrhiza variegata	23.	Caladium hortulanum conbidum
9.	Alocasia macrorrhiza	24.	Caladium hortulanum attala
10.	Alpinia sanderar	25.	Calathea insignis
11.	Alpinia zerumbet	26.	Calathea rufibarba
12.	Anthurium andraeanum	27.	Codiaeum variegatum gold dust
13.	Aphelandra squarrosa	28.	Codiaeum variegatum mammy
14.	Asparagus densiflorus myers	29.	Codiaeum variegatum petra
15.	Asparagus densiflorus myriocladus	30.	Codiaeum variegatum





## CHAPTER - 27

### CACTUS & SUCCULENTS



Variegated Sempervivum



Sempervivum Grape Tone



Sempervivum Cobweb



Sempervivum Red Lion



Sempervivum Calcareum



Sempervivum Ciliosum



Powder Puff



Powder Puff



Red Thorn



Britton & Rose



Corn Cob



Blue Candle



Paper Spine



Joseph's Coat



Domino



Bishop's Cap



Golden Barrel



Latispinus



Peanut



Pine Cone



Angel Wing



Thimble



Golden Ball



Peruvian Old Man



Pincushion



Albiflora



## SEDUM



Major



Minor



White Diamond



Dragon Blood



Little Gem



Cape Blanco



Little Missy



Tricolor



Hispanicum



Sieboldii



Fire Storm



Lime Zinger



Fuzzy Wuzzy



Sunsparkler



Green Jelly Bean

## SENECIO & SEMPERVIVUM



Ruby Necklace



Red Lion



Citriformis



Mahogany



Vertical Leaf

## COTELYDON & KALANCHOE



Key Lime Pie



Bear Paw



Orbiculata



Mother of Millions



Chocolate Soldier



String of Pearls



Purple Heart



Donkey's Tail



Calico Kitten



Ruby Necklace



Sedum Sieboldii



Baby Necklace



String of Hearts



Little Missy



String of Bananas



## ECHEVERIA



Black Prince



Blue Rose



Violet Queen



Cubic Frost



Culibra



Topsy Turvy



Lipstick



Painted Lady



Crinoline Ruffles



Gray Curl



Minima



Atlantis



White Rose



Raindrops



Blue Fairy

## CRASSULA



Devil's Horns



Tiger Jade



Red Pagoda



Gollum Jade



Campfire



Springtime



Baby Necklace



Hummel's Sunset



Brevifolia



Ruffle Jade



Giant Watch Chain



Mesembryanthemoides



Pagoda Village



Devil's Horns



Tiger Jade



Ovata f. variegata



Red Pagoda



Colico kitten



Campfire



Ruffle Jade



Baby Necklace



Silver Springtime



Tiger's Jaw



Ivory Towers



Springtime



Cotyledonis



Moonglow



Green Pagoda



Rubricaulis Candy Cane



Rupestris High Voltage



Gollum Jade



Falcata Propeller



Tom Thumb



Orbicularis



Giant Watch Chain



Nudicaulis var. herrel



Pagoda Village





Window



Venosa



Cooperi



Cuspidata



African Pearls



Batesiana



Silver



Zebra Plant



Panda Plant



Flapjacks



Panamensis



Chocolate Soldier



Mother of Thousands



Mother of Millions

# CACTUS



Powder Puff



Thimble



Hedgehog



Bishop Cap



Paper Spine



Corn Cob



Pine cone



Joseph's Coat



Golden Barrel



Angel Wing



Dwarf Chin



Echinopsis



Sunburst



Mardi Gras



Lily Pad



Black Rose



Suncup



Kiwi



Luteovariegatum





Sedum  
cuspidatum



Senecio  
rowleyanus



phedimus



crassula  
ovata



crasula  
ovata 'gollum'



crassula  
ovata 'hobbit'



graptosedum  
bronze



sedum  
luteoviride



kalanchoe  
rombophylla



crassula  
wolkensii



cyanotis  
somalensis



kalanchoe  
houghtonii



kalanchoe  
blossfeldiana



portulaca gilliesii



lenophyllum



sedum  
rubrotinctum



echinopsis



sedum  
diffusum



pachyveria  
'powder puff'



echeveria  
palida



tradescantia  
sillamontana



pachyphytum  
oviferum



sedum  
sediforme



crassula  
capitella 'campfire'



Echeveria  
black prince



sedum  
golden glow



crassula  
capitella thyrsiflora



scilla  
pauciflora



sedum  
hernandezii



sedum  
pachyphytum



echinopsis  
chamaecereus silvestrii



Kalanchoe  
laetivirens



aeonium  
haworthii



portulacaria  
afra



echeveria



crassula  
perforata



crassula  
lycopodioides



kalanchoe  
fedtschenkoi



kalanchoe  
beharensis



crassula  
rogersii



orostachys



sedum  
morganianum



crassula  
fragilis



kalanchoe  
tomentosa



anacampseros



aeonium  
decorum



stapelia  
variegata



plectranthus  
australis



callisia  
repens



callisia  
fragrans



haworthia  
rigida



graptoveria  
opalina



haworthia  
cymbiformis



graptosodium  
francisco baldi



sempervivum



crassula  
sarmentosa variegata



sedum lineare  
variegatum



tradescantia pallida  
'purple heart'



graptoveria  
titubans



graptoveria  
douglas huth





Pink Blush



Aloe Brevifolia



Window



Cuspidata



White Fox



Debbie



Silver Haworthia



Fred Ives



Little Jewel



Ghost Plant



Zebra



Variegated Butterfly



Gasteria Flow



Coral Aloe



Agave Butterfly



Lavender Pebbles



Ice Plant



Concrete Leaf



Lobster Flower



Pink Ice Plant



Variegated Ghost



Ruby Necklace



Citriformis



Brevicaule



Superbum



Royal Flush



Pachyphyllum



Split Rock



Variegated Aloe

## AEONIUM



Sunburst



Mardi Gras



Lily Pad



Kiwi



Crested Sunburst



Suncup



Green Platters



Black Rose



Dinner Plate



Luteovariegatum

## CACTUS



Golden Ball



Powder Puff



Thimble



Hedgehog



Bishop Cap



Britton & Rose



Paper Spine



Corn Cob



Pine cone



Joseph's Coat



Old Man



Golden Barrel



Angel Wing



Dwarf Chin



Echinopsis



Lady Finger



Mammillaria Albiflora



Devil's Tongue



# CHAPTER - 28

## ESSENTIAL ELEMENTS AND THEIR SOURCES

MAJOR			MINOR
Essential elements used in relatively large amounts			Essential elements used in relatively small amounts
Mostly from Air and water	From Soil		
Carbon (C)	Calcium - (Ca)	Copper	- (Cu)
Hydrogen (H)	Magnesium - (Mg)	Manganese	- (Mn)
Oxygen (O)	Sulphur - (S)	Zinc	- (Zn)
	Nitrogen - (N)	Molybdenum	- (Mo)
	Phosphorus - (P)	Cobalt	- (Co)
	Potassium - (K)	Boron	- (Bo)
	Iron - (Fe)		
ROLE OF PLANT NUTRIENTS			
Group I	Energy Exchanges		Hydrogen and Oxygen
Group II	Energy Storers		Carbon, Nitrogen, Phosphorus, Sulphur
Group III	Translocation Regulators		Potassium, Sodium, Calcium and Magnesium
Group IV	Oxidation-Reduction Regulators		Iron, Manganese, Zinc, Copper, Boron and
			Molybdenum

### C-Deficiency Symptoms of Major and Minor Elements

#### Major (Micronutrients) Elements

S. No.	Element		Symptoms Major (Macronutrients ) Elements
1	Nitrogen	1	Older or lower leaves of plant mostly affected; effects localized or generalized.
		2	Effects mostly generalized over whole plant ; more or less drying or firing of lower leaves ; plant light or dark green.
		3	Plant light green ; lower leaves yellow, drying to light brown colour; stalks short and slender if element is deficient in later stages of growth.

S. No.	Element		Symptoms Major (Macronutrients ) Elements
2	Magnesium	1	Effects mostly localized ; mottling or chlorosis with or without spots of dead tissue on lower leaves ; little or no drying up of lower leaves.
		2	Mottled or chlorotic leaves, typically low ridden, as with cotton, sometimes with dead spots ; tips and margins turned or capped upwards stalks slender.
3	Phosphorus		Plant dark green, often developing red and purple coulurs, lower leaves sometimes yellow, drying to greenish brown or black colour, stalk short and slender if element is deficient in later stages of growth.
4	Potassium	1	Mottled or chlorotic leaves with large or small spots of dead tissues.
		2	Spots of dead tissue small, usually at tips and between veins, more marked at margins of leaves, stalk slender.
5	Calcium	1	New or bud leaves affected, symptoms localized.
		2	Terminal bud dies, following appearance of distorts on at tips or bases of young leaves.
		3	Young leaves of terminal bud at first typically hooked, finally dying back at tips and margins, so that later growth characterized by cut-out appearance at these points, stalk finally dies at terminal buds.
6	Sulphur	1	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
		2	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
7	Zinc		Spots generalized, rapidly enlarging, generally involving areas between veins and eventually involving secondary and even primary veins; leaves thick ; stalks with shortened internodes.
8	Boron		Young leaves of terminal buds becoming light green at bases, with final breakdown here, in later growth; leaves becomes twisted, stalk finally dies back at terminal bud.
9	Copper	1	Terminal buds commonly remain alive, wilting or chlorosis of younger or bud leaves with or without spots of dead tissue, veins light or dark green.
		2	Young leaves permanently wilted (wither-tip effect) without spotting or marked chlorosis; twig or stalk just below tip and seed head often unable to stand erect in later stages when shortage is acute.
10	Manganese	1	Young leaves not wilted, chlorosis present with or without spots of dead tissue scattered over the leaf.
		2	Spots of dead tissue scattered over the leaf, smallest veins tend to remain green, producing a checkered or reticulating effect.
11	Iron		Young leaves chlorotic, principal veins typically green, stalks short and slender.

## CHAPTER - 29

### IMPORTANT FERTILIZERS

The fertilizers and their uses in addition to the percentage of elements contained in them

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
Nitrogenous Fertilizers						
1	Sodium Nitrate	Na No4	16.0	-	29	Produces alkalinity in the soil. No accumulation in light soil suitable for use in acid soils. Soils not used in larger amounts.
2	Ammonium Sulphate	(NH4)2 SO4	20.5	110	-	Mostly used in present days. Acid forming fertilizer. Higher doses are harmful. It does not leach easily. Easy to handle.
3	Ammonium Nitrate	NH4 NO3	33.5	60	-	Best for dry land crops. It is completely used. More effective on heavier soils, because leaching is not very pronounced. In heavy rain-fall area, nitrate is completely leached out.
4	Ammonium Chloride	NH4 CL	25.0	128	-	Can be applied to light as well as heavy soils without loss of nitrogen. Nitrogen is absorbed by soil particles. Should not be used in acidic soils.
5	Ammonium Phosphate	(NH3)2 HPO4	21.0	55-77	-	They are primarily used on leguminous crops including pulses. They can be applied to any type of soil. Loamy, neutral soils are best, because phosphate and nitrogen both will be available.
6	Ammonium Sulphate Nitrate	-	26.0	93	-	It has the same effect as ammonium sulphate. Where leaching occurs on heavier soils, it is better. Transplanted paddy responds better to this fertilizer. It is safe to apply on highly acid soils than ammonium sulphate.

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
7	Urea	CO (NH <sub>2</sub> ) <sub>2</sub>	46.0	80	-	Well aerated soil helps in the decomposition of urea which is converted into ammonical nitrogen. Applied in dry land. Being less acidic, hence can be used on wider range of soils. Anaerobic condition may cause loss of nitrogen from urea. Very good for foliar application.
8	Calcium Cyanamide	Ca CN <sub>2</sub>	22.0	63	-	It is highly based producing fertilizer, well aerated soil condition may help in the reduction of nitrogen in acid soils. It take longer time to release nitrogen for crops.
9	Calcium Ammonium Nitrate	-	20.5	-	-	This neutralizes the acidity of the soil due to the presence of lime. It should be used in those soils, where leaching is not heavy. For light soils it should be given in smaller doses.
10	Calcium Nitrate (Calnitro)	Ca(NO <sub>3</sub> ) <sub>2</sub>	15.0	-	-	It is suitable for acidic soils more prominently than for calcareous or saline alkaline lands. Should not be used under wet conditions as nitrate is likely to leach out in the soil.
11	Potassium Nitrate	KNO <sub>3</sub>	13.0	-	29	It is a basic salt and is more for the supplying of potas-sium rather than nitrogen. It leaches out very quickly in wet soils.
Phosphatic Fertilizers						
			P <sub>2</sub> O <sub>5</sub> Content	Acidic or Alkaline		
1	Single Super-phosphate	16.0-20.0	neutral	90		Suitable for all types of soil. The effect of it on heavy soils more than on lighter soils because of low level of other nutrients.
2	Triple Super-Phosphate	48.0-50.0	Acidic	95		Alluvial soil of North India responds very much to this fertilizer. Both are water soluble.



S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
3	Basic Slag	3.4  Indian	alkaline			It reacts on acidic soils. The availability is more under water soils, which contain high contents of organic matter. It is not soluble in water. It is applied much earlier than it is required for the crops.
4	Rock Phos-Phate	Ca (Po <sub>4</sub> With impirities	20.0-25.0	acidic	-	It is much more effective on acidic soils than alkaline soils. Insoluble in water. It does dissolve in soil water in the presence of organic matter or green manure. Highly effective on heavily leached soils. Its effectiveness increases if it is mixed with super-phosphate.
5	Bonemeal	Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	25-28 and 1.2% N	alkaline	70	As already stated, it is not water soluble fertilizer. It takes time to get dissolved in the soils. The efficiency of this fertilizer increases in the presence of organic matter in large quantities. Suited for acidic soils. The availability of phosphorus from bone meal is higher in water soil conditions than in drylands.
6	Ammonium Phosphate	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> and (NH <sub>4</sub> ) <sub>2</sub> PO <sub>4</sub>	48-54 And 11-21% N	acidic	100	Most suitable fertilizer for Indian soils. Ammo. phos. is liked on account of 20 : 20 percentage P and N with water solubility Can be used on light medium and heavy soils. Its response is most pronounced on medium and heavy soils than on lighter ones. It is equally effective in wet as well as dry lands,

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
Potassic Fertilizers						
1	Potassium Sulphate	K <sub>2</sub> SO <sub>4</sub>	47-52			Response to this has been obtained on all soils in India where it is deficient. Soils of high calcium content retain the sulphate ions than low content ones Suitable for application on calcareous and alkaline soils. Not suited on heavy soils. In highly leached acid soils sulphur deficiency is actually observed. It contains 38 — 49% Sulphur.
2	Potassium Chloride (Muriate of potash)	KCl	60-62			It is imported in large amounts due to high percentage of K <sub>2</sub> O. In acidic soils it has greater response than potassium sulphate. Cl ions are not retained by soils of heavy type hence can be used on such soils. In alkaline soils Cl ions prove toxic for crops.



## CHAPTER - 30

### MEDICINAL PLANTS

**Common Name :** Ghrita Kumari  
**Botanical Name :** Aloe vera  
**Family Name :** Asphodelaceae



#### MEDICINAL PROPERTIES / USES

Aloe Vera is very popular and also called as “Ghrita Kumari”. Aloe is commonly used can be grown in various climatic conditions. It is sensitive to water logged conditions and also cold climate is not favourable for this plant.

**Medicinal Uses:** Detoxifies the body, hydrates skin, lowers high cholesterol, stabilizes blood sugar, prevents kidney stone, reduces high blood pressure, supports immune system, and helps in inflammation, wounds, burns and eczema, etc.

**Other Uses:** Aloe Vera has been widely used for cosmetic use such as for making lotions, facial creams, etc. The commonly used element is leaf juice and leaf gel.

**Common Name :** Ashwagandha  
**Botanical Name :** Withania somnifera  
**Family Name :** Solanaceae



#### MEDICINAL PROPERTIES / USES

Ashwagandha Withania somnifera is also known as Poison gooseberry. It is a short shrub herb of 35 to 75 cm with a single stem with branches extend radially. The flowers are small and green while ripe fruit is orange red and has milk coagulating properties. The plants long, brown roots are used for medicinal purpose.

**Medicinal Use:** In Ayurveda, the leaves and fruit of ashwagandha are applied to tumours, tubercular glands and ulcers. It has capability of improving arthritis symptoms, helps in reducing symptoms of anxiety, reduces cholesterol level and can improve attention and impulse control in children with ADHD (Attention deficit hyperactivity disorder).

**Side Effects & Safety:** Higher dose of ashwagandha might cause stomach upset, diarrhoea and vomiting and can irritate the gastro intestinal tract. So the patient having stomach disease are advised not use ashwagandha.

**Common Name :** Brahmi  
**Botanical Name:** Bacopa monnieri  
**Family Name :** Scrophulariaceae



#### MEDICINAL PROPERTIES / USES

Brahmi (*Bacopa monnieri*) is one of the most valuable medicinal plants in Ayurveda and has been used traditionally from several years. This is well known as “Brahmi” in Ayurveda and considered as “Medhya Rasayana” i.e. Brain Tonic. This herbal plant is also known as Thyme leaved gratiola. It is a small prostrate herb with fleshy leaves which can be propagated by cuttings. Brahmi can be grown in rich soil with regular and heavy watering up to 2 to 3 times a day and should permanently be kept in moist.

**Medicinal Uses:** It is extensively used as neurotonic in traditional Indian Medicine. Brahmi is also used for treating mental and nervous disorders. It is also beneficial for the patient of Alzheimer’s disease and of Liver cancer. It is also used as herbal supplement in epilepsy, anxiety and depression.

**Common Name :** Chirata  
**Botanical Name:** Swertia chiraytia  
**Family Name :** Gentianaceae



#### MEDICINAL PROPERTIES / USES

Chirata is an annual herb mostly found in temperate region. The part used in the medicine is that which grow above the ground. It is also known as Indian gentian.

**Medicinal Uses:** Chirata is a powerful anti-inflammatory agent which is good for rheumatoid arthritis, for joint diseases, swelling, pain and redness. It is a ayurvedic therapeutic plant and used for fever, constipation, upset stomach, loss of appetite, intestinal worms, skin diseases and cancer. It is often called as a “Bitter tonic”. In India it is used for malaria.

**Side Effects & Safety:** Diabetes patient are not allowed to use chirata in their diet as it might lower the blood pressure. Pregnant and Breast feeding ladies should stay on safe side and avoid use.



**Common Name :** Giloy

**Botanical Name:** *Tinospora cordiflora*

**Family Name :** Menispermaceae



### MEDICINAL PROPERTIES / USES

Giloy is also known as Guluchi, is a famous ayurvedic perennial climber herb found in India. It has a significant heart shaped leaves, yellow flowers and ripe berry fruit of red colour. Guluchi is an excellent rasayana for the treatment of various diseases. Though it is used broadly these days but it has the reference in Ramayana and Durga Saptashati. The roots, stems, leaves and fruits are used in the treatment of various diseases.

**Medicinal Uses:** The benefits of giloy are countless. It is used in increasing immunity of the body, its fight against infecting organisms. The leaves of the plant in juice cure psychological disorder. Even leaves are also used in swine flu treatment; it is also used for the treatment of fever due to infection. Giloy is a remedy for diabetes. The traditional use of the leaves is to cure urine infection and stomach ulcer. Its helps in purifying blood and helps in controlling level of Blood Pressure. It is also used in curing rheumatic pain. When leaves of giloy are mixed with cow milk it helps in curing leucorrhoea. The leaf extract also used in curing jaundice and anaemia. It also removes the toxins from the brain. It adds strength and vigour to the body and removes the weakness.

It is considered a most divine herb because of its various ayurvedic uses. Therefore, it is also called as “Amruta” for its divine healing nature.

**Common Name :** Gurmar

**Botanical Name:** *Gymnema sylvestre*

**Family Name :** Asclepiadaceae



### MEDICINAL PROPERTIES / USES

Gurmar is also known as Madhunashini. It is a vulnerable species, slow in growing, perennial, medicinal woody climber which has much therapeutic application in Ayurveda. Leaves of Gurmar in India are well known for their sweet taste suppressing activity.

**Medicinal Uses:** Since India is becoming the diabetic capital of the world, here is the hope called as Gurmar. It is used for reducing blood sugar level since centuries; the paste of the root is used for the treatment of snake bites or wounds. It also brings down a high cholesterol level. Leaf juice is helpful in avoiding constipation and also helps in regulating the weight of the body. The plant extract is used as a liver tonic and is used to refresh the cardiac activities by improving circulation of blood. Traditionally, it is used for the treatment of gastric troubles. The leaf extracts also cures eye problem and root bark is useful for the treatment of piles. It's give comfort in colic pain and dropsy.

**Common Name :** Holy Basil  
**Botanical Name :** *Ocimum basilium*  
**Family Name :** Lamiaceae



### MEDICINAL PROPERTIES / USES

Holy Basil is commonly known as “Tulsi” which is a common herb grown in many households with wide range of therapeutic properties. Tulsi is an erect much branched sub shrub of 30 to 60 cm tall with green or purple leaves that are strongly scented and hairy at stem. Generally two varieties of Tulsi are found Rama Tulsi and Krishna Tulsi.

**Medicinal Uses:** Tulsi has a beneficial effect in cardiac disease and reduces the level of blood cholesterol. The juice of Tulsi is beneficial in the treatment of ringworms, leucoderma and other skin diseases. Tulsi leaves have strengthening effect on the renal stone. It is rich in antioxidant properties and can reduce stress, enhance stamina, promote healthy metabolism and is a natural immune-modulator. Its oil is also used against the insects and bacteria. The Rama Tulsi is the effective remedy for the severe acute Respiratory Syndrome. Juice of its leaves gives relief in cold, fever, bronchitis and cough. Tulsi oil is also used as the ear drop. Tulsi helps in curing malaria. It is very effective against indigestion, headache, hysteria, insomnia and cholera. The fresh leaves of Tulsi are taken by the people every day. Due to its remarkable healing properties it is also known as “Queen of Herbs”

**Common Name :** Sarpagandha  
**Botanical Name :** *Rauvolfia serpentina*  
**Family Name :** Apocynaceae



### MEDICINAL PROPERTIES / USES

Sarpagandha is also known as “Indian Snake Root” is an evergreen plant which has been in use since years in Indian Medicines. It is an erect under shrub with spear shaped leaves and with white and red flower. It is a useful herb in Ayurveda and Homoeopathy treatments.

**Medicinal Uses:** It is used for the treatment of high blood sugar, it cures hysteria and hypertension. It is also useful for in the treatment of cataract. It also cures plague and fever. Sarpagandha is used for the treatment of Schizophrenia. In different countries it is used as a sedative. It is also used against irregular heart action in old ages. It can also cure rheumatism, edema and intestinal diseases. It is also used against constipation and dizziness.



**Common Name :** Thyme  
**Botanical Name :** *Thymus vulgaris*  
**Family Name :** Lamiaceae



### MEDICINAL PROPERTIES / USES

Thyme is a small perennial shrub with lots of branches and light purple to pink flowers. It grows in hot and sunny locations. The parts which are used for medicinal purposes are flowers, leaves and oil.

**Medicinal Uses:** Thyme is used for curing bronchitis, whooping cough, sore throat, colic, arthritis, upset stomach, gastritis, diarrhoea, a movement disorder in children (dyspraxia), parasitic worm infection and skin disorders. It is also used to increase urine flow, to disinfect the urine and as an appetite stimulant. Thyme oil is used as a germ killer in mouthwashes. It is also applied to the scalp to treat baldness and to the ears to fight bacterial and fungal infections.

**Common Name :** Calihari  
**Botanical Name :** *Gloriosa superba*  
**Family Name :** Colchicaceae



### MEDICINAL PROPERTIES / USES

*Gloriosa superba* is composed of two words “Gloriosa” means full of glory and “superba” means superb is a perennial herb and grown as a climber. It is also known as Glory Lily because of its eye catching and multi-coloured glorious flowers. The tendrils which are present in the leaves help the plant to grow with the support of other plants in order to get sunlight. The flowers are red, orange, yellow and multi-coloured. It is the state flower of Tamil Nadu. The height of plant is about 3.5 m to 6 m. This medicinal plant is having underground V shaped tubers.

**Medicinal Uses:** The plant *Gloriosa superba* gives ease from the neuralgic pain. It helps in curing skin disease and itching in the skin. It also kills worm in the body. It gives comfort from abdominal pain and used in the treatment of piles and chronic ulcer. The extract from the root is used as a tonic that can add vigour to the body. Since, this plant is rich in colchicine's, so the seeds are used in the treatment of rheumatism and gout. The tubers of glory lily are used against snake bite and the extract is used to kill lice. The tubers of this plant are also used for the treatment of kidney problem. Due to its laxative nature, it can be used as a home remedy for constipation. It also cures haemorrhoids disease and also helpful for the treatment of small pox.

**Common Name :** Isabgol  
**Botanical Name :** *Plantago ovata*  
**Family Name :** Plantaginacea



### MEDICINAL PROPERTIES / USES

It is called as “Psyllium”. Isabgol is a stem less annual herb. The part used in medicinal property is husk and seed. Husk of Isabgol is having absorbing and retaining property. Isabgol requires light soil and well irrigation. It can grow in cool climate and dry weather. It is propagated by seeds.

**Medicinal Uses:** It is beneficial in chronic dysenteries and for treating constipation and intestinal disorders. It work as calorie free fibre food and promotes regular bowel movement. The seeds of isabgol are having cooling effect as is used in ayurvedic, unani and allopathic medicines. The seed and husk cures inflammation of the mucous membranes of gastro intestinal and urinary tracts, piles and gonorrhoea. It can treat diarrhoea, can lower blood sugar levels and also lowers cholesterol levels and is good for heart.

**Common Name :** Neem  
**Botanical Name :** *Azadirachta indica*  
**Family Name :** Meliaceae



### MEDICINAL PROPERTIES / USES

It is also called as “Margosa” in English. *Azadirachta indica* is derived from words Azad means Free, Dirakht means Tree and Indica means Indian Origin which literally means “The Free Tree of India” or “Noble Tree”. It is commonly called as Indian Lilac and is very fast growing, evergreen tree which reaches the height of 15 to 20 meters. Its fruits and seeds are the source of neem oil.

**Medicinal Uses:** All parts of neem tree are anti-fungal, anti-diabetic, antibacterial, antiviral and sedative in nature. The neem oil obtained from the seeds is used as a medicine. Neem gum is used as a bulking agent and for the preparation of special purpose food (for diabetics). The neem leaf paste is applied to the skin to treat acne and also used against pox viruses in India. People who are affected with pox viruses are generally made to lie in bed of neem leaves and branches. The flower produces nectar that can be used as a sweetener. Roots of neem are used in relieving fever. Neem is also helpful in the treatment of cough, asthma, ulcers, piles, intestinal worm, and urinary diseases.



**Common Name :** Kalmegh  
**Botanical Name :** *Andrographis paniculata*  
**Family Name :** Acanthaceae



### MEDICINAL PROPERTIES / USES

Kalmegh is commonly called as “King of Bitters” and the part used in medicinal properties is leaves. This medicinal plant grows up to the height 110 cm. The seeds are yellowish brown and small white flowers with rose purple spots are borne in this plant. All plant parts are extremely bitter in taste.

**Medicinal Uses:** Kalmegh is an antioxidant and anti-inflammatory in nature. It is used for the treatment of cancer and HIV. The regular use of Kalmegh is helpful to cure cough, cold, sinus and body pain. It is also used as a blood purifier and enhances immunity. It protects the liver and used as a liver tonic. Traditionally, Kalmegh is used in the treatment of leprosy and Cholera. The tonic made by kalmegh is used against weakness to add strength and vigour to the body. The extract of Kalmegh is used in the treatment of slow digestion, bowel irritation and irregular menstrual syndrome. The syrup of kalmegh is used against fever and malaria. It is also used against the respiratory infection and juice of kalmegh is used to cure ulcer. The bitter extract of the leaves is useful in killing worms in the stomach. The entire plant is very useful in the treatment of snake and scorpion bite. It is also used against heart disease and helps in reducing high blood sugar.

**Side effects and Safety:** The plant is strongly avoided during pregnancy because of its anti-fertility property.

**Common Name :** Mandukparni  
**Botanical Name :** *Centella asiatica*  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Indian Pennywort”. Mandukparni is known since the ancient times to enhance intellect and wisdom. Its leaves resembles with human brain, thus this medicinal plant is treated as brain food.

**Medicinal Uses:** It is used as a nerve tonic, cardiac tonic, sedative, laxative and blood purifier. It also help in curing skin diseases like eczema and prevents from leprotic ulcers. It is good for healthy hair. It also act as a mood elevator from the conditions like stree, anxiety, tension, depression, etc. Respiratory conditions like asthma, bronchitis, hiccups, etc may be treated with the help of mandukarni. It is beneficial in case of epilepsy. It is also recommended to the patients ho have low red blood cell count.

**Common Name :** Jawarnkush  
**Botanical Name:** Cymbopogon  
jwarancusa  
**Family Name :** Poaceae



### MEDICINAL PROPERTIES / USES

It is an important perennial medicinal herb found as a weed throughout India. Roots and shoots are the important parts which are used medicinally. Traditionally, the species name has been derived from two sanskrit words “Jwar” and “Ankusha” meaning “Fever” and “Breaker”.

**Medicinal Uses:** This medicinal plant is used against different diseases like vomiting, abdominal tumors, unconsciousness, blood impurities, skin problems, etc. It is used in the treatment of gout, rheumatism and fever.

**Common Name :** Sadabahar  
**Botanical Name:** Catharanthus roseus  
**Family Name :** Apocynaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Periwinkle” and “Nityakalyani”. It is a very commonly grown plant in India. It is an evergreen shrub that grows to about 90 cm in height having smooth, glossy and dark green leaves and flowers throughout the year.

**Medicinal Uses:** This medicinal shrub helps in treating gastritis, cystitis, diarrhoea and diabetes. The leaves and stem are a source of alkaloids that have anti-tumor and anti-cancer properties. Sadabhar controls nosebleeds, bleeding gums, mouth ulcers and sore throats. It also helps in increasing blood circulation in the brain, support brain metabolism, prevents memory and concentration problems, prevents early ageing of brain cells. Periwinkle also helps in cough, lung congestion, eye irritation and skin infections.



**Common Name :** Shatavari  
**Botanical Name:** *Asparagus racemosus*  
**Family Name :** Asparagaceae



#### MEDICINAL PROPERTIES / USES

Shatavari is considered one of the most beneficial ayurvedic herbs for health issues to women. It is a perennial climbing plant extending to a height of 1 to 2 meters. The flowers having fragrance are white in colour with small spikes. Roots are white, tuberous, radish-shaped and found in clusters.

**Medicinal Uses:** The root powder of this herb supports the female reproductive system, promotes fertility, strengthens the female reproductive system, strengthens the uterus, helps in removing pathogens and other toxins, helps in digestion, boosts the immune system, helps in regulating the menstrual cycle, helps in treating PMS and relieves menstrual pain. It also helps in ease for menopausal symptoms. Supports healthy milk production in lactating mothers and also helps in maintaining normal hormone levels. It also supports normal oestrogen (hormone) production and utilization. Shatavari can enhance the level of white blood cell count and has properties to fight against cholera, typhoid fever and dysentery.

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**Common Name :** Gudhal  
**Botanical Name:** *Hibiscus rosasinensis*  
**Family Name :** Malvaceae



#### MEDICINAL PROPERTIES / USES

It is an annual growing shrub that grows up to the height of 2.5m. The leaves are simple and dark green in colour. The flowers are long, trumpet-shaped with five petals in the shades of white to pink, red, purple or yellow with a size of 4 to 15 cm.

**Medicinal Uses:** It is used in kidney stone remedy and helps in reducing blood pressure. This medicinal plant also helps in liver protection and has anti-oxidant and anti-cancerous properties. It also helps in wounds, boils and in scalp treatment. It relieves from headache and from upset stomach. Hibiscus also lowers cholesterol and helps in managing blood pressure. It has anti-ageing and anti-depressant properties.

**Common Name :** Mahuwa  
**Botanical Name :** *Madhuca indica*  
**Family Name :** Sapotaceae



### MEDICINAL PROPERTIES / USES

The bark of this tree is grey to dark brown in colour, leaves are dark green and flowers are small pale yellow which grow in dense clusters. The Part used in medicinal properties is seeds, bark, flowers, and fruits, oils of seeds, leaves and bark.

**Medicinal Uses:** Various parts of mahuwa are used for the treatment of a variety of diseases. The bark of trees is used for rheumatism, chronic bronchitis, diabetes mellitus, bleeding, spongy gums, diarrhoea and in curing scabies and other skin diseases. The fruits are also edible and used to treat ulcer and chronic tonsillitis and pharyngitis. The edible flowers are nutritive and used as tonic, analgesic, diuretic, cooling agent, in treatment of helminths, bronchitis, etc. The leaves of Mahuwa are used in the treatment of eczema and the roots of the tree can be applied on ulcers.

**Common Name :** Bauhinia  
**Botanical Name :** *Bauhinia variegata*  
**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Kachnar”. It is a deciduous medicinal plant whose height is moderate. Its bark is greyish brown with irregular dark patches. The flowers are pink in colour.

**Medicinal Uses:** Kachnar is very useful in various glandular diseases. Flowers are laxative in nature and flower buds are helpful in piles, cough. It is also beneficial in case of obesity, osteoporosis, swelling glands and in menstrual cycle. It helps in healing up the wounds and also helpful in providing relieve due to burning sensation in the body.



**Common Name :** Dhak  
**Botanical Name :** Butea monosperma  
**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Dhak” or “Palaash” and is found throughout India. It is deciduous medicinal tree with terminal flowers which are red in colour giving tree an appearance of fire flame. Due to this reason it is also called as “Flame of Forest”. The part which is used in medicinal properties is seeds, leaves and flowers.

**Medicinal Uses:** It is useful in treating inflammation, swelling conditions related to bones. The seeds of Palaash are also laxative in nature and are often used to treat worm infection. The gum of Butea monosperma is used to treat dysentery and diarrhoea. Dried flowers are used to cure skin rashes and infection in summers. Paste of flowers is also applied externally to cure joint pain, swelling, sprain injury and arthritis. The bark of the tree also helps in blood purification. Roots of Palaash tree are useful to cure night blindness.

**Common Name :** Papaya  
**Botanical Name :** Carica papaya  
**Family Name :** Caricaceae



### MEDICINAL PROPERTIES / USES

It is commonly known as “Papaya” or “Tree melon”. It is an evergreen herb having tree like appearance which is 2 to 10 m tall. It contains white latex with green colour leaves of 25 to 75 cm in diameter. Flowers are yellow and tiny funnel shaped. Fruit of papaya is large with fleshy orange pulp when ripe skin is thin yellow in colour.

**Medicinal Uses:** Papaya is a fruit which is highly helpful for weight loss. Its provides approximately 39 Kcal per 100 gm. Papaya is helpful in preventing atherosclerosis and other heart diseases, diabetes as it's an excellent source of vitamin C as well as a good source of Vitamin E and Vitamin A. Due to its antioxidant properties papaya prevents the oxidation of cholesterol. It is also rich in fibre content so helpful in lowering the bad cholesterol level. The nutrients present in papaya are found to be helpful in the prevention of colon cancer. Papaya contains protein digesting enzyme namely papain which are responsible to lower inflammation and improves healing from burns. Papaya is found to be beneficial for the immune system and helps in preventing from cold, infections and flu. It is also responsible in providing protection against inflammatory polyarthritis. Taking papaya regularly in diet is helpful in reducing the risk of prostate cancer.

**Common Name :** Dhania  
**Botanical Name :** *Coriandrum sativum*  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Coriander commonly known as “Dhania” in India is an herb that is extensively used around the world as a condiments, garnish or decoration on culinary dishes. Its leaves and fruits have a pleasant aroma and are commonly used raw or dried for culinary applications. The part used in medicinal property is leaves and seeds.

**Medicinal Uses:** Coriander oil is used as stimulant for gastric secretion. It has benefits as a carminative, digestive, wormicidal, diuretic. It is also found beneficial for brain development and can be used as tonic for various neurological disorders. It is helpful in reducing cholesterol level, blood pressure. It acts in diarrhoea treatment by helping in smooth digestion and regular functioning of liver. Coriander is rich in iron that can directly give positive effects in anaemic conditions. It also helps in treating mouth ulcers, menstrual problems and in getting remedy from eye problems as it is rich source of Vitamin A, Vitamin C and Minerals like Phosphorus which are beneficial for eye problems. Coriander leaves and seeds are also beneficial in health problems like small pox, conjunctivitis and diabetes. It can also cure ulcers and inflammations.

**Common Name :** Haldi  
**Botanical Name :** *Curcuma longa*  
**Family Name :** Zingiberaceae



### MEDICINAL PROPERTIES / USES

Turmeric is commonly called as ‘Haldi’. It is used in India, as food substances as well as medicine. It can be used both internally & externally. It is found in rhizome with oval, long and thick roots. It is bitter in taste, pungent with warm effects.

**Medicinal Uses:** It is anti-septic, useful in ulcers, wounds, antimicrobial, antibacterial, Anti-viral treatment, cold, cough, bronchitis, conjunctivitis, liver diseases, sprain, and painful oedema. It is helpful in improving digestion, in relieving from arthritis, prevents cancer. Boost up the immune system. Haldi is found beneficial for weight management and also is reducing cholesterol level. It is also helps in preventing Alzheimer’s disease. Turmeric is also rich in Iron so helpful for anaemic person. It is used in the treatment of all skin disorders, discoloration of skin, anomalies of urine and of blood. Turmeric is very effective in eosinophilia. Effective medication in all nature of allergies.



**Common Name :** Long pepper

**Botanical Name :** Piper longrum

**Family Name :** Piperaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as 'Pippali' cultivated for its fruit which is usually dried. It is a slender, aromatic climber with perennial woody roots creeping and jointed stems, fleshy fruits embedded in the spikes. Long piper leaves are memerous, dark green, shinning above and pale & dull beneath. Fruit is long and attains red colour when it ripens and when it dries it turn into black.

**Medicinal Uses:** Long pepper has a wide range of application in medicines. It is used as a "Rasayana" in the treatment of respiratory disorders and also an important constituent in digestive formulations. It treats stomach-ache, heartburn, indigestion, intestinal gas, diarrhoea and cholera; it is also used for lung problem including asthma, bronchitis & cough. Other uses include treatment of headache, toothache epilepsy, fever, and stroke, trouble sleeping (insomnia), leprosy, extreme tiredness, enlarged spleen, muscle pain, nasal discharge, paralysis, snakebites, tetanus, thirst, tuberculosis and tumours. It is also used in treating menstrual cramps infertility.

**Common Name :** Baheda

**Botanical Name :** Terminalia bellerica

**Family Name :** Combretaceae



### MEDICINAL PROPERTIES / USES

Terminalia bellerica is also known as "Baheda". The plant grows up to 60-80 feet in height. The trunk is straight and dark brown in colour. The leaves are broad, oval and 4 to 8 inches long. The flowers grow in both upper and lower part. When fruit dries it looks like a pentagon and is fibrous. In Sanskrit it is called as "VIBHEETA" which means the one which takes away the fear of diseases.

**Medicinal Uses:** It is rejuvenating, presents ageing and adds longevity. It is also cures vomiting and excessive thirst. The plant is useful for improving mental disorder. It cures lose of appetite and also proved anti-diarrheal because of its astringent property. Baheda is useful for piles and curing intestinal worms. The fruit is useful for curing eye related problems such as immature cataract or nay kind of infection. It is used to lower the blood pressure and levelling the cholesterol. Terminalia bellerica promotes hair growth, adds nutrition's and useful against greying. The fruit chewed is believed to cure cough, cold, asthma and hoarse voice. It is also helpful in stopping bleeding, in curing bronchitis, and in curing digestive problem. It is also helpful for ear pain. It has been proved beneficial against jaundice, leprosy and anaemia. Baheda is useful against cardiac problems, diabetes & urinary disorders. The tonic is good for brain and stomach.

**Common Name :** Vacha  
**Botanical Name:** Acorus calamus  
**Family Name :** Acoraceae



### MEDICINAL PROPERTIES / USES

Acorus calamus is commonly known as “Sweet flag” or “Sweet Root”. It is a perennial, erect, aromatic herb common on river banks and marshes. The medicinal purpose the roots of the plant are used. It has aromatic leaves and rhizomes.

**Medicinal Uses:** The rhizome of vacha has stomachic, carminative and nervine properties. It is used in the treatment of diseases of the body and mind. It is given to improve memory and functioning of brain. Vacha is also used in the treatment of paralysis, cholera, headache, joint pain, fever, cough, diarrhoea epilepsy, and retention of urine, intestinal worms, cough, bronchitis, diarrhoea, gas, hair loos, indigestion, vocal problems and various skin disorders. It can also be useful in syphilis, boils, wounds for acne, etc.

**Common Name :** Bael  
**Botanical Name:** Aegle marmelos  
**Family Name :** Rutaceae



### MEDICINAL PROPERTIES / USES

Bael is the most ancient sacred tree in India. Mostly it is planted near the temple and used as a dedication to Gods. The use of this plant is seen in scripture like Vedas and Mahabharata. The plant act as a climate purifier by absorbing poisonous gas from the atmosphere.

**Medicinal Uses:** The juice of the fruit gives comfort from constipation and dyspepsia. The fruits are use against viral and intestinal parasites. It is also used for the treatment of tuberculosis and gynaecological disorders. It can also be used against the urinary complaint. The fruits are also used to increase appetite. Due to bitter and pungent taste of fresh fruit, it can be used to decrease the Blood Sugar. The fruit is also used in intestinal disorder. It is also used in the treatment of diarrhoea, dysentery and irritation in the elementary canal. The juice can be used as brain and heart tonic. The leaves are used for a diabetic person and can be used against peptic ulcers. Leaves are also useful for the treatment of jaundice, leucorrhoea, wounds, deafness; conjunctivitis raw leaves can be used to cure gastric problems and irritation in the bowel. Flowers of Bael is use to prepare tonic for curing epilepsy and the extract can be used for the treatment of dysentery and diabetics.



**Common Name :** Motha  
**Botanical Name :** *Cyperus rotundus*  
**Family Name :** Cyperaceae



### MEDICINAL PROPERTIES / USES

*Cyperus rotundus* is commonly called as “Motha” which can be seen growing as weed in garden, lawn, fields and waste lands. It looks like grass and have tuberous roots underground. It is a perennial plant. Its blacklists lustrous roots have distinct small due to the presence of essential oil. These rhizomes roots are rich in medicinal properties and are used for the treatment of diseases since time immemorial. They are used fresh and dried.

**Medicinal Uses:** Motha is used in the treatment of a variety of diseases. It is one of the best herbs for treating many female disorders like yeast, candida and premenstrual syndrome. It is also used for menopause, menstrual disorders and breast tumours. It is used for treating digestive disorders and breast tumours. It is used for treating digestive disorders pain in abdomen, low appetite, digestive weakness, indigestion, diarrhoea and bleeding dysentery.

**Common Name :** Amla  
**Botanical Name :** *Embllica officinalis*  
**Family Name :** Phyllanthaceae



### MEDICINAL PROPERTIES / USES

*Embllica officinalis* is also known as “Amla” (Indian gooseberry). It is a medium sized plant that grows not more than 18m in height. The trunk is slightly curved and the branches are scattered around. The bark of amla plant is grey with hard reddish wood. It has a yellowish green or pinkish colour flower and the fruit is pale yellow in colour round in shape. The leaves are lighter in weight, long in shape and small like lemon.

**Medicinal Uses:** The Vitamin C content in Amla helps in improving the digestive system, rejuvenates the body, cures stomach constipation, helps in blood purification, reduces cough and asthmatic problems and improves eyesight. Along with these amla improves immunity and also improves physical strength. It is used for scalp treatment as it is having carotene and iron; Amla ensures proper absorption of calcium that directly or indirectly is beneficial for bones, teeth and nails. Amla is good for weight loss and helps in preventing eye related problems such as cataract, vision improvement. The presence of vitamin A and carotene over comes many problem related with eyes. It is also used for healthy heard by reducing the level of cholesterol. It also relieves from asthma, bronchitis respiratory congestion, chronic cough and cold.

**Common Name :** Amaltas  
**Botanical Name:** Cassia fistula  
**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

Cassia fistula commonly called as 'Amaltas' is a medium sized tree with brilliant yellow flowers growing at roadside and garden long cylindrical pods are used in medicinal property seeds are shiny black in colour for medicinal purpose, all parts of the tree viz. roots, bark leaves, fruits are used.

**Medicinal Uses:** Amaltas is very effective laxative. This herb is used to treat fever, heart disorders, bleeding disorders, abdominal distension, and abdominal pain. Fruit are used to treat leprosy and are best anti-pyretic and purgative in nature. It is also used in skin disorders and in protecting liver. Cassia is also used in the treatment of rheumatism, gout the fruit pulp is a medicine for curing constipation the leaves are rubbed on skin in case of severe itching. It is also used in treating fever, inflammation and legatorial infections.

**Common Name :** Ashok  
**Botanical Name:** Saraca indica  
**Family Name :** Caesalpinaceae



### MEDICINAL PROPERTIES / USES

Ashok tree is one of the most legendary and sacred trees of India. It is an evergreen tree 15-20 meter high. The leaves are 15cm long and of oblong shape. The flowers are yellowish orange and scarlet. All parts of the tree such as bark, leaves, flowers and seeds are used medicinally. Due to its medicinal value, it is known as a universal plant.

**Medicinal Uses:** Ashok tree is popularly used in the treatment of gynaecological problems and menstrual disorders in women. The Ashok herb can naturally improve the skin's complexion. The bark is used to cure bacterial and fungal infections. Ashok helps in treating irritations and burning sensation in the skin. It also helps in curing diarrhoea and purification of blood. Ashok is also used for curing of piles and bleeding caused due to piles. Powder made from Ashok seed cures kidney stones and act as a memory enhancer, helps in urine retention. Saraca indica is also used for heart diseases and tumours.



**Common Name :** Ginger  
**Botanical Name :** *Zingiber officinale*  
**Family Name :** Zingiberaceae



### MEDICINAL PROPERTIES / USES

Ginger is also known as 'Adarak' is a flowering plant whose rhizome/root is widely used for medicine. It is an herbaceous perennial which grows through pseudo stems about a meter tall bearing narrow leaf blades.

**Medicinal Uses:** It is carminative, analgesic, antiviral, and anti-inflammatory in nature. Ginger can treat many forms of Nausea like nausea caused by cancer treatment by HIV/AIDS, reduces muscle pain and soreness. Due to anti-inflammatory in nature it can help with Osteoarthritis. Ginger is commonly used for various types of "stomach problem" including motion sickness. Other uses include pain relief from rheumatoid arthritis menstrual pain. The oil made from ginger is sometimes applied to the skin to relieve pain.

**Common Name :** Elaichi  
**Botanical Name :** *Elettaria cardamomum*  
**Family Name :** Zingiberaceae



### MEDICINAL PROPERTIES / USES

Elettaria cardamom, commonly known as "Green or True Cardamom", is an herbaceous perennial plant. It is also been called as Queen of Spices." It grows about 2 to 4 m in height. The leaves are alternate about 40-60 cm along with long pointed tip.

**Medicinal Uses:** Cardamom is a stimulant and carminative which is used for indigestion and flatulence. In India, is broadly used to treat infections in teeth and gums. It is used to prevent and treat throat troubles, congestion of the lungs and pulmonary tuberculosis. It is also used in inflammation of eyelids and also digestive disorders. It is also used as an antidote for both snake and scorpion venom. Cardamom is used as a breath- freshener and is use to thin the blood.

**Common Name :** Yastmadhu / Mulethi  
**Botanical Name:** Glycyrrhiza glabra  
**Family Name :** Fabaceae



#### **MEDICINAL PROPERTIES / USES**

It is commonly called as “Mulethi” or “Licorice”. It is a hardly leguminous undershrub attaining the height of about 3 meters with compressed pods. The roots are sweet in tastes and used in medicinal property. The flowers of mulethi is whitest purple in colour with green colour leaves.

**Medicinal Uses:** It is conventionally used in the treatment of respiratory and digestive disorders. Mulethi is specifically use in the treatment of chronic acidity, ulcers and chronic bronchial conditions. It is also used in reducing stress, depression and anxiety. Mulethi is also effective remedy for lowering the level of bad cholesterol in the body. The root of mulethi is beneficial in boosting the immune system of body which helps in giving body strength to fight against various harmful diseases. It also keeps liver healthy and is extremely beneficial for skin against eczema and dryness. The root of Licorice is considered to be extremely effective remedy for weight loss. Mulethi is also beneficial for treating sore throat and cough. It reduces the infections such as bronchitis and asthma

**Common Name :** Pudina  
**Botanical Name:** Mentha spp.  
**Family Name :** Labiatae



#### **MEDICINAL PROPERTIES / USES**

It is commonly called as “Mint” and is a popular branching; perennial grows up to 60-80cm in height. It is propagated mainly by its stolons. Leaves are sharply toothed, green in colour. Flowers are abundant in number and purplish in colour. This plant does not produce seeds.

**Medicinal Uses:** Pudina is helpful in promoting digestion, it can help in weight loss, it is a good treatment for irritable bowel syndrome and colic spasms. It can also treats nausea and headache. Pudina is an effective relief for respiratory disorders and cough. It fights against depression and fatigue. It is also helps in improving memory and can promote oral health. It is also helpful in preventing cancer and is good for skin health. It alleviates allergies, hay fever and protects against radiation induced DNA damage. Mint is also useful from getting relief from muscle pain and from sinus disorder. It also reduces risk of cancer and Alzheimer’s disease. It is beneficial in treating arthritis and ulcerative colitis.



**Common Name :** Cinnamon  
**Botanical Name :** Cinnamomum zeylanicum  
**Family Name :** Lauraceae



### MEDICINAL PROPERTIES / USES

Cinnamon is commonly called as “Dalchini”. It is evergreen tree which grows from 20 to 30 feet. The plant has strong branches and thick scabrous bark which is smooth and yellowish. Leaves are dark green on top and lighter green underneath. It has small yellowish-white flowers which bears dark purple berries (Fruit). Bark of cinnamon is used in medicinal property.

**Medicinal Uses:** The Bark of cinnamon is carminative, astringent, stimulant, antiseptic in action. The essential oil which is extracted from cinnamon is a potent antibacterial, anti-fungal and uterine stimulant. It stops vomiting, relieves flatulence and is useful in diarrhoea and haemorrhage of the womb. It is also useful in reducing blood sugar and cholesterol level. Dalchini is also useful in prevention of acne, pimple, cough, cold. It is also helpful in arthritis pain in improving memory and in insomnia.

**Common Name :** Garlic  
**Botanical Name :** Allium sativum  
**Family Name :** Amaryllidaceae



### MEDICINAL PROPERTIES / USES

Garlic is one of the most widely used medicinal plants since ancient times. It is commonly called as “Lahsun”. Allium sativum is an herbaceous, annual, bulbous plant grown for its pungent and edible bulb. The bulb is up to 7cm in diameter and is made up of 1 to 15 cloves. The flowers are spherical in shape initially enclosed in a cluster of papery bracts which splits and open into a green white or pinkish flower.

**Medicinal Uses:** Garlic is used to treat cough, contains allicin, which reduces blood pressure and improves circulation. It is good for rheumatism, arthritis, gout, fluid retention and obesity. Garlic is also useful in strengthening the immune system. It has vitamin B6 which helps in boosting up the mood. It is also helpful in regulating blood sugar, in treating fever, cough & stomach ache. It may prevent cancer of the prostate colon and stomach. It is applied to skin for fungal infections. Garlic cures from urinary tract, kidney infection and yeast infections. It is also helpful in weight control & weight loss. It also helps in preventing heart attack and atherosclerosis.

**Common Name :** Drumstick  
**Botanical Name :** *Moringa oleifera*  
**Family Name :** Moringaceae



### **MEDICINAL PROPERTIES / USES**

*Moringa oleifera* is commonly called as “Senjana” fast growing, deciduous tree. It can reach a height of 10-12m. The Bark has a whitish grey colour. The flowers are fragrant with yellowish white petals.

**Medicinal Uses:** Moringa is used for anaemia, arthritis, rheumatism, asthma, cancer, constipation, diabetes, diarrhoea, epilepsy, stomach pain, stomach and intestinal ulcers, intestinal spasms, headache, heart problem, high blood pressure, thyroid disorders, fluid retention and bacterial, fungal, viral and parasitic infections. It is also use in reducing swelling, boosting immune system and helps in increasing breast milk production. Drumstick is helpful in protecting and nourishing skin and hair. It also helps in treating edema and protects the liver. Moringa contains Calcium and Phosphorous which helps in making bones healthier. It is also helpful in treating depression, anxiety and fatigue.

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**Common Name :** Parsley  
**Botanical Name :** *Petroselinum crispum*  
**Family Name :** Apiaceae



### **MEDICINAL PROPERTIES / USES**

Parsley is a biennial herb grows up to 80 cm long with thin stem and triangular outline leaves. The part used in medicinal property is the entire plant: leaves, fruits and roots.

**Medicinal Uses:** Parsley has been used as a source of certain vitamins and minerals. The seeds of parsley have been traditionally as a carminative to decrease flatulence and colic pain. The root of parsley is use as a diuretic and the juice to treat kidney ailments. The oil of parsley is been use to regulate menstrual flow in the treatment of amenorrhea. Leaves are been used to treat tumours, insect bites, lice, skin parasites. It also helps in the treatment of diseases of the prostate cancer. It is also been use as a scalp lotion to stimulate the growth of hair. Parsley is also helpful in stimulating the appetite, improving digestion and increasing urine production.

**Common Name :** Arjun

**Botanical Name :** Terminalia arjuna

**Family Name :** Combretaceae



### MEDICINAL PROPERTIES / USES

Terminalia arjuna is commonly called as “Arjun” is an evergreen large tree, grows up to 20-25 meters in height. Bark is smooth and grey. Leaves are simple, hard and around 10-20 cm long. Flowers are yellowish white and blooms in March – June. Fruiting in Arjun takes place in September- November.

**Medicinal Uses:** The Bark of Arjun has been used from ages for the treatment of heart and blood vessels disorders. It helps in relieving chest pain, high blood pressure and high cholesterol. It is also used for urinary tract diseases. Arjun is helpful in protecting liver and to treat respiratory conditions including respiratory tract infections, cough and sore throat. It is also used for dysentery. The wine of Arjun bark is very useful in treating bleeding piles and leucorrhoea. The paste of the bark is applied over the fractures helps in promoting the early healing. The herb contains a substance called casuarinin that seems to prevent breast cancer. Arjun helps in promoting normal blood flow and reduces the symptoms of giddiness, headache and insomnia.

**Common Name :** Tejpatta

**Botanical Name :** Cinnamomum tamala

**Family Name :** Lauraceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Talisha Pattri” or “Tejpatta” and is a medium sized evergreen tree of about 2 to 10 m tall. Its mature leave are dried and commonly known as bay leaves are used in medicinal properties.

**Medicinal Uses:** Cinnamomum tamala leaves and bark have aromatic, astringent, stimulant and carminative qualities. It is used in rheumatism, colic, diarrhoea, nausea and vomiting. Tejpatta is also used in the treatment of cold, cough, allergy and headache. It can also be used for scalp infection, for lice in hairs. Abdominal pain, abdominal gas, indigestion can be cured by Tejpatta. Regular intake of bay leave can prevents stone formation in kidney. Heart diseases, uneasiness and uterus infection can also be prevented by the use of Tejpatta. Arthritis, joint pain, gout are also cured by the application of bay leaves at the affected area.



**Common Name :** Fenugreek / Methi

**Botanical Name :** *Trigonella foenum-graecum*

**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

Fenugreek also known “Methi” is an herbaceous annual plant that stands around 2-3 feet (60-90cm) tall. It has green leaves, small white flower and pods that contain small, golden-brown seeds. The plant has an erect growth habit and have strong, sweet aroma.

**Medicinal Uses:** Fenugreek is helpful in digestive problem such as loss of appetite, upset stomach, constipation, gastritis. It is also used for diabetes, painful menstruation, polycystic ovary syndrome, atherosclerosis and for high cholesterol. Fenugreek is helpful in kidney ailments, mouth ulcers, boils, bronchitis, cellulitis, tuberculosis, baldness, cancer and Parkinson’s disease. Methi is also used for hernia, male infertility and in women’s methi promotes milk flow after child birth and reduces menstrual cramps.

**Common Name :** Lemon Grass

**Botanical Name :** *Cymbopogon citratus*

**Family Name :** Poaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Lemon grass” and is a perennial grass grown for its fragrant leaves and stalk which is used as a flavouring agent. Lemongrass is also referred to as Ginger grass or citronella grass.

**Medicinal Uses:** Lemon grass is useful in relieving anxiety, lowering cholesterol, preventing infection, boosting oral health, relieving pain, boosting red blood cell level and relieving bloating. It also helps in reducing fever, blood sugar level and stimulates the uterus and menstrual flow.



**Common Name :** Beetroot  
**Botanical Name :** Beta vulgaris  
**Family Name :** Chenopodiaceae



### MEDICINAL PROPERTIES / USES

Beets are herbaceous biennial root vegetable. The plant is usually erect with long main root and purple green leaves growing on stems. The beets are propagated by seeds.

**Medicinal Uses:** Beet is commonly used in the treatment of liver diseases and fatty liver. They are also useful in reducing the levels of triglycerides (a type of fat) in the blood, blood pressure and muscle soreness. Beet root also helps in preventing cancer of breast and prostate. It helps in boosting up the energy level, fight against inflammation. It promotes brain health by preventing Alzheimer's disease. It controls blood sugar, aids digestion, helps in the treatment of Anaemia. Beets are the great source of carotenoids which reduce the risk of cataract formation. It also promotes stronger bones and teeth as they are a good source of calcium.

**Common Name :** Ajwain  
**Botanical Name :** Trachyspermum ammi  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Trachyspermum ammi is also known as ajwain or bishop's weed. It is an annual herb. Both the leaves and the seed-like fruit of the plant are consumed for medicinal properties. The leaves are green in colour and flowers are of white colour. The height of plants is approximately 60-90 cm.

**Medicinal Uses:** Ajwain helps in providing instant relief from acidity and indigestion. It also helps in treating common cold, provides relief from migraine headache. Ajwain is also useful for ear tooth ache. A component called thymol in ajwain seed acts as a strong germicide. Thus ajwain seeds can be crushed and applied on the skin to treat infection or cuts. Ajwain seeds help in halting premature greying of hairs. It also eases the pain due to arthritis and helps in cleaning the skin by lightening acne scars.

**Common Name :** Clove

**Botanical Name:** Syzygium aromaticum

**Family Name :** Myrtaceae



### MEDICINAL PROPERTIES / USES

Cloves are the aromatic dried flower buds. The tree of clove is an evergreen that grows to a height ranging from 8 to 12m, having large leaves with blood red colour flowers which are numerous in groups.

**Medicinal Uses:** Clove is most commonly applied directly to the gum for toothache, pain control during dental work and other dental related issues. Cloves are applied to minor cuts for healing purposes. Tea of clove is a popular warm beverage to relieve congestion. Oil of clove is helpful in relieving headache, flatulence as well as reduces stretch marks clove is used as a carminative and also use for boosting the immune system by purifying the blood and help to fight against various diseases. Cloves are good expectorants that promote the discharge of mucous and secretions in the respiratory passage. Clove oil stimulates blood flow and circulation making useful for the people having cold extremities. It is also helpful for preventing the breakdown in retina of the eye and also enhances memory retention. Clove is also beneficial for diabetic patients by controlling the blood glucose levels. Eugenol found in clove is powerful enough for preventing blood clots. Sucking of clove bud reduces the desire of alcohol. Clove oil is very effective in curing foot and nail fungus.

**Common Name :** Fennel

**Botanical Name:** Foeniculum vulgare

**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Fennel is an aromatic perennial herb grown for its edible shoots, leaves, and seeds. The height of the plant is about 1 meter (3 feet) tall and has stalks with finely divided leaves. The flowers are small yellow in colour and fruits are small, dry, greenish-brown to yellowish-brown. The dried ripe seeds and oil are used to make medicine.

**Medicinal Uses:** There are many health benefits of fennel which include relief from anaemia, indigestion, flatulence, constipation, colic, diarrhoea, respiratory disorders, and menstrual disorders. It also aids in eye care. It has anti-cancer properties and reduces heart diseases. It also helps in regulating blood pressure and improves brain function. Fennel helps in boosting immunity and regulates menstruation. It also protects against the harmful effects of radiation during cancer treatment.



**Common Name :** Rosemary  
**Botanical Name:** *Rosemaria officinalis*  
**Family Name :** Lamiaceae



### MEDICINAL PROPERTIES / USES

Rosemary has a strong fragrance. It is used in oil, perfumes and cooking. The leaves are evergreen 2-4cm (0.8-0.16 in) long and 2-5mm broad, green above and white below with dense short woolly hair. It is considered easy to grow for beginner gardeners. It grows all year round and strong healthy plants flower in summer with pale to deep blue colour flowers.

**Medicinal Uses:** Rosemary improves memory, helps in reducing blood sugar, body weight, helps in preventing cataracts, protects the body's cell and DNA from radical free damage, simulates liver enzyme which help inactivating estrogen hormones which can cause breast cancer. Rosemary also helps in preventing age related skin damage, encourages enzymes which flush harmful toxins out of the liver and body. Rosemary also helps in improving kidney function and increases urine flow. It act as a stimulant for hair growth, boost mental activity, relieve respiratory problems and pain due to menstrual cramps, prevents from peptic ulcers, leukaemia and kidney stone.

**Common Name :** Aak  
**Botanical Name:** *Calotropis procera*  
**Family Name :** Asclepiadaceae



### MEDICINAL PROPERTIES / USES

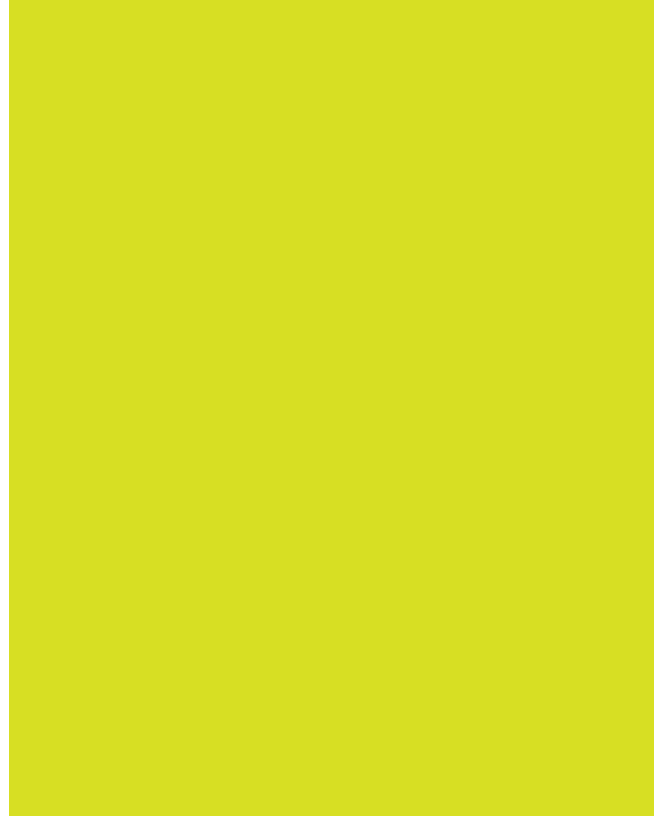
Aak is commonly called as "Madar". It is a perennial shrub growing 2.5 m high with various branches and sub branches. Leaves are simple. It has bunch of waxy flowers that are white or lavender in colour and in shape of crown. The name of this plant is synonymous with Sun as the herb is very strong and astringent in action same as powerful rays of sun.

**Medicinal Uses:** Whole plant is used to treat common diseases such as fever, rheumatism, indigestion, cold, and eczema, diarrhoea for the treatment of boils and for the treatment of jaundice. Root is use for the treatment of elephantiasis, asthma, cough and leprosy. Stem of madar is use for the treatment of skin diseases, intestinal worms, and leprosy and cure leucoderma. The leaves and latex of Aak are used as an antidote for snake poison. It also improves appetite thereby fighting anorexia and also helps in healthy working of the respiratory system.











California Poppy  
Flowers







# **CENTRAL PUBLIC WORKS DEPARTMENT**

Ministry of Housing and Urban Affairs

# **MUNICIPAL CORPORATION BHAVNAGAR**

## **VENDOR LIST**



**(A)LIST OF APPROVED VENDORS FOR CIVIL WORKS**

<b>Sr. No.</b>	<b>ITEMS</b>	<b>Approved Brands / Quality</b>
1	CEMENT PPC 53 Grade & SULPHATE RESISTANT CEMENT,S.R.C.	Ambuja, Hathi, Ultra Tech, Sanghi, Siddhi, Hi-bond
2	BRICKS	MBM, Arjun, PBM, 555, Kisan, ABM, TRD, Pares, Dhara, B.R.C., Kiran, BMB, Kirit, Sonal
3	Steel TMT, CRS	TISCO, SAIL, VIZAG, Kamdhenu, NATIONAL, Electrotherm, JSW, Welspun steel, Pollad Steel, DIAMOUND TMT, M. G. Steel, Friends Steel, Crown next TMT, Briskon TMT
4	VITRIFIED TILES	Asian, Kajaria, Jonson, Varmora, Simpolo, OASIS
5	CERAMIC TILES	Asian, Kajaria, Johnson, Varmora, Simpolo, OASIS
6	GLAZED TILES	Asian, Kajaria, Johnson, Varmora, Simpolo
7	ACRYLIC PAINT	ICI, Asian, Nerolac, Burger
8	OIL BOUND DISTEMPER	ICI, Asian, Nerolac, Burger
9	EXTERIOR WEATHER PROOF EMULSION PAINT	ICI, Asian, Nerolac, Burger
10	Oil Paint	ICI, Asian, Nerolac, Burger
11	SANITARY WARE	Cera, Hindware, Parryware
12	CAST IRON PIPES AND FITTINGS.	NECO, Swayarhoo, Bengal, Oriental Castings, Electro steel Castings
13	P.V.C. PIPES AND FITTING (UPVC/CPVC)	Finolex, Supreme, Jain, Kisan, Astral, Dutron, Prince
14	CHROMIUM PLATED WATER SUPPLY FITTINGS	Jaquar, Ess Ess, Plumber ,ESSCO, Crown, Metro, Prince
15	GALVANIZED PIPE	Tata, Essco, Jaquar, Ess Ess, Plumber
16	GALVANIZED FITTINGS	'R' Brand, 'RV' Brand, Kranti
17	C.I. MANHOLE COVER	Manish, Sil, NECO
18	PLUMBING FIXTURES	Jaguar, Plumber, Essco
19	PVC WATER TANK (100% VIRGIN PVC)	Sintex, Aqua
20	ALUMINIUM SHEETS AND ACCESSORIES	Nalco, Jindal, Hindalco, Banko

Sr. No.	ITEMS	Approved Brands / Quality
21	ALUMINIUM EXTRUDED DOOR/ WINDOW SECTION	Jindal, Hindalco, Banko, Ajin India, Aldowin, Alumilite
22	ALUMINIUM HARDWARE	Rajdoot, Belu, Diamond, Glider, Ajin India, Aldowin, Alumilite
23	WATER PROOFING MATERIALS	Zycosil, Dr. Fixit, Kerakoll, Pidilite, Roff
24	DOOR CLOSER	Efficient Gadget, Everite, Hardwin, Aldowin, Ozone
25	DOOR FITTINGS	Godrej, Efficient Gadgets (E.G.) Dunex, Doorset, Suzu, Coral
26	HINGES	Suzu, Yama, E.P.P.W.
27	SCREW AND BOLTS	Nettle Folds, GKW, Stud
28	BOLTS & FASTENERS	Hilti, Fisher
29	LIFT	Top, Express, Omega, OTIS, Schander, TRIO, Aegis Elevator, Mitsubishi, Aditya, Siemens slider
30	ROOFING MATERIAL – Galvalume sheets	TATA, Essar, Jindal
31	Slag Cement	SANGHI CEMENT Sanghipuram
32	CPVC PIPES FOR AUTOMATIC SPRINKLER FIRE EXTINGUISHING SYSTEM	ASTRAL POLY TECHNIK LIMITED પાર્કિંગ એરિયા, બેઈઝમેન્ટ એરિયા જેવા વિસ્તારો સિવાય માત્ર કન્સીલ્ડ પાઈપીંગ માટે આ કંપનીના CPVC pipe નો ઉપયોગ fire sprinkler piping માટે કરવાની મંજૂરી આપવામાં આવે છે.
33	AAC Blocks	NXTBLOC
34	Jointing Mortar	NXTFIX Block
35	Ready Mix Plaster	NXTPLAST
36	Block joining Masonry Mortar	Unifix
37	Tile adhesive	Unifix
38	RCC bench	Sardar Pre cast
39	Rubber mould garden curbin	Sardar Pre cast

<b>Sr. No.</b>	<b>ITEMS</b>	<b>Approved Brands / Quality</b>
40	Rubber mould Paver block	Sardar Pre cast
41	Fencing Pole	Sardar Pre cast
42	RCC Masonry block	Sardar Pre cast
43	Pre cast wall	Sardar Pre cast

## (B) LIST OF APPROVED VENDORS FOR MECHANICAL & ELECTRICAL WORKS

Sr. No.	Description	Name of Manufacturer
1	HSCF Pump	Crompton Greaves Ltd
		Kirloskar Brothers Limited (KBL)
		JASCO
		Mather & Platt Pumps Ltd.
		Jyoti Ltd.
2	Electric Motor	Lubi Industries LLP
		Bharat Bijlee Ltd.
		Jyoti Ltd.
		JSL Industries Ltd.
		Jeumont Electrical India Pvt. Ltd.
3	Electrical Panel	LHP
		Crompton Greaves Ltd
		Bhagyashree Power Control
		Dynamic Control System
		Elembica Services
4	Kinetic Air Valve	JSL Industries Ltd.
		Nutral Power Tech
		Kirloskar Brothers Limited (KBL)
		FOURESS Engineering (India) Limited.
		Durga Valves Pvt.Ltd
5	Expansion Bellows	Orbinox
		શ્રી કિર્લોસ્કર નિર્માણ કંપની લિમિટેડ
		Precise Engineers
6	Dewatering (Drain) Pump(Submersible/ Horizontal)	KSB Pumps
		Kirloskar Brothers Limited (KBL)
		JASCO
		Crompton Greaves Ltd
		La Gajjar Machinery Pvt Ltd.
		Pullen Pumps Industries Pvt. Ltd.
		MBH
7	Sluice Valves and Sluice Gate	Kirloskar Brothers Limited (KBL)
		DURGA Valves Pvt.Ltd
		L & T Valves
		Jupiter
		SACHDEVA
8	UPVC Pipe	Supreme Industries Ltd.,Mumbai
		Dutron Polymers Ltd
		Parixit Industries Ltd., A'bad
		Jain Irrigation Systems Ltd., Jalgaon
9	HDPE Pipe	Parixit Industries Ltd., A'bad
		Jain Irrigation Systems Ltd., Jalgaon
		Dutron Polymers Ltd
		Jindal
10	C.I. Pipe	Essar Steel
		Electro Steel, Kejriwal, Oriental Castings, BIC, Jindal, Lanco Industries Ltd.,Chennai, Kesins
13	EOT Crane	Grip Engineering Pvt. Ltd., JAPS Project, Brady & Morris Engineering Co. Ltd., Techno Industries



Sr. No.	Description	Name of Manufacturer
14	Cable & Wires	KEI Industries Ltd.
		Polycab Wires Pvt. Ltd.
		Aerolex Cables Pvt. Ltd.
		Allwin Industries
		Finolex Cables
		L&T Cables
		ULTRA CAB (India) Limited
15	Transformer	Atlanta Electricals Pvt. Ltd.
		Powerlite Electricals
		Voltamp Transformers Ltd.
		SKP Transformers
		Arya Electronics
16	Components for MCC :	
	Switch	L&T, Siemens
	HRC Fuse	L&T, Siemens
	Timer	L&T, Siemens
	Relay	L&T, Siemens
	Push Button Stations	L&T, Siemens
	Indicating Lamp	L&T, Siemens
	Cable Jointing Kit	CCI, M. Seal
	MCB/DB's	MDS, Siemens, Indokupp
17	Capacitors	L&T, Crompton, Khatau Note: Capacitors shall be oil fill type
18	KWH Meter	Simco, Jaipur, GEC
19	Light Fittings: (Indoor & Outdoor Luminaries)	Philips, Crompton, Bajaj, NESSA Illumination
20	Exhaust Fans	Crompton, Bajaj,
21	Ceiling Fans	Crompton, Bajaj, Havells
22	Air Blowers	Everest Ltd.
		Swan Pneumatics (P) Ltd
23	Alum Dosing Pumps	Asia LMI
		VK Pumps
		Swelore
24	Pressure Gauges	General Instruments
		Bells Control
		H. Guru Marketing
25	Level Gauge / Indicator	R K Dutt
		Levecon
		S. B. Electromec
26	Clarifier Equipment	Enviro Control Associates
		Voltas Ltd
		Hindustan Dorr-Oliver
		Geomiller/Triveni
27	Chlorination System	Industrial Device (I) Pvt. Ltd
		Metito
		Chloroequip
		Pennwalt
28	Gear Box	Greaves
		Radicon
		Elecon
		Shanti

Sr. No.	Description	Name of Manufacturer
29	Level Switches	Level-Tech
		Revathi Electronics
		Levec
30	Refrigerator	LG, Samsung, Kelvinator
31	PVC Pipes for Fluid	Finolex, Jain Irrigation
32	PVC Conduits for Electricals	Precision, Shakti
33	Butterfly Valve	KIRLOSKAR Brothers Limited(KBL), DURGA valves Pvt Ltd, L & T valves, R&D MULTIPLE, Jupiter, श्री कृष्ण इंस्टीट्यूट IVC, IVI, Audco, R & D multiple, Jupiter, Cair, Orbit Engineers
34	Check Valve (Dual Plate check Valve)	KIRLOSKAR Brothers Limited(KBL), DURGA valves Pvt Ltd, Orbinox, R&D MULTIPLE, Orbit Engineers
35	Metallic Expansion Bellow	Beloflex(B.D. Engineers), Stanfab Engineering Pvt. Ltd., D. Wren Engineering Pvt. Ltd., Sur Industries,
36	Centrifugal / Centrifugal Non Clog Pumps	Beacon Weir, KSB, Mather & Platt (Wilo), Worthington, WPIL, Xylem pumps , Grundfos Pumps Pvt. Ltd., MBH, JASCO
37	Submersible non Clog Pumps / Submersible Centrifugal Pumps	Kirlosker, KSB, ABS, ITT- Flyght, Xylem pumps, Grundfos Pumps Pvt. Ltd. , MBH, JASCO, AQUA, Jyoti, PULLEN PUMPS, Alpha, Het Pump
38	Screw Pump	Roto, Netzsch, Tushaco, Seepex
39	Metering / Dosing Pumps	Swellore, V.K. Pumps, Shapotools
40	Non Return Valves ( Single / multi door) / Dual Plate Check Valves	Kirlosker, IVC, IVI, R & D multiple, Durga, Jupiter, Cair, Orbit Engineers
41	Knife Gate valves	Jash, Fouess, Vass (Dezurick), Vag, Orbinox, Orbit Engineers
42	Sluice gates / open Chanel Gates	Jash Engineering, IVC, R & D Multiple, Jupiter
43	Mechanical Fine Screens – Step (Mat) Type / Drum Type	Jash, Huber, Johnson, Savi, Italy, Apollo Screens
44	Mechanical Course bar Screen	Jash, Huber, Johnson, HDO, Triveni, Savi, Italy
45	Manual Bar Screen	Jash, Japs, HDO, Triveni, Auric
46	Grit mechanism	EIMCO – KCP, Hindustan Dorr – Oliver, Jash-Shivpad, Triveni, Voltas
47	Diffused Aeration System	EDI, OTT, Rehau
48	Air Blower	Kay, Swam, Everest, Usha Compressors, Gardner Denver
49	Agitator / mixer	Remi, Schurtek, Fibre & Fibre, Milton Roy
50	Gear Boxes	Greaves, Elecon, CPEC, PEPL, Bonfiglioli
51	Centrifuge	Humboldt, Alpha Laval, Hiller

Sr. No.	Description	Name of Manufacturer
52	HDPE Pipes	Astral, Dutron, Duraline, Narmada, RIL (PIL), Penwalt, Anjney, Jain Irrigation, Sangir
53	Air Compressor	Ingersoll – Rand, Khosla, Kirlosker, CPE, Alpha
54	Bearing For All Equipments	SKF, FAG, Tata
55	Fasteners	Precision, Durakhanawala, Echjay, Tata, Sundaram
56	Mechanical Seals	Eagle Seals (Sealol), Durametallic, Burgman
57	Electric Actuator	Auma, Rotork, Emerson, Pentair
58	(1) CATEGORY III Indoor LED fittings, LED Panel light, LED down light, outdoor LED light (street light, LED flood light, LED Post top lantern, LED bollard ) (2) Solar LED Light	NESSA ILLUMINATION TECHNOLOGIES PVT.LTD., Litsun, Nextray
59	STREET LIGHT POLES	AMBICA POLES (for octagonal poles, swage poles, street light poles, high mast poles, decorative poles, conical poles, JETCOTECH Engineering LLP
60	Resilient Seated Slice Valve	Cair
61	Air Valve	Cair, Orbit Engineers
62	Flow Control valve	Cair
63	Altitude Control valve	Cair, Orbit Engineers
64	Pressure reducing valve	Orbit Engineers
65	Pressure relief valve	Orbit Engineers
66	Ball valve	Orbit Engineers
67	Mast pole	JETCOTECH Engineering LLP
68	Earthing material	JETCOTECH Engineering LLP
69	Hot dip galvanizing	JETCOTECH Engineering LLP
70	LED Highbay	Litsun

**(C) LIST OF APPROVED VENDOR FOR INSTRUMENTATION SYSTEM**

<b>SR NO</b>	<b>DESCRIPTION</b>	<b>Name Of Manufacturer</b>
1	Electromagnetic Flow Meter	E+H, Siemens, Abb, Fuji, Yokogawa, Krohne-Marshall, AAROH Embedded System Pvt Ltd., Emerson, SBEM
2	Pressure Gauges	Wika, H.Guru, General Instruments Consortium Manometer (India) P. Ltd. , Baumer, Waaree
3	Pressure Switch	Danfoss , Indfoss , Switzer
4	Process Analyzers (pH, DO, Free / Residual Chlorine , BOD / COD)	E+H , Emerson , Hach , Chemitech , Polymetron, Wtw (Forbes Marshall),Yokogawa
5	Ultrasonic transmitter level / diff. level / flow	E+H, Siemens – Milltronics, Krohne, Vega
6	Hydraulic level transmitter	E+H,Siemens, ABB, Forbes- Marshall, Emerson, SBEM
7	Displacer/Float Switches	Levcon, Nivo, Toshbro, Pune Techtrol , SBEM
8	PP Float / Buoyancy switch	Pepprl + Fuchs, Baumer, Waaree, E+H , Pune Techtrol , SBEM
9	Float & Board Type Level Gauge	Levcon, Nivo, Toshbro, Pune Techtrol, SBEM
10	Electromagnetic Flow Meter	E+H, Siemens, ABB, Fuji, Yokogawa, Krohne-Marshall
11	Field Transmitter (P, DP,F, L , T)	ABB, Fuji, Yokogawa, Honeywell, Emerson
12	Pressure Gauges	Wika, H.Guru, General Instruments Consortium Manometer (India) P. Ltd., Baumer, Waaree
13	Panel Mounted Process Indicator & Flow Integrator	Masibus, Nishko, Nivam, Selectron, Radix, Yokogawa, ABB
14	Pressure Switch	Danfoss, Indfoss, Switzer
15	Programmable Logic Controllers	Rockwell (Allen Bradeley), Siemens, Schneider, Fuji, ABB, GE Fanuc
16	Control Panel Enclosure	Rittal, Enklotek, Bartakke, BCH, Eldon
17	Alarm Annunciator	Aplab Ltd., Minilec , IIC
18	Solenoid valves	Asco, Rotex, Schrader
19	Tube Fitting	Excel Hydropneumatic, Multimetal, Placka



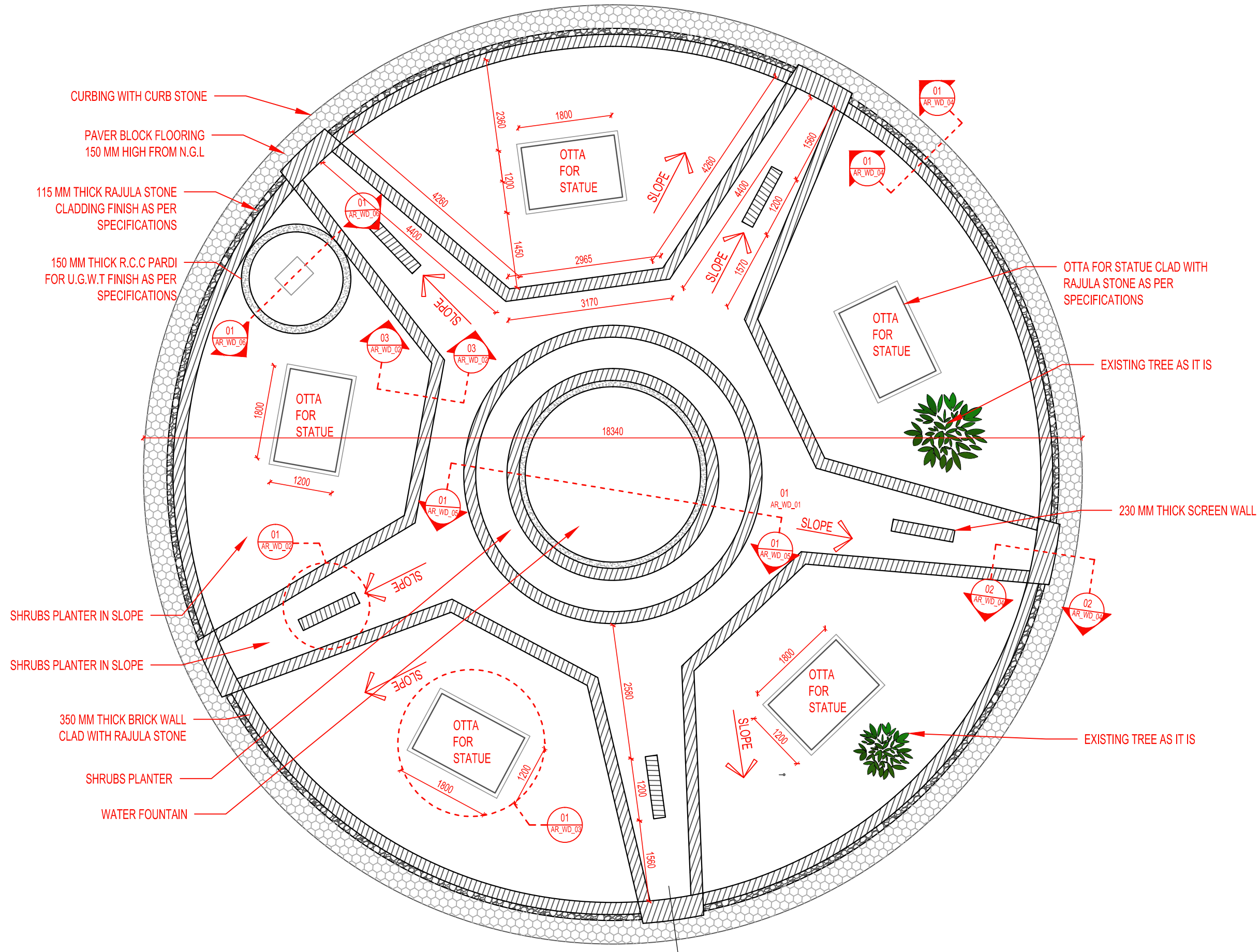
20	Instrument Valves , Manifolds	Aptek, Anmol (Superlok), Excel Hydropneumatic, General
21	Fitting	Instrument Consortium , Multimetal, Technomatic, Placka
22	Pneum , Brass Fitting	Swagelok, Multimetal Industries, SMC, Festo
23	Control Panel Accessories / Components	
a.	Miniature Relay	Wago, Omron, Phoenix, Rockwell
b.	Indication Pilot Lamps (LED Type)	Teknic, Schneider, Siemens
c.	Push Button / Selector Switch (with NO/NC Elements)	Teknic, Schneider, Siemens
d.	DC Power Supplies (DIN Rail mounted)	Phoenix, Omron, Schneider, Rockwell
e.	Terminals	Elmex, Phoenix, Wago, Connectwell
f.	Panel Wires	Finolex , Havell's , R R Kabel
g.	Panel Illumination	Philips , Crompton , GE
24	Instrument Cables (Power , Signal , Control)	Associated Cables, Associated Flexible and Wires P.Ltd., Brooks Cables, Thermo Cables, Udey Pyro
25	Cable Glands	Ex- protecta, Braco, Sudhir, Comet, Connectwell
26	Junction Box	Ex- protecta, CEAG, Sudhir, Baliga, FCG
27	Cable Tray	M.M.Engineering, Globe, Jacinth, Equi. Reputed, JETCOTECH Engineering LLP
28	Computer System	HP-Compaq, Dell, IBM, Sony, Samsung
29	UPS	Hirel-Hitachi, Emerson, APC
30	<ol style="list-style-type: none"> <li>1. PLC (Programmable Logic Controller )</li> <li>2. SCADA (Supervisory Control and Data acquisition )</li> <li>3. VFD (Variable Frequency Drive Up to 500 KW )</li> <li>4. ACB ( Air Circuit Breaker up to</li> </ol>	MITSUBISHI ELECTRIC INDIA PRIVATE LIMITED, Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune 411026

	6000A) 5. MCCB ( Moulded Case Circuit Breaker up to – 1600 A) 6. MCB (Miniature Circuit Breaker up to – 63 A) 7. ELCB (Earth Leakage Moulded Case Circuit Breaker up to 1600 A) 8. Contractor up to – 800 A & OLR (Over load Relay) up to 630 A 9. Multi Functional Meters 10. MPCB (Motor Protection Circuit Breaker up to 32 A )	
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**(D) LIST OF APPROVED VENDORS FOR MATERIALS RELATED TO WATER  
SUPPLY AND SEWERAGE NETWORK**

<b>SR. NO.</b>	<b>ITEMS</b>	<b>NAME OF AGENCIES</b>
1	A C Pressure pipe MAZZA process	Lotus, Kirti
2	A C Pressure pipe MEGHNANI process	Lotus, Kirti, Hindustan
3	Sluice Valve	Durga, kartar, Kirloskar, Jupiter, SACHDEVA ( C.I. & D.I.), શ્રી કિર્તી ઇન્ડસ્ટ્રીઝ, Cair, Orbit Engineers
4	DI Pipe	Electrotherm (I) Ltd.,Ahmedabad, Lanco Industries Ltd.,Chennai, Electrsteel, Jindal Saw Ltd.,Ahmedabad, Kesins, Welspun
5	R.C.C. PIPE ( COLLAR JOINT & SOCKET SPIGOT JOINT) CLASS NP3 & NP4, & R.C.C. COLLARS	VIPUL SPUN PIPES (SIHOR & LATHIDAD,BOTAD), KATARIYA & CO. (DHASSA), OMKARESHVAR PIPES ( NAVAGAAM), OMKAR PIPES ( LATHIDAD, BOTAD), MARUTI PIPES ( BAGODARA ,AHMEDABAD), KALATHIYA PIPES(BAGODARA ,AHMEDABAD), R. S. PIPES (BODELI), UMA HUME PIPES (KALOL, GANDHINAGAR), SIDHDHIVINAYAK ( KARDEJ ,BHAVNAGAR)
6	R.C.C. MACHINEOLE FRAME & COVER, INLET FRAME COVER 10T.(600*450 MM.) , 20T.,35T., & 50T.	SONI CEMENT PRODUCT , VIPUL SPUN PIPES, KATARIYA & CO., OMKARESHVAR PIPES, OMKAR PIPES, MARUTI PIPES, KALATHIYA PIPES , R. S. PIPES, UMA HUME PIPES, SIDHDHIVINAYAK , S.K. Corporation, Laxmi Price Industries, S.J.Corporation, Sardar pre cast
7	Stone ware PipeManufacturer having BIS Certificate for ISI marking	Krishna Pipe, j.K. Pipe, Taya ceramic, Burn & co., perfect Potteries, Navroji Vakil, Kashmira
8	D.I. & C.I. FITTINGS	RG BRAND, ESSEM Engineering Industries, Bikaners Engineers works
9	CID Joints	ESSEM Engineering Industries
10	Valves & Graded Castings	ESSEM Engineering Industries
11	Pipe Fittings	ESSEM Engineering Industries, Bikaners Engineers works
12	CI/DI/MS graded castings	Bikaners Engineers works
13	Scaper machine hole	Sardar Pre cast

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PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI THEME  
AT - VIJAYRAJNAGAR, BHAVNAGAR



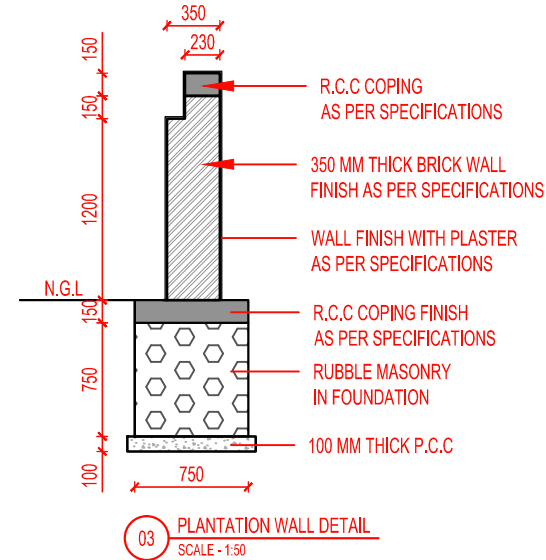
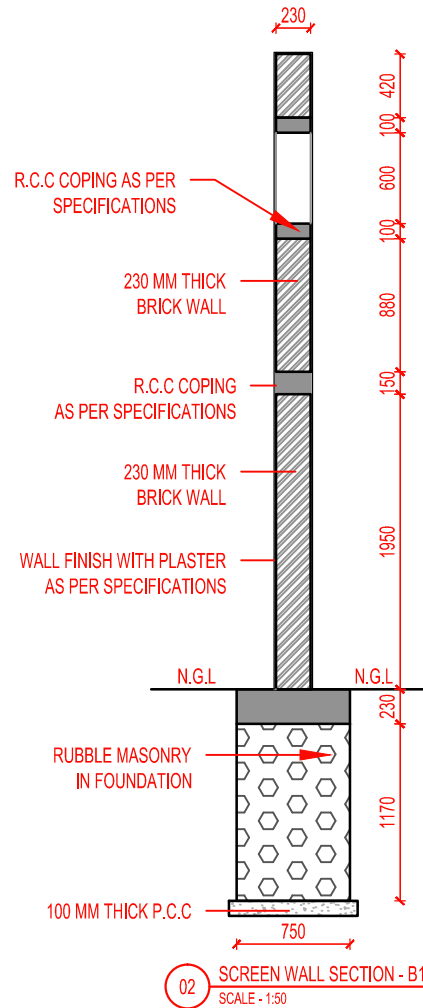
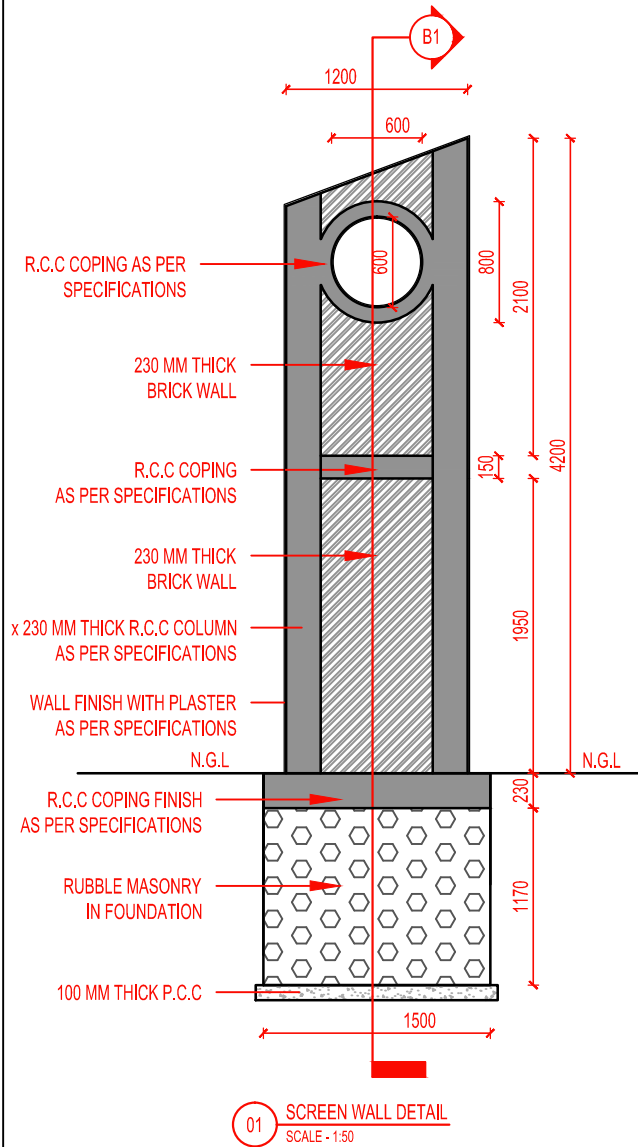
ARCHITECT : SURYARAJ.SINH. N. GOHIL  
suryaraj.architect@gmail.com

#### CIRCLE LAYOUT PLAN

TENDER DRAWING	DRAWING NO.  <b>AR_WD_01</b>
DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A3	
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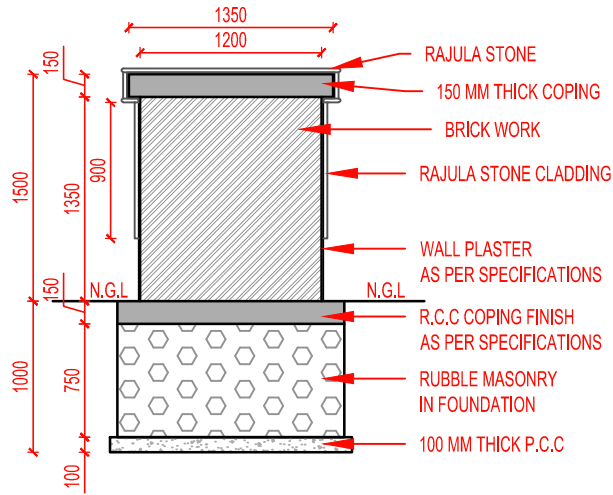
PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR



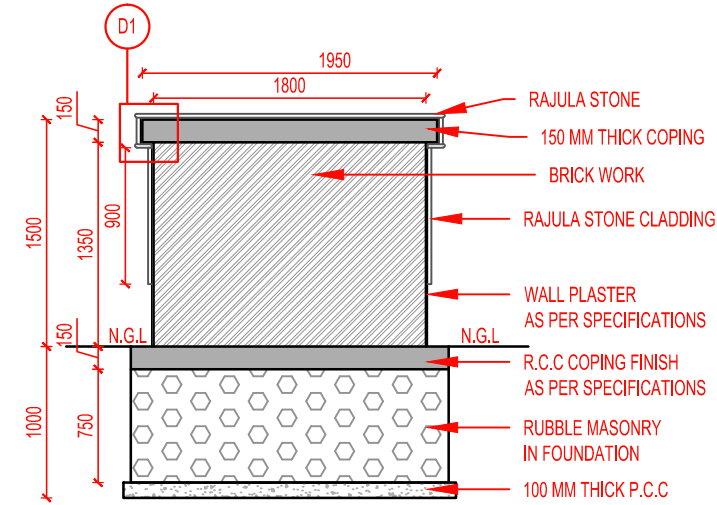
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#### SCREEN WALL & PLANTATION WALL DRAWING

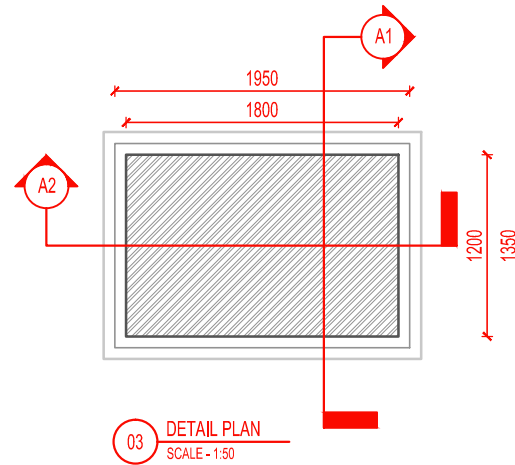
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DRAWN BY : DH	
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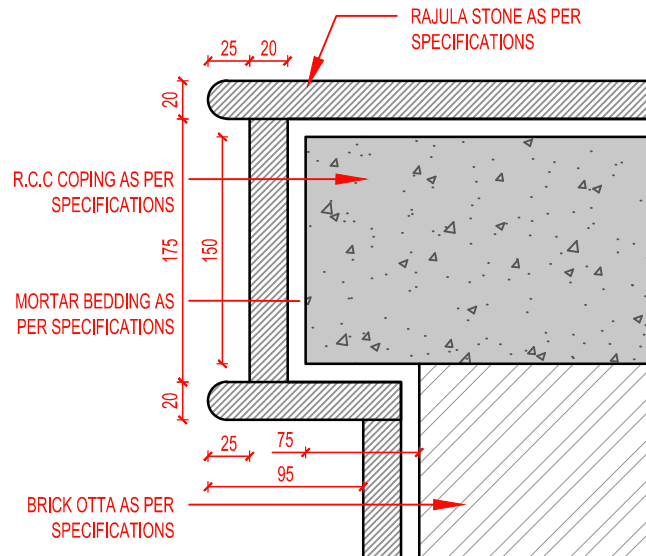
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SCALE - 1:50



02 SECTION - A2  
SCALE - 1:50



03 DETAIL PLAN  
SCALE - 1:50



04 STONE FIXING DETAILS - D1  
SCALE - 1:5

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CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR

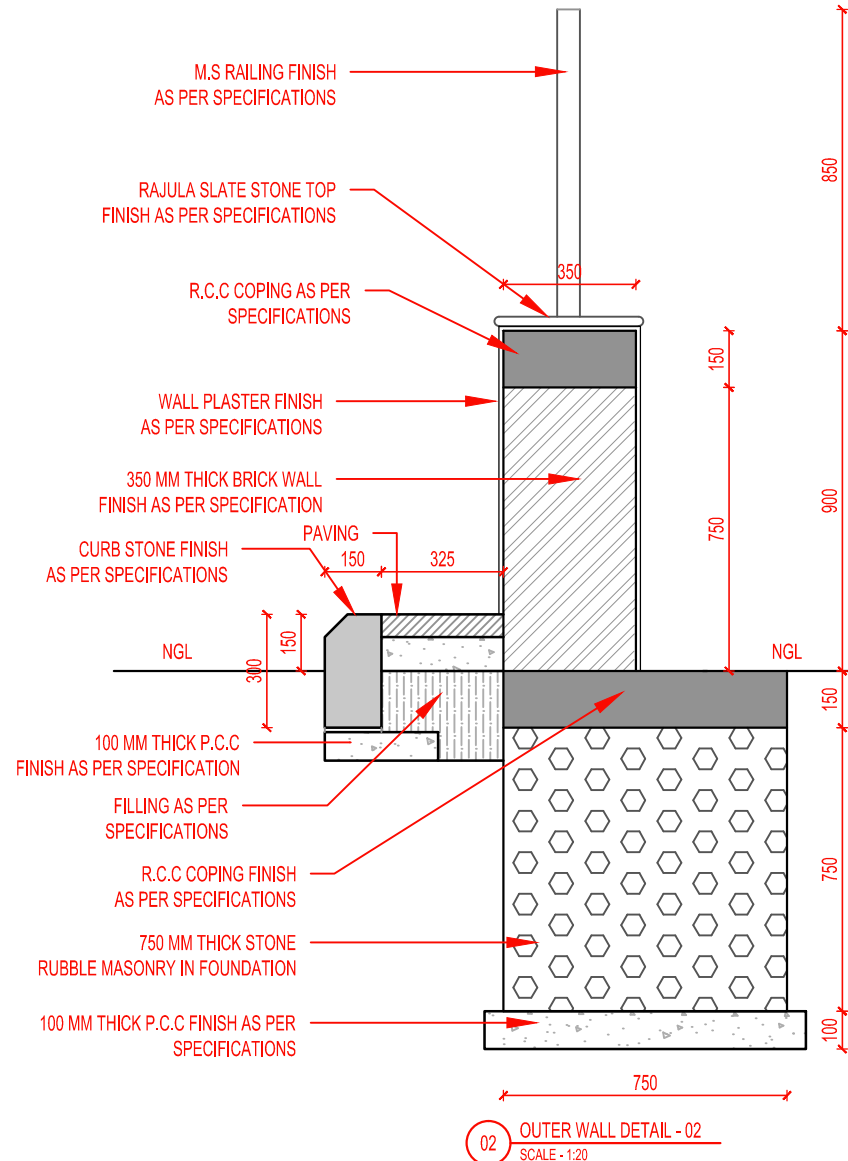
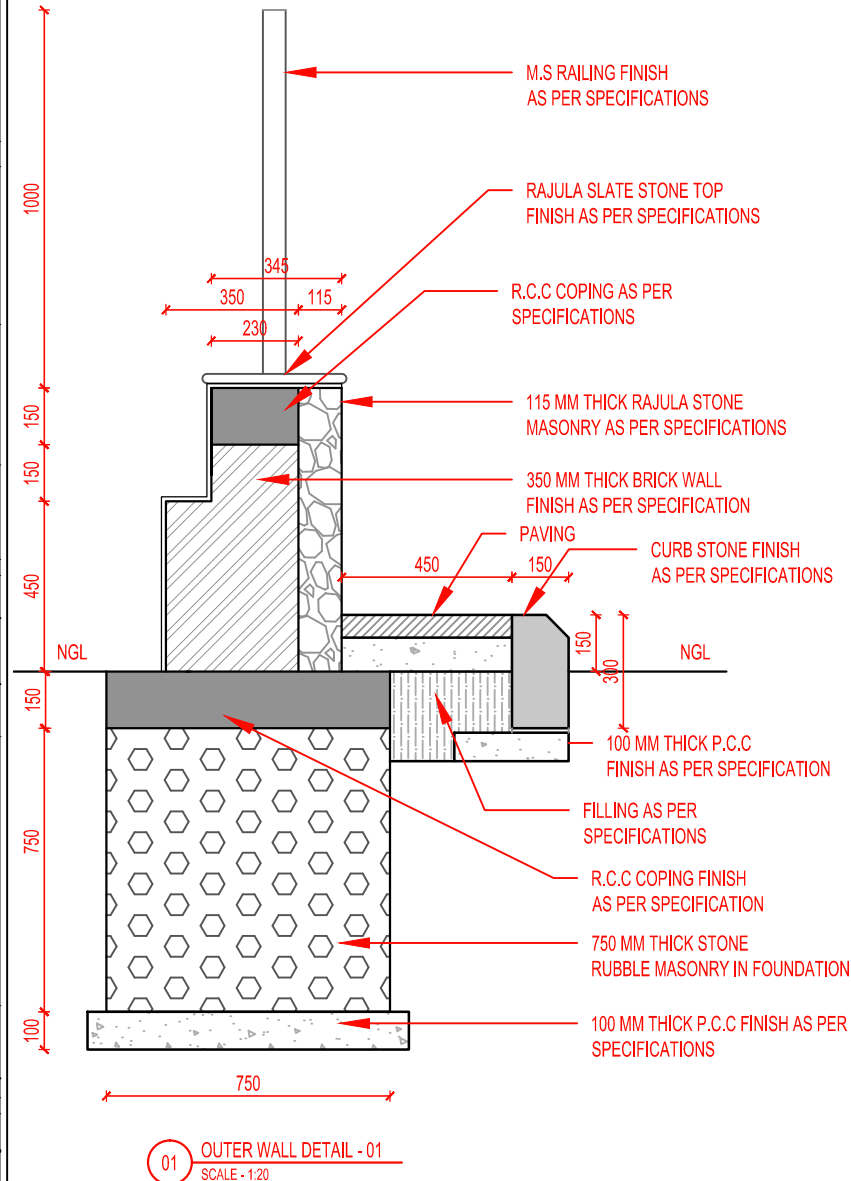


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#### SCULPTURE OTTA DRAWING

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CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
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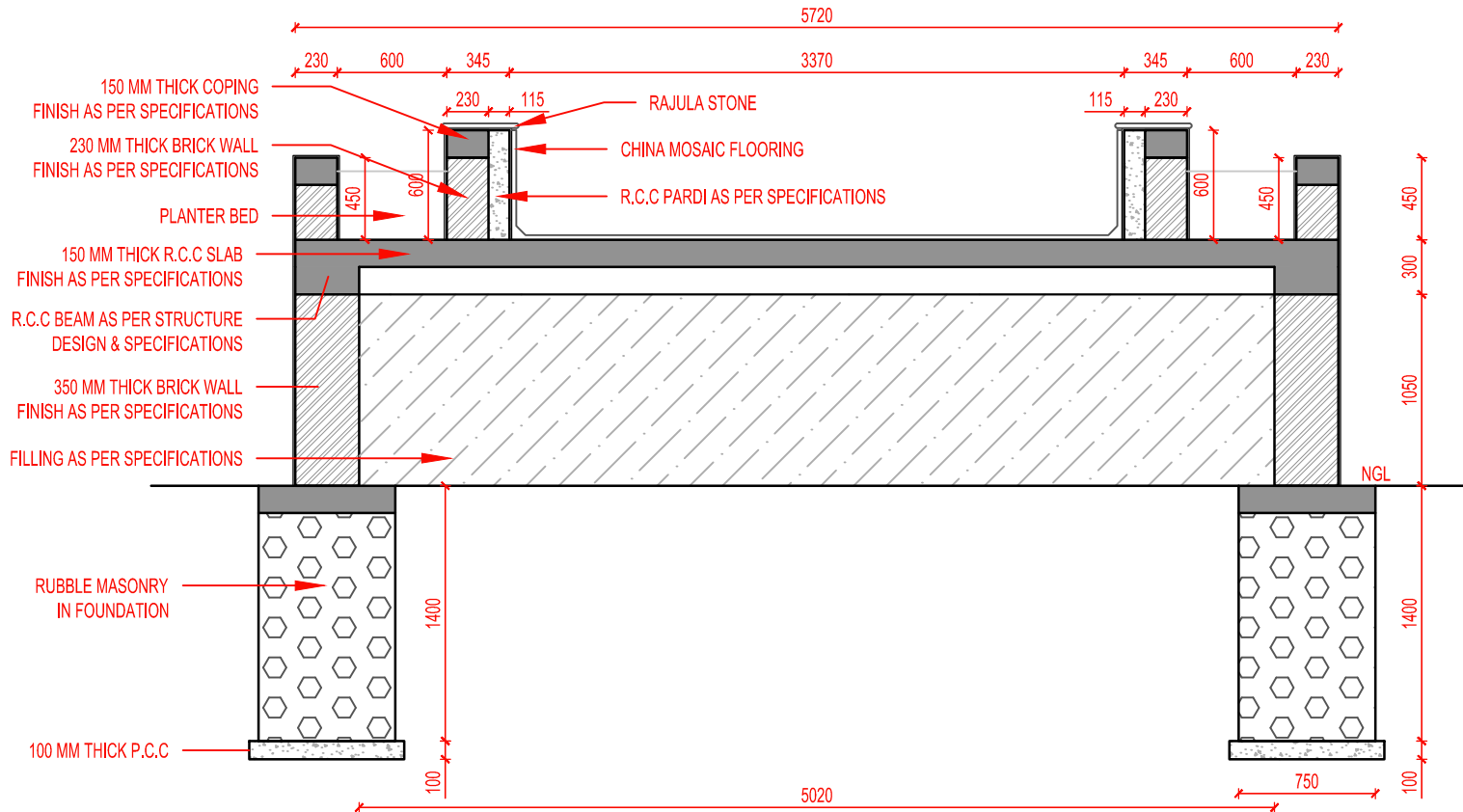


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#### OUTER PERIPHERY WALL DETAIL

TENDER DRAWING	DRAWING NO.  <b>AR_WD_04</b>
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SHEET : A4	
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01 FOUNTAIN WALL DETAIL  
SCALE - 1:40

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PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR



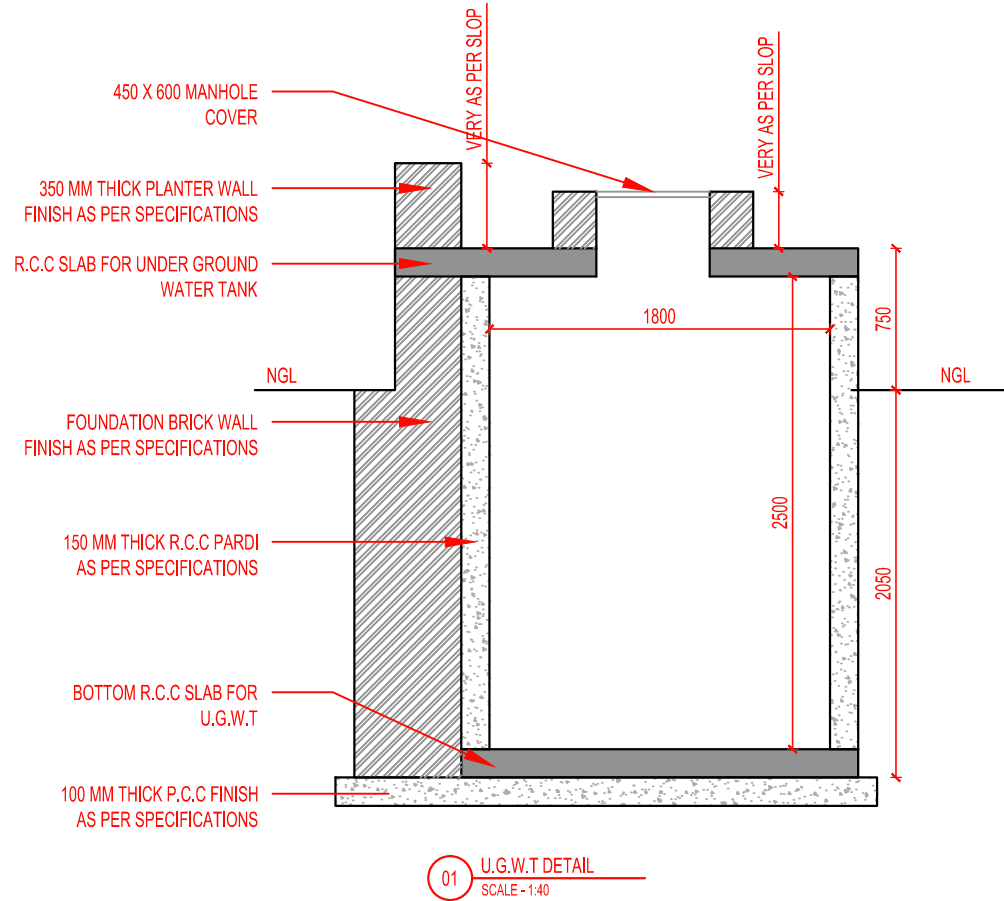
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#### OUTER PERIPHERY WALL DETAIL

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CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
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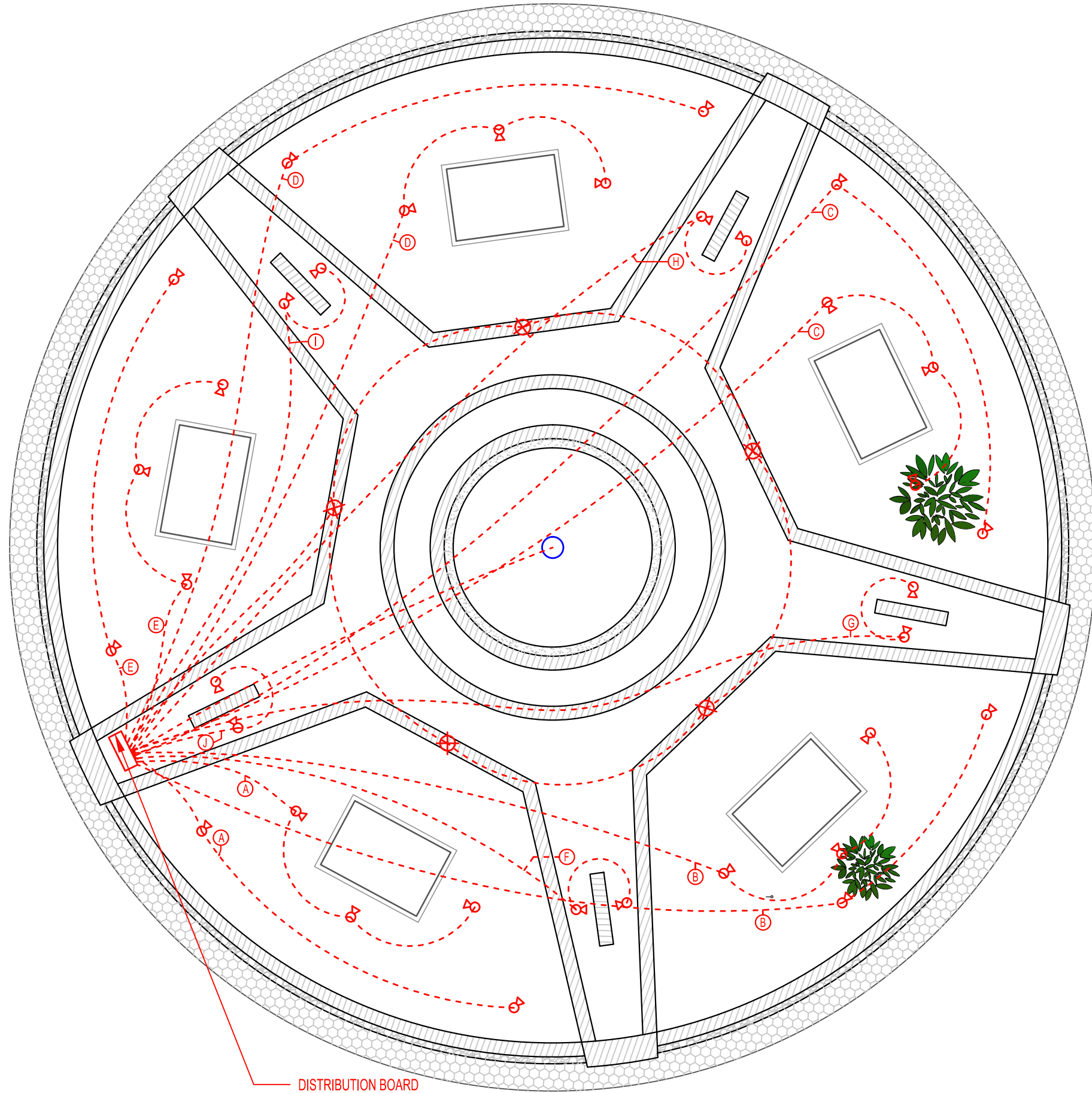


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#### U.G.W.T DETAIL

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SHEET : A4	
DRAWN BY : DH	
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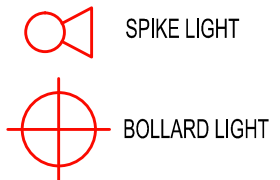
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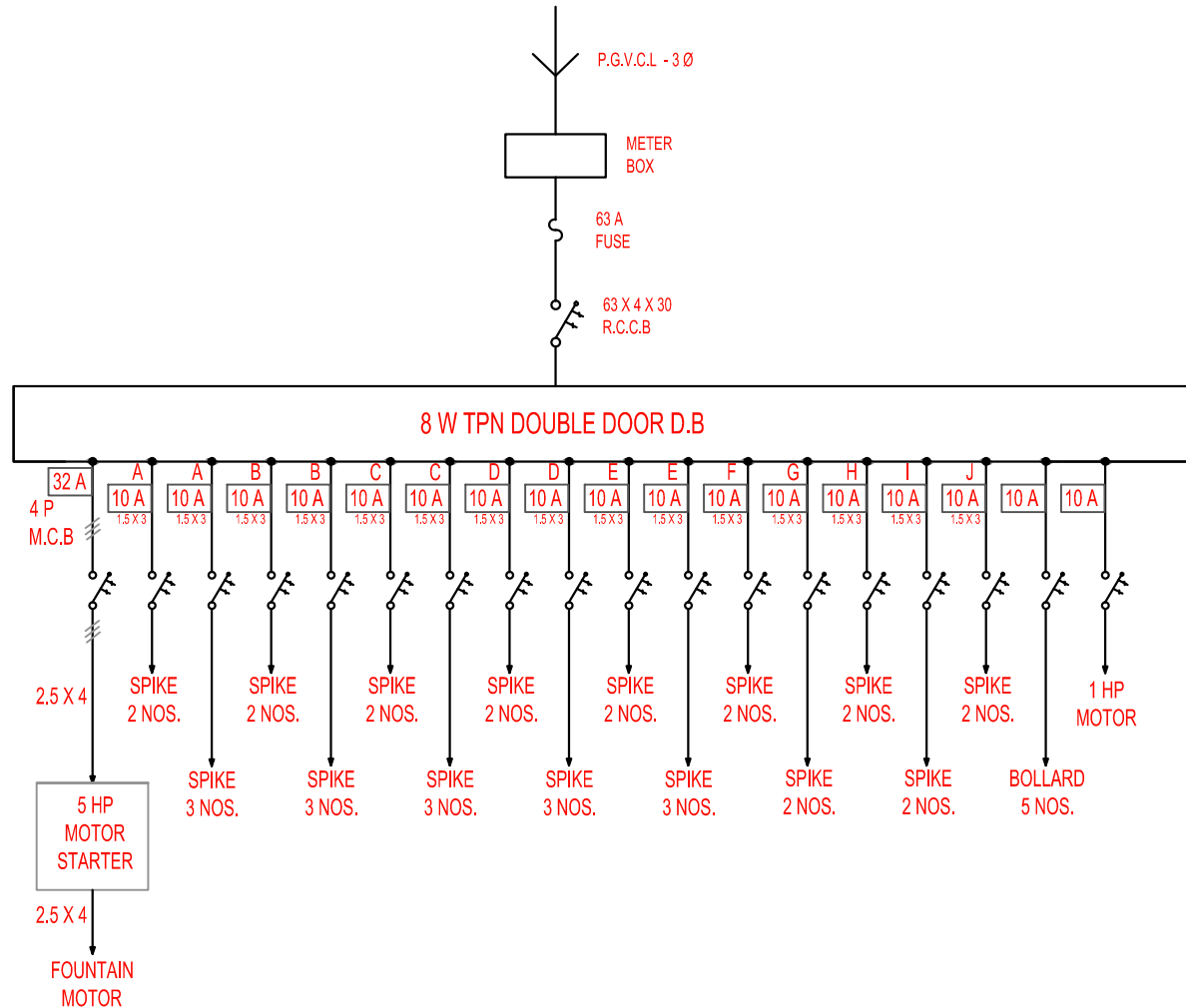
PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI THEME  
AT - VIJAYRAJNAGAR, BHAVNAGAR



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CIRCLE ELECTRIC PLAN

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PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR



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DISTRIBUTION BOARD DIAGRAM

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DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

## ELECTRICAL LOAD CALCULATION & SPECIFICATIONS

SR NO.	CONNECTED ITEM	ITEM LOAD	NOS.	TOTAL LOAD	PHASE
1	SPIKE LIGHT	12 W	35	420 W	SINGLE
2	FOUNTAIN LIGHT	20 W	5	100 W	SINGLE
3	BOLLARD LIGHT	30 W	5	150 W	SINGLE
4	1 HP PUMP	750 W	1	750 W	SINGLE
5	5 HP PUMP	3700	1	3700 W	THREE
	TOTAL LOAD -			<b>5120 W</b>	

## ELECTRICAL ITEMS SPECIFICATIONS

SR NO.	ELECTRICAL ITEM	APPROVED BRAND
1	P.V.C Pipes	precision, vraj, nihar
2	M.C.B, R.C.C.B, D.B	Schneider, Legrand, Hager
3	WIRES & CABLES	R.R, K.E.I, polyclab
4	Motor starter	siemens, or as per selection

**NOTE\* - ALL ELECTRICAL ITEMS AS PER ATTACHED SPECIFICATION BOOKLET  
OR AS PER DIRECTION & SELECTION BY AUTHORITY**





सत्यमेव जयते



एक कदम स्वच्छता की ओर

# CPWD HANDBOOK OF HORTICULTURE



## Central Public Works Department

Ministry of Housing and Urban Affairs



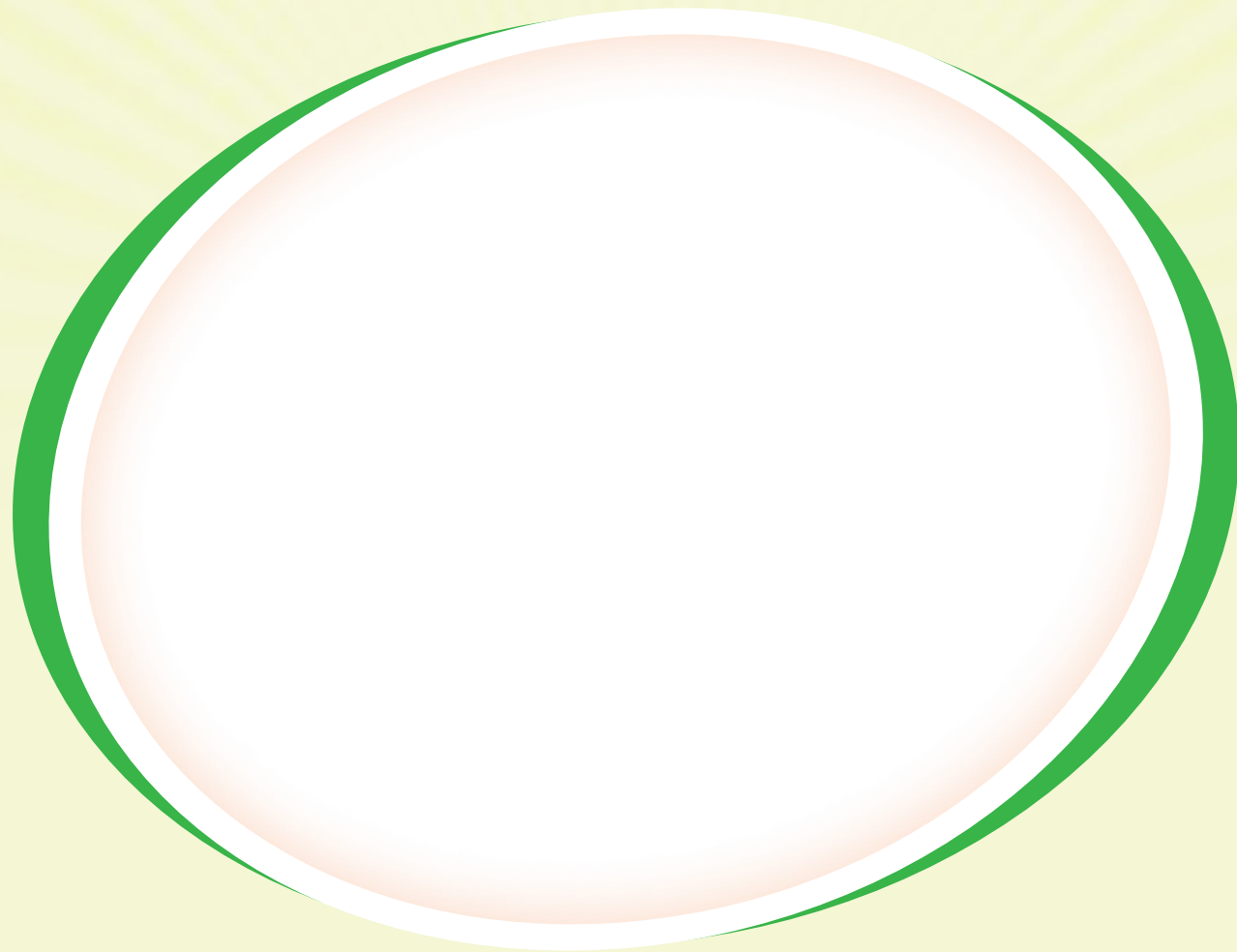
Zaitoon (*Olea europaea*)



सत्यमेव जयते



# CPWD HANDBOOK OF HORTICULTURE



**CENTRAL PUBLIC WORKS DEPARTMENT**  
Ministry of Housing and Urban Affairs







Hon'ble Prime Minister planting Rudraksh Tree in the Parliament House





Hon'ble Minister and his wife visiting Bonsai stall during CPWD flower show





हरदीप एस पुरी  
HARDEEP S PURI



अवधान श्री वजीर कान्हू राम पुरी (स्वातंत्र्य संग्राम)  
श्री वल्लभ राम पुरी (स्वातंत्र्य संग्राम)  
हरदीप एस पुरी  
भारत सरकार



Minister of State (IC), Housing & Urban Affairs  
Minister of State (IC), Civil Aviation  
Minister of State, Commerce & Industry,  
Government of India

#### MESSAGE

It gives me immense pleasure to note that "CPWD Handbook of Horticulture" is being published by the Central Public Works Department on the occasion of 166<sup>th</sup> CPWD Day on 12 July 2020.

Green areas are the lungs for the planet Earth. Man survives only if the surrounding natural habitat is green and vibrant. Any grievous assault on nature puts our very survival as a human race in peril. We can all contribute in our own ways in keeping the earth green. In urban areas, tree lined avenues and parks supplement the ecosystem and add to the aesthetics.

I hope this book will be beneficial for the professionals and amateurs in the field of horticulture and ornamental gardening.

I congratulate Shri Vinit Kumar Jayaswal, Director General, CPWD and his team for publishing this handbook of Horticulture.

New Delhi  
07 July 2020

  
(Hardeep S Puri)



दुर्गा शंकर मिश्र

सचिव

**Durga Shanker Mishra**

Secretary



भारत सरकार  
आवास और शहरी कार्य विभाग  
भारत सरकार, नई दिल्ली-110011

Government of India  
Ministry of Housing and Urban Affairs  
Newman Bhawan, New Delhi-110011



### MESSAGE

Congratulations to Central Public Works Department for publishing "CPWD Handbook of Horticulture" on the occasion of its 166<sup>th</sup> Foundation Day. This Handbook deals with various aspects of horticulture, landscaping and ornamental gardening. Green areas are not only important for environmental conservation, noise-dampening regulations, bio-aesthetics, but also for stress busting efforts.

I am confident that this Handbook will increase awareness amongst horticulturists, professionals, garden amateurs, practicing engineers and architects.

I applaud the efforts of Shri Vireh Kumar Jeyaraj, Director General, CPWD and his team in publishing this very useful Handbook.

(Durga Shanker Mishra)

New Delhi

7 July, 2020







Yoshikazu Yamaguchi  
Consul General



सत्यमेव जयते

भारत सरकार  
Government of India



भारत सरकार, नई दिल्ली  
भारत सरकार, नई दिल्ली-110011  
Central Public Works Department  
Minist Bhawan, New Delhi-110011  
Tel: 2342344/1011 Fax: 23421444  
E-mail: cpwd, cpwd@cpwd.gov.in

### MESSAGE

It gives me immense pleasure to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 165<sup>th</sup> CPWD Day on 12 July, 2020.

Landscaping and horticulture are essential elements for healthy living and create pleasant eco-friendly surroundings. Trees, shrubs, foliage, flowering plants and green spaces trigger happy emotions with feelings of togetherness with nature. This ultimately improves work performance.

I hope this CPWD Handbook of Horticulture which contains various aspects of Horticulture will be beneficial to professionals, garden amateurs, garden lovers and public at large to update their knowledge in the field of landscaping, horticulture and ornamental gardening.

I appreciate the sincere efforts of Dr P. K. Tripathi, Deputy Director General, Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

  
(Y.K. Jayaswal)

New Delhi  
July, 2020

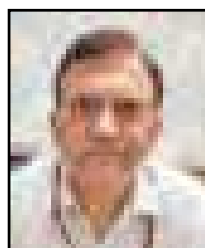




भारत सरकार  
Government of India  
अपर सचिव (जी.)  
Additional Director General (Tech)  
केंद्रीय लोक निर्माण विभाग  
Central Public Works Department



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### Message

I am happy to note that CPWD Handbook of Horticulture is being published by the Horticulture Wing of Central Public Works Department on the occasion of 166<sup>th</sup> CPWD Day on 12 July 2020.

Horticulture, landscaping and garden design is the foundation of any great landscape. The garden can incorporate both natural and man made materials. Plants are considered one of the most cost effective agents for remedying negative views of an area, thereby adding to its aesthetic value and significantly improving the visual amenity, economic and social conditions of the city.

Indoor air pollution is now considered by many experts to be one of the major threats to health. During pollution alerts, people are generally advised to stay indoors. Now a days Indoor plants are advised for air purification and absorption of obnoxious gases emitted through household gadgets.

I appreciate the sincere efforts of Dr P.K.Tripathi, Deputy Director General Horticulture and his team of officers and staff for bringing out this book and I wish it a great success.

  
(Anant Kumar)

New Delhi  
July, 2020





**डॉ. प्रसून कुमार त्रिपाठी**

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## **FOREWORD**

In CPWD, Horticulture deals with planting of ornamental plants in a such a way that it creates picturesque effect. The concept of landscape and horticulture is being implemented by way of using different sort of garden features that must conform to the place and the purpose.

The importance of a tree can be attributed that a mature leafy tree produces as much oxygen in a season as ten people inhale in a year. A single mature tree can absorb carbon dioxide at a rate of 48 pounds per year and release enough oxygen back in to the atmosphere to support two human beings. On average, one tree produces nearly 260 pounds of oxygen each year. Two mature trees can provide enough oxygen for a family of four.

This book contains 30 chapters on different aspects of horticulture and ornamental gardening ranging over various fields of horticulture. I understand this book would be really reference and beneficial for the professionals and garden amateurs through know how, discussions, experiences for refreshing and updating latest technology and methodology in the field of horticulture and ornamental gardening.

I express my sincere gratitude and thanks to Sh. V. K. Agarwal, Director General, CPWD for entrusting this fine work.

I also express my sincere thanks to Sh. Anant Kumar, A.I.G. (Tech/Works) for guiding me during this work.

I take this opportunity to thank Sh. Yoginder Singh, Sh. Ram Singh Meena, Sh. R. Solvi, Sh. Ram Kumar Malik, Deputy Directors (Hort.), Sh. Ashwani Kumar Deshpande, Sh. Sudhir Kumar, Dr. S. K. Singh, Dr. Deepthi Saxena, Sh. R. S. Chauhan, Divyesh Kumar Tyagi, Sh. B. B. Sharma, Sh. V. K. Gaur Assistant Directors (Hort.), for providing necessary data's and pictures during the writing of this book, and Sh. Anant Singh Shukla, Sh. Ramesh Shukla and Sh. Dilip Karmakar for typing this manuscript neatly.

(Dr. P. K. Tripathi)  
Deputy Director General (Hort.)

New Delhi  
July, 2020

# CONTENTS

INTRODUCTION	1
HISTORY	2
1. HORTICULTURE AND THE LANDSCAPE	3
2. GREEN WALL / VERTICAL GARDEN	15
3. MODULAR LANDSCAPING SOLUTIONS	17
4. HYDROPONICS	23
5. HOME GARDEN FEATURES	26
6. ROOF GARDENS	31
7. PLANT PHYSIOLOGY	32
8. TREES	33
9. PALMS	59
10. SHRUBS	67
11. HEDGES & EDGES	82
12. GROUND COVERS	87
13. CLIMBERS	89
14. ROSES	94
15. LAWNS	113
16. CHRYSANTHEMUM	117
17. RARE TREES IN CPWD LOCATIONS	121
18. MIRACLE FRUIT	146
19. DETAILS OF CPWD PARKS	149
20. COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI	162
21. DECORATION AT DIFFERENT SAMADHIES	168
22. DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS, PREPARATION OF FLORAL TABLEAU	190
23. WINTER SEASONAL FLOWERS	211
24. SUMMER AND RAINY SEASON FLOWERS	237
25. FLOWER BEDS	242
26. POTTED PLANTS	245
27. CACTUS & SUCCULENTS	248
28. ESSENTIAL ELEMENTS AND THEIR SOURCES	260
29. IMPORTANT FERTILIZERS	262
30. MEDICINAL PLANTS	266

# INTRODUCTION

The Horticulture Unit of CPWD was established way back on 1st April, 1912 under the able guidance of Shri R.H.Loke, Horticulture Superintendent. Since then the unit has evolved into a large wing, pioneer in execution of all kinds of horticulture & Landscape works. The major functions of the wing are as follows:

- Development & Maintenance of open spaces and parks
- Development of different types of gardens
- Raising of trees
- Development and Maintenance of Landscape and Horticulture works in Residences of Hon'ble Vice President, Prime Minister, Ministers, Members of Parliament, Judges of Supreme Court & High Court etc.
- Development and Maintenance of Landscape and Horticulture works in the Samadhi complexes of National Leaders spread in about 200 acres area. The Rajghat and other Samadhi complexes



are not only visited by International dignitaries and leaders but also International and local tourists.

- Development and Maintenance of Landscape and Horticulture works in Central Government office complexes and residential areas

Besides above, Horticulture wing is also involved in enhancing and conserving the green areas, aesthetic improvement of the gardens and preparation of green manure using green waste in localized areas, thereby maintaining and conserving an eco-friendly environment. The nurseries maintained by this wing of CPWD are well known for maintaining large collection of indigenous plants, seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture wing is maintaining two major nurseries i.e. Government Sunder Nursery and Government Mehrauli Nursery in New Delhi.



Hon'ble Prime Minister planting Kadamba Tree

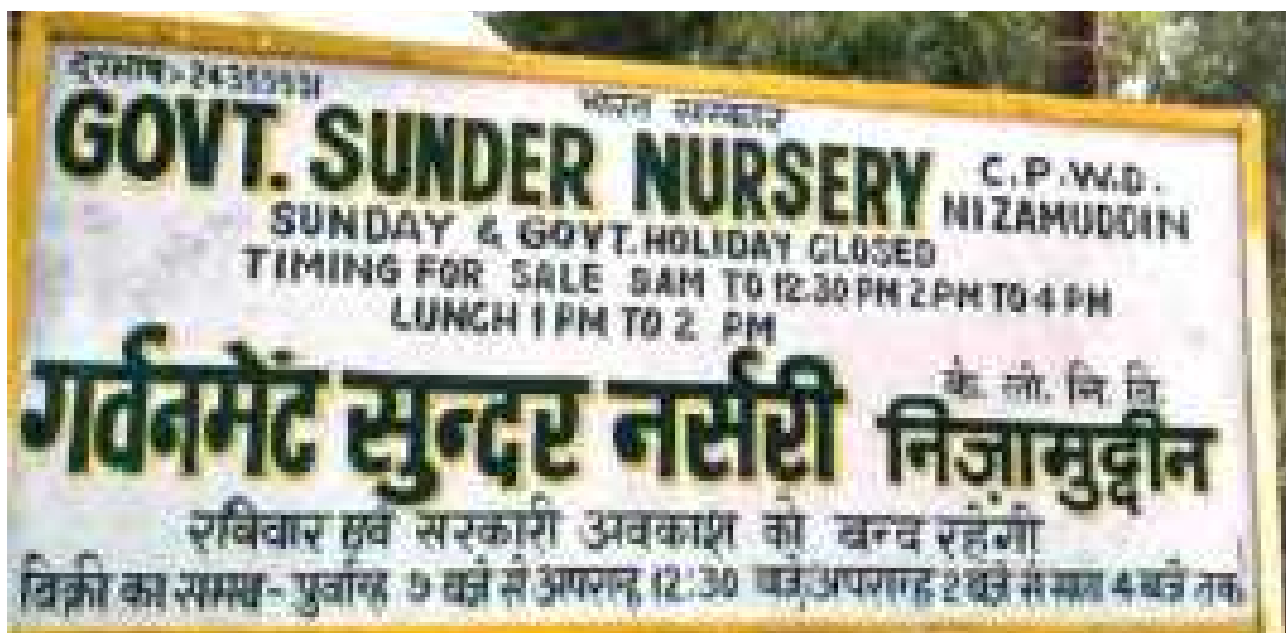
## HISTORY

The Horticulture Wing of CPWD was established on 1st April, 1912 with a very small unit headed by Shri R.H. Loke (British origin), as Horticulture Superintendent. It was pioneer in the field of horticulture and famous for indigenous plants and collection of all kind of seasonal, perennial, foliage, exotic, herbal and aromatic plants. Horticulture Unit is maintaining two major nurseries viz., Govt. Sunder Nursery and Govt. Mehruali Nursery.

Govt. Sunder nursery was inaugurated in February, 1949, presently spreaded in 20

acres land (approx.) at Nizamuddin, New Delhi. The nursery is bordered by Humayun's Tomb to the South and the National Zoological Park to the North.

Govt. Mehruali Nursery is located in Shaheed Jeet Singh Marg, (in front of NCERT Gate No.2), Katwarai Sarai New Delhi. Mehruali nursery is presently spread over in 33 Acre area (approx.) and is also having a collection of foliage's plant, perennials, seasonal plants, palms, cactus, Bougainvillea, money plants, roses, etc.





# CHAPTER - 1

## HORTICULTURE AND THE LANDSCAPE

The CPWD , comprises of Civil, Electrical, Architecture and Horticulture wings, finds its relation with the Built Infrastructure. The people of the world are slowly realizing the damage that has been done to our environment. The success of development and maintenance of landscaping features can be judged by the quality of relationship between the building, the site ,landscaping features and its surroundings .The natural resources which are useful in the landscaping should be environmentally sustainable and function efficiently and economically in the long run. Man`s greed for quick economic gains has led to imbalance of this planet thereby threatening to the very survival of mankind in the not very distant future. In our metro cities we are already experiencing the effects of soil, water, air and noise pollution which has already crossed the threshold of human tolerance and has manifested itself in the deterioration of all life forms. In this bleak scenario there is still a ray of hope if people in general are awake and realize that the solution for correcting our mistakes lies in our understanding of nature as a holistic phenomenon and take course of action intelligently and diligently.

In CPWD, Horticulture deals with planting of ornamental plants in such a way that it creates a picturesque effect .Landscaping gardening can be defined as the decoration of a tract of land with plants and other garden materials so as to produce a picturesque and naturalistic effects in a limited space. Landscape gardening can also be defined as the beautification of a tract of land having a house or other object of interest on it. It is a done with a view to create a natural scene by

the planting of lawn, ground covers, shrubs ,hedges and trees. The arrangement and final establishment of the garden features must be done in a such a way that it gives an effect of a natural landscape soothing to the heart. It must act in such a way that it helps in improving of the total living environment for the people. The concept of landscape and horticulture by way of using different kind of garden features must conform to the place and the purpose for which it is built example. Selection of plants in a Samadhi and in a recreational park are totally different to one another. Care must be taken to define the relationship between various colours of the plants, flowers, building or other objects present at the site.

### Landscape Concept and Garden Design :

Garden and garden features should be compatible to each other and meet the characteristics of the garden, because it is an extension of house and an enclosure for pleasure. It is essential to understand the site characteristic and its potential for development and conceptualize the scheme for specific purpose and design accordingly. Most of us love to be with nature and are often disappointed with the limited space available around the house, which makes us think that these little spaces do not accommodate beautiful gardens. Landscaping is making of pictures with plant materials and hence its principles are same as those of art. Followings are the points which needs to taken care during the landscape concept and garden design.

Rhythm: Repetition of same object at equidistance is called rhythm. It can be created through the shapes, progression of size or a continuous line movement, rhythm creates movement to the eye. In gardens generally trees of single species of equal height and shape are planted to create this effect. In Mogul gardens, fountains and water canals have also been extensively used to create such effects. Now-a-days other objects like lights are also used to

Whether you're planning to "borrow ideas," or coming up with your customized landscape design, you need to know the basic principles of landscape design. Understanding these landscape design principles will increase your creativity while at the same time help you generate new ideas. A great landscape design lies in the eyes of the artist, and these basic principles of landscape design will not only boost your creativity, but also ensure that the elements in your design have balance and harmony.

## Basic Principles of Landscape Design:

### 1. Unity

Unity in landscaping is the repetition and consistency of a design. Repetition is used to bring about unity in your design by repeating like elements which include plants and decor in the landscape. Consistency is used to create unity by fitting different elements of a landscape together to create a common unit or theme.

### 2. Balance

Balance is simply a sense of equality. There are two types of balance in design: symmetrical and asymmetrical balance. In symmetrical balance, two sides of the landscape are identical while in asymmetrical balance, the landscape composition is balanced using different elements and objects which have almost similar imaginary weight.

### 3. Contrast and harmony

Contrast helps highlight certain elements in your design, while harmony helps elements in a landscape composition look unified. Contrasting elements draw the viewer's attention when they're placed next to each other. Contrast and harmony are achieved by the comparison of any elements of art or using complementary colors side by side.

### 4. Color

Color gives your landscape design the dimension of real life. Warm colors (e.g. red and orange) seem to advance towards you, making an object seem closer. While cool colors like blues and greens seem to move away from you. Blues and greens are used to create perspective.

### 5. Transition

Transition is simply a gradual change. Transition in a landscape design is illustrated by gradually varying the plant size or the color intensity. Transition can also be applied to texture, foliage shape and size of different elements.

### 6. Line

Line is the mother of all elements in landscape design. Lines are used almost everywhere including creating beds, entryways, walkways, texture and perspective. Lines are also used to give an illusion of depth and distance.

### 7. Proportion

Proportion refers to the size of an element in relation to the other. Among the principles of landscape design, this is the most obvious one but still needs a little planning and thought. One must ensure that all the elements in a landscape design have proper proportions.

### 8. Repetition

Repetition is directly related to unity. It's good to have several elements and forms in

a garden, but repeating the same elements gives your design various expressions. Too many objects that are not related can make your design look unplanned and cluttered. Also, don't overuse an element since over using an element can make your design feel boring, uninteresting, and monotonous.

### **In Conclusion**

With these basic principles of landscape design designing a landscape can be a nice way of unleashing your creativity. Utilizing, colors, contrast, and lines all can help influence the design of your landscape.

### **Important Things to Consider When Planning Your Landscape Design:**

Whether you are interested in completely redesigning your landscape or simply making a few changes there are some important factors to consider before you start planting. While many people head straight to their local gardening supply store to browse the selections, creating a plan beforehand will help you chose plants that will best fit your needs and thrive in your landscape.

It's easy to go out and be tempted into buying plants that look beautiful at the garden store, only to get them home and realize they are wrong for your landscape. These tips will help you develop a plan and put you on the road to creating a beautiful, cohesive, and thriving landscape.

### **Know your Garden :**

Think about your regional climate, the topography of your site, and your soil type when planning your landscape.

Keep in mind that the specific conditions of your garden are likely to create a microclimate based on the amount and length of sun and shade exposure the area receives.

Microclimates are usually broken into one of four categories: full sun, partial shade, shade, or deep shade; take note of your landscape's microclimate when selecting plants for your landscape.

The topography of your site is important to consider as well as you plan; take note of how water drains in your landscape. The best landscape design will promote water movement away from your home towards other areas of your garden.

### **Who will be using your Garden :**

Think about who will be using your garden and how they will use it. Will children be using your garden? Do you have pets? Are you hoping to use your garden for outdoor entertaining? Remember you can create different spaces for different uses in your landscape using strategic plantings and hardscapes. Walkways can be used to move people from one area to another.

Since you will be using and maintaining your garden (or hiring someone to maintain it) consider what your maintenance style and



budget are. Be as realistic as you can. How much time will you truly have to put into your landscape? Or if you won't have the time will you have the money to pay someone else to put in the time? How much do you have to invest in your landscape? Determining the answer to these questions will help to ensure the success of your landscape for years to come.

### **Think about themes of your garden:**

A theme can unify your landscape and help guide your plant and material selections. Themes can be as simple as using consistent shapes or forms throughout your garden or as complex as creating a relaxation garden or an Oriental garden. When deciding on a theme for your garden, a good place to start is looking at the architecture of your home. Try to complement the lines and style of your home's architecture in your garden; after all, your garden is an extension of your home.

Themes can help guide how you place and select plants, decorations, hardscapes, and structures. Are you someone who wants lots of neat, geometric shapes and structures in your landscape? Do you want softer lines and a more natural feel to your space? Do you want a landscape to include only specific colors? Questions like these will help you choose a unified theme for your garden.

### **Create and link spaces :**

In order to get the most out of your garden, think of it as another room, or rooms, in your home. Just as a home has well defined and carefully planned rooms, so should your landscape; using your materials wisely allows you can create different "rooms" in your landscape. Don't forget to think about how you'll link your spaces. How will people move from one area of your garden to another? Create openings to encourage

exploration in your garden and keep people moving throughout the landscape.

### **Make your plants work for you :**

Early in your planning you should determine how your plants will function in your landscape. Plants can be used in a number of ways, they can provide you with fresh and delicious fruits and vegetables, beautiful scenery, lovely aromas, and much more. Plants can be used as barriers to define areas within your landscape as well as identify where your landscape ends. You can use plants to create physical barriers in your landscape by blocking both views and access to an area. If you want to keep your views open, but maintain some barriers, low growing plants can be used to create implied barriers, blocking access but not the view.

Correctly placed plants can also be used to alter your landscape site conditions. Temperature, light levels, and wind are greatly affected by the trees and plants in a landscape. The noises in your landscape can be affected by what you put into the design, such as water features or bird houses, as well as any physical barriers that keep your garden insulated from noises beyond your landscape.

### **Structure your plantings :**

Consider your various visual planes when selecting plants. Starting from the area above you, think about the overhead plane, this might include archways and trees.

Moving on to the vertical plane, consider how closely spaced or far apart plants will be, how plants will be layered or staggered (generally larger plants are used behind smaller plants), as well as the individual and massed heights and widths of your plants.

Don't forget about the ground plane (including how smaller plants will be grouped



and arranged as well as groundcovers and hardscapes).

Repeating similar shapes and structures in your garden will give you a unified view throughout your space.

### **Highlight important points :**

Using unique plants, distinct structures, or garden ornaments allows you to highlight a particular area of your landscape. Contrasting shapes, textures, sizes, and colors will help to capture attention and direct it to a specific area.

### **Pay attention to detail :**

Plants, hardscapes, and garden ornaments all have their own visual details, from various forms and shapes to an array of colors and textures. By thinking about how these visual details can be used to complement and contrast each other, you can create a cohesive and captivating landscape.

Don't just think about visuals; taking into consideration the scents of the plants you select for your landscape can enhance the experience you create for those in your garden. Think about when flowers will be blooming and fragrant, as well as what scents will complement each other in the landscape.

### **Think about the future :**

More specifically, take into account how the passage of time will affect your landscape plants. When selecting plants, make sure you consider the plant's growth rate, maintenance needs, and its eventual mature size. Make sure you provide your plants with enough room to reach their mature size. Keep in mind though, that mature size is typically based on optimal growing conditions, your landscape's specific conditions may cause a plant to grow larger or smaller.

### **Protect your resources:**

By choosing resource-efficient plants, consciously managing water, and choosing environmentally sound hardscapes, you can help protect and preserve your environment.

Before removing plants from your landscape, determine whether these plants truly need to be removed, or if they could be relocated to another area of your yard. When selecting new plants, look for resource-efficient plants, ones that will require less water, fertilizers, and pesticides.

When planning the changes to your landscape, consider installing a rainwater catchment system which will provide you with an environmentally sustainable source of irrigation water. With careful planning such a system can even be incorporated as an aesthetic design element.

Using environmentally friendly hardscapes, non-toxic preservatives, stains, paints, and cleaners is another way you can protect your natural resources. Also, consider reusing construction materials; before demolition starts consider what materials you might be able to reuse, repurpose, or incorporate into your new lands



## GARDEN STYLES

The Orangerie in the Gardens of Versailles with the Pièce d'Eau des Suisses in the background (French formal garden)



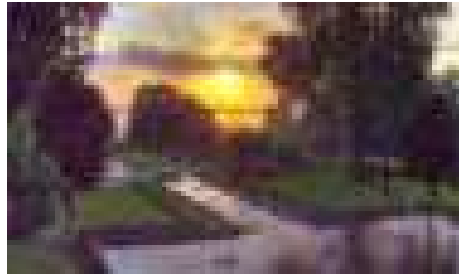
Stourhead (1741-80) (English garden)

Jardin del Generalife de Granada (Spanish garden)



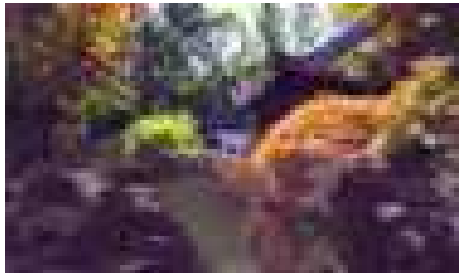
Reflection of the Bagh-e Narenjestan (orange garden) and the Khaneh Ghavam (Ghavam house) at Shiraz, Iran (Persian garden)

Mughal gardens at Taj Mahal, Agra, India



Nishat Bagh, terrace garden at Srinagar, India (Mughal Gardens)

The Yuyuan Garden in Shanghai, China (created in 1559) shows all the elements of a classical Chinese garden



Ryoan-ji (late 15th century) in Kyoto, Japan, the most famous example of a Zen rock garden

Royal Botanic Gardens, Kew, London



Labyrinth maze of Bravaux, Durbuy, Belgium

Parc de Bagatelle, a rose garden in Paris



Roof garden on the top deck of a multi-storey car park at Hyderabad

# GARDEN FEATURES

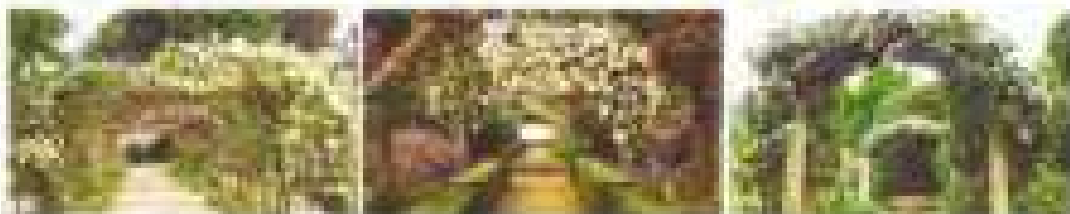
GARDEN  
PAVING



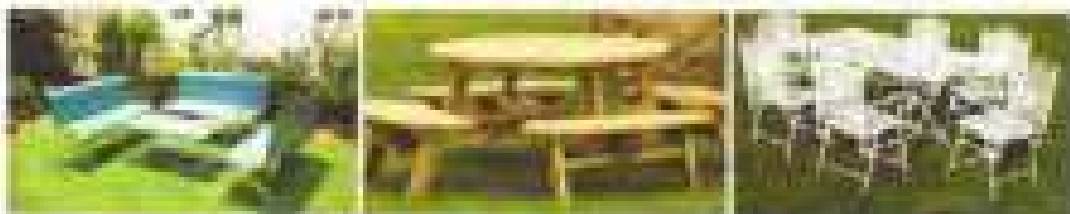
GARDEN  
GATES



GARDEN  
ARCHES



GARDEN  
FURNITURES



GARDEN  
SCULPTURES



GARDEN  
GAZEBOS



GARDEN  
BRIDGES

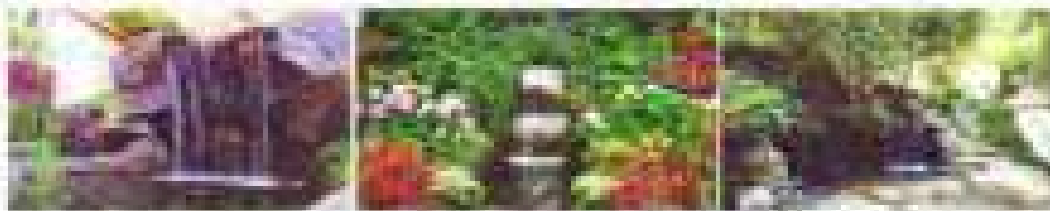


# GARDEN FEATURES

GARDEN  
FOUNTAIN



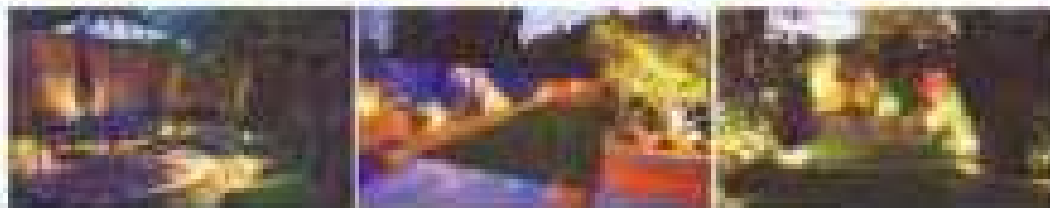
GARDEN  
WATER FALLS



GARDEN  
WATER BODY



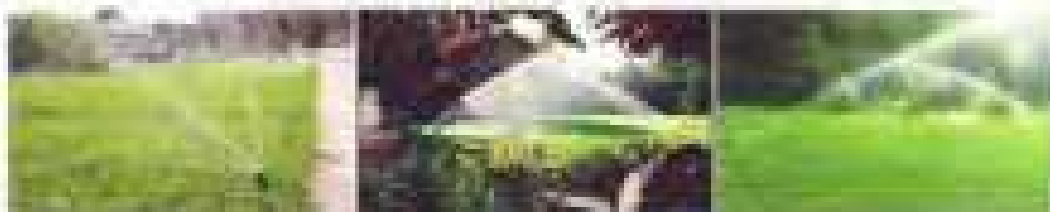
GARDEN  
ILLUMINATION



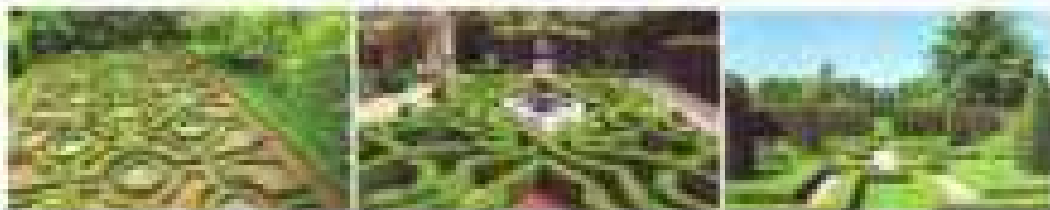
GARDEN  
CHILDREN  
PLAY AREA



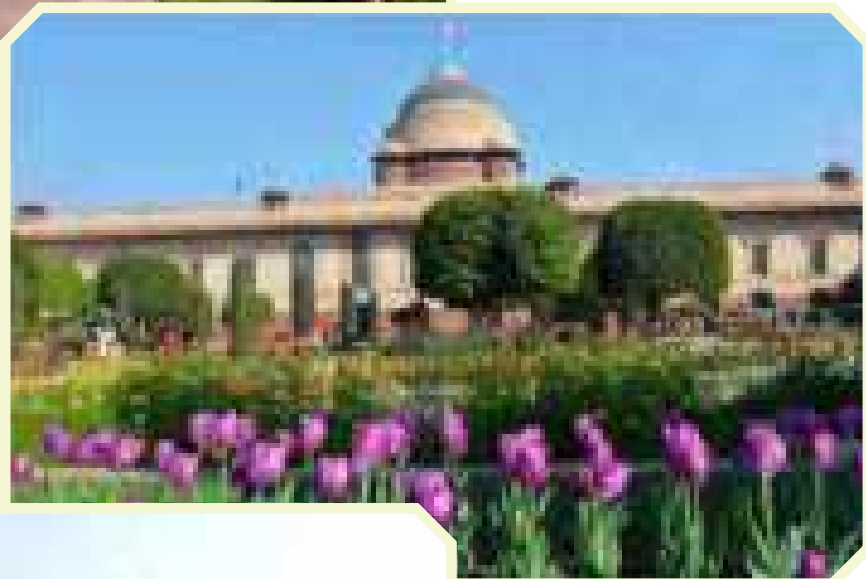
GARDEN  
FOR-UPS  
SPRINKLERS



GARDEN  
KNOTS



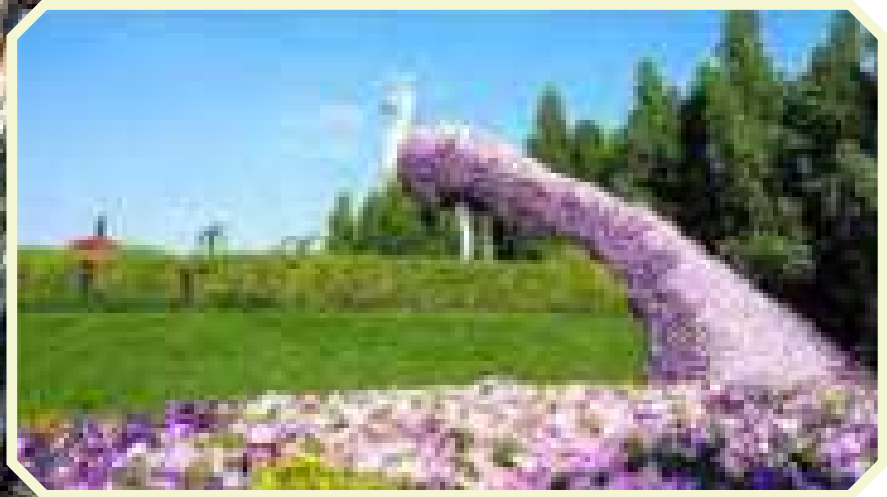




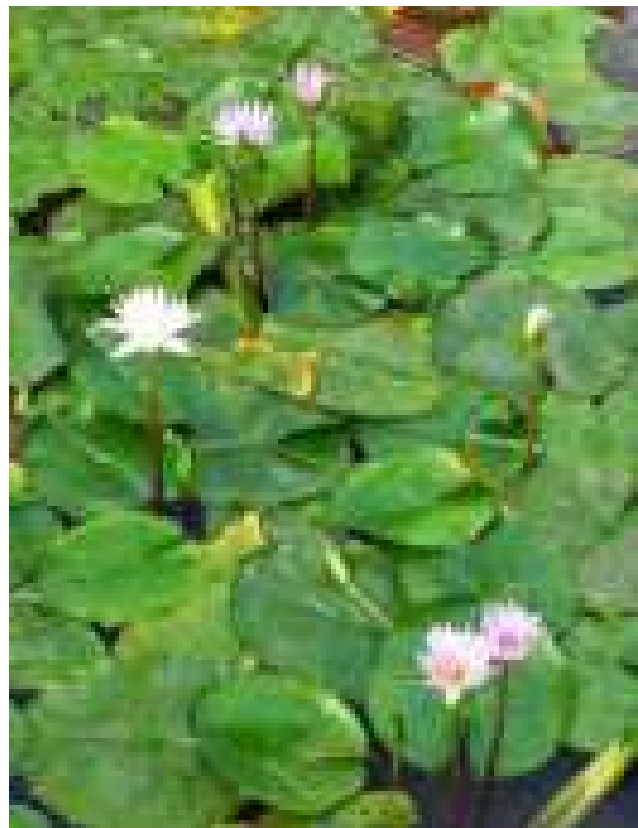
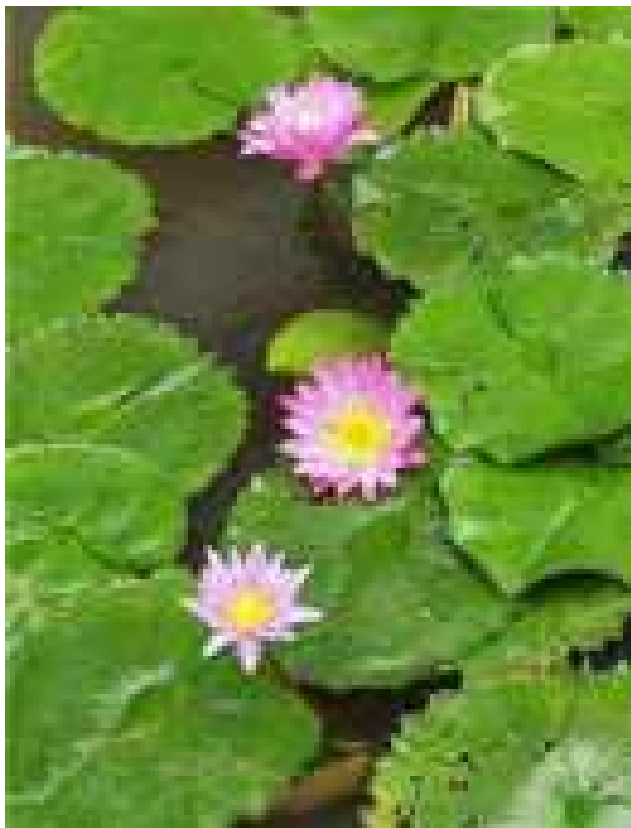
President Estate Garden



Landscaping Ideas



Landscaping Ideas





Landscaping Ideas



## CHAPTER - 2

### GREEN WALL / VERTICAL GARDEN

Green wall/Vertical Garden is the new concept of gardening particularly suitable for cities, as they allow good use of available vertical surface areas. With nationwide emphasis on being environment friendly and conserving resources beautiful creations like a Green Wall are bound to become common place in most commercial and residential buildings. A Green Wall, also known as living wall, bio wall or a vertical garden, is a living plant based exterior or interior wall to buildings or homes which may be free standing structures or part of the building. They are more frequently composed of climbing plants, but there are other options that some designers have incorporated in which the plants are grown in specially made support structure and growth media such as soil. The benefits of a Green Wall go far beyond aesthetics. A Green Wall is a natural insulation that helps to maintain and regulate the temperature within a building. It has been observed that the exterior of a wall with a Green Wall is 10 degrees cooler than an exposed wall. With the rising costs and shortage of energy, this feature reduces consumption of energy for heating or cooling in a multiple occupancy building. Living walls used on the interior of a building can also help to maintain humidity levels as well as assist in the air filtration, which can be a problem for some commercial buildings because they are located in crowded parts of the city. According to the EPA (Environmental Protection Agency), USA, poor indoor air quality is ranked fourth on a list of 31 of the worst environmental threats that the average worker faces each day. Another benefit of Green Wall is that they can be a means of water reuse. The Plants may purify slightly polluted water by

breaking down the nutrients and filtering into the water system. They also have the ability to absorb noise and reduce noise pollution inside the building while increasing the property value of a building. The living wall could also function for urban gardening or for its beauty. In vertical gardens, various types of modular panels can be used along with geotextiles fabrics, growing media, irrigation systems, and plants.

#### Commonly seen types of vertical gardens

Ideally the selected plants are planted into the modules or pots and are allowed to settle and grow over a period, before installation on site. Watering can be done manually or through irrigation systems which can be installed along with living wall structure. These living wall structures can be fixed directly to existing walls or can be fixed on to a MS framework in case of free standing living walls.

**Green wall:** This type consists of plastic modules which have a geotextile fabric bag which is filled with growing media and rooted plants are inserted into slits made into the bag placed inside the module. The modules can be fixed to walls directly or on a framework.

**Bio wall:** This type consists of plastic frames and plastic pots. Plants can be planted directly into the pots. The pots can be easily inserted into the frames, which are fixed to walls directly or on a framework.

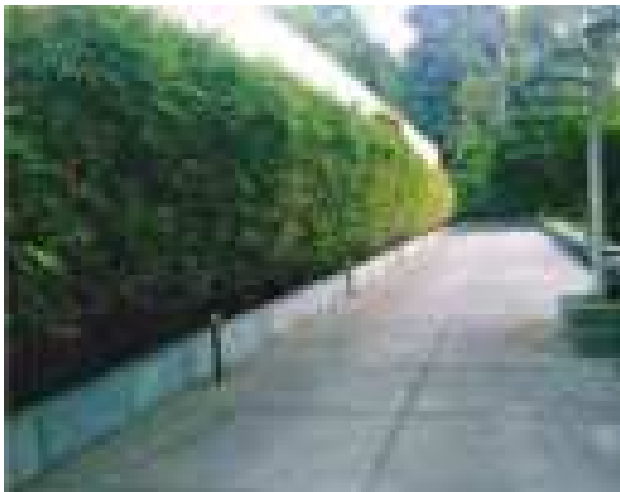
**Living wall:** This type consists of felt fabric fixed on a support, which in turn is fixed to

the wall. Plants can be planted directly into slits made to this fabric.

## Benefits:

### 1. Aesthetics.

Green walls combine the works of art by nature in different ways as there are numerous varieties of plants that can be used in different combinations.

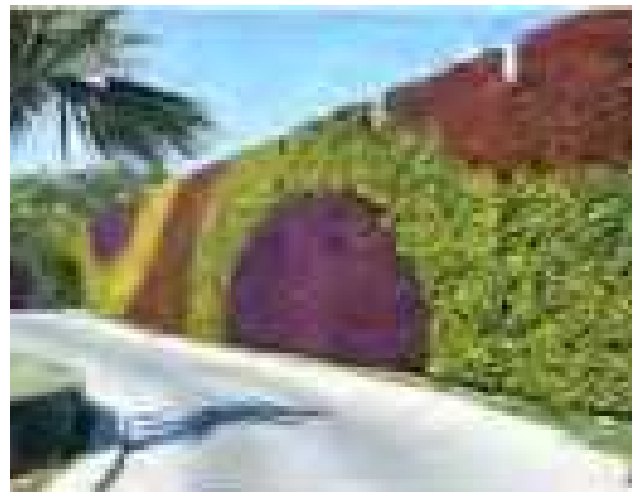


### 2. Indoor Air Quality

It is well established that plants can purify air. Along with indoor potted plants, green walls go a long way in improving indoor air quality.

### 3. Health and Wellness.

Living in urban environments, we are surrounded by concrete, traffic, noise and pollution. It has a profound impact on our physical and mental wellness. Greenery softens this hard environment, acting as a tonic to ease stress and fatigue.



## CHAPTER - 3

### MODULAR LANDSCAPING SOLUTIONS

Landscape Horticulture around the country has been evolving with new trends and we need to keep in pace with the developments of the International world of green practices in order to keep up with the influx of Landscape developments in this country.

People have practiced landscaping for centuries. As far back as the ancient civilizations, humans were manipulating the land for both aesthetic and practical reasons. The addition of plants, changes to the existing terrain and the construction of structures are all part of landscaping. Today landscaping refers to the planning, laying out and construction of gardens that enhance the appearance and create useable space for outdoor activities around a home.

A high proportion of the population and economic activities are at risk from climate change are in urban areas, and a high proportion of global greenhouse gas emissions are generated by urban-based activities and residents. Suspended Particulate Matter (SPM) is the main problem of urban air pollution in India, caused mainly due to fast growing population of automobiles and poor traffic control, congested roads as well as factories in the peri urban areas. The most watched pollutants include particulate matter (PM), Nitrogen dioxide (NO<sub>2</sub>), Sulphur dioxide (SO<sub>2</sub>) and Carbon dioxide (CO<sub>2</sub>), that are continuously degrading the ambient air quality in major cities in India.

With the growth of urbanization the cities are converted in to concrete jungles day by day and consequently reducing the greenery, rise to global warming, here the need is to bring about greenery in the every little available area along with its beautification.

Landscaping products which can bring about greenery vertically as well as horizontally as per your need and available spaces as all of them are modular system. Followings are the some key Features & General Informations about Various Landscaping Products.



#### DRAIN MAT

Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile Sheet Drains for single side drainage applications are prefabricated products that consist of a solid, formed, three dimensional core covered with a geotextile filter fabric bonded to the dimple side of the core. The filter fabric is securely bonded to prevent soil intrusion into the core flow channel while allowing water to freely enter the drainage core. Sheet drains solid cores allow water entry from one side and are typically used to collect and re-direct water from a structure or site. Sheet drains are designed for use in both vertical and horizontal drainage applications.

#### HONEYCOMB GRASS PAVER

Each Honeycomb Grass paver Unit made with a High-density recycled and UV rays-stale polythene (PE-HD), Weighing 1 kg.

and available in green or black colour. The Load bearing capacity is 200 tons/m<sup>2</sup> & Dimensions of the unit is 500mm x 430mm x 45mm.



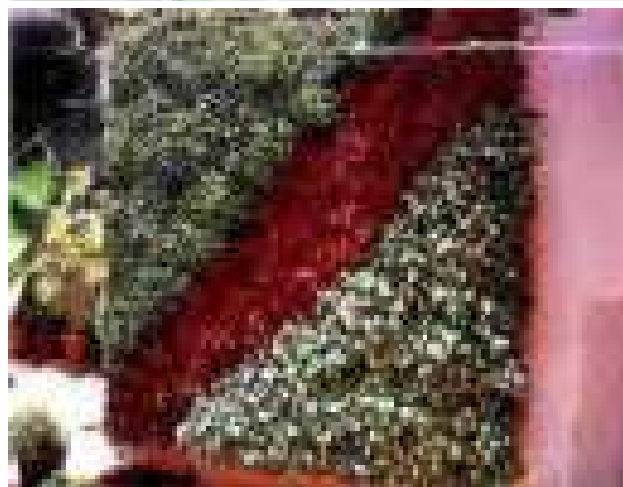
- Instant lawn effect with minimal labour.
- Makes maintenance operations, including lawn moving very easy.
- Mobility to your lawn patch. Takes ample foot traffic.
- Eliminates heavy ground and soil preparation.
- Water logging is eliminated with the special studs provided below the trays.
- The unique interlocking trays allow replacement of damaged lawn instantly with matured turf.



## GREEN WALL

Each Green wall Unit made with a UV rays-stable RC Polypropylene (PP), Weighing <3.5kg. and available in green or black colour. The load bearing capacity is 150 kgs /module & Dimensions of the unit is 500mmx125mm.

- Modular Planting System
- Very Little framework Required
- Self Supporting & Strong Structure
- Easy for Creative Planting Design & Easy Maintenance
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible
- Each Plant can be Accessed & Maintained Individually.





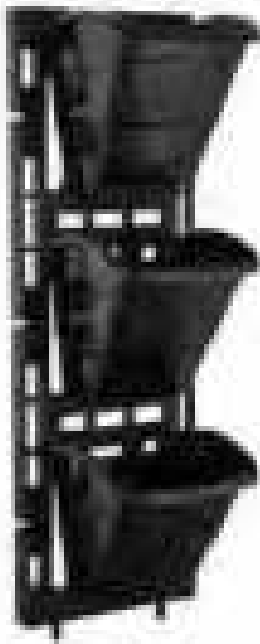
## BIO WALL

“BIOWALL” it’s a kind of Green wall made from the shown product. Where we can create most beautiful Green wall using our choice of plants, herbs etc.

As Highlighted above one of the main feature of BIOWALL is its flexibility in the sense of giving it a shape.

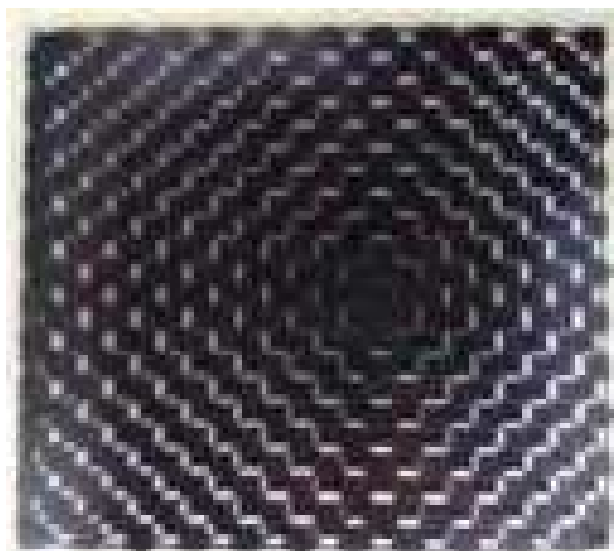
It gives freedom of having green wall in the required shape like Round, Half Circle, Square, Angular and Curve in addition to normal horizontal and vertical. Each Bio wall Unit is made with a UV rays-stable RC Polypropylene (PP), made in black colour, Dimensions of the unit is 450mm x 150mm x 125mm.

Available in box containing 4 frames + 12 pots and it covers area of 3 Sq.Ft.



## DRAIN CELLS

Drain cell Unit is made with 100% recycled Polypropylene available in black colour. Can take compressive load of  $> 100t/m^2$  Above 1200 KN having Discharge Capacity of 350 lit./min @1% Gradient Available in Dimension of: 610mm x 410mm x 30mm, 450mm x 450mm x 30mm & 450mm x 450mm x 20mm.



## GEO TEXTILES

Geotextiles are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect or drains. Typically made from polypropylene. Geotextile forms an integral part of drain cell system.

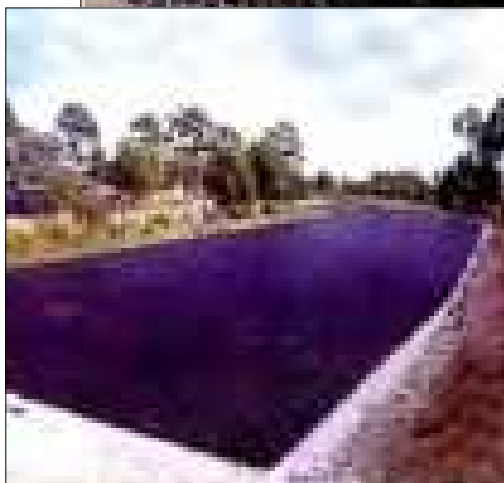
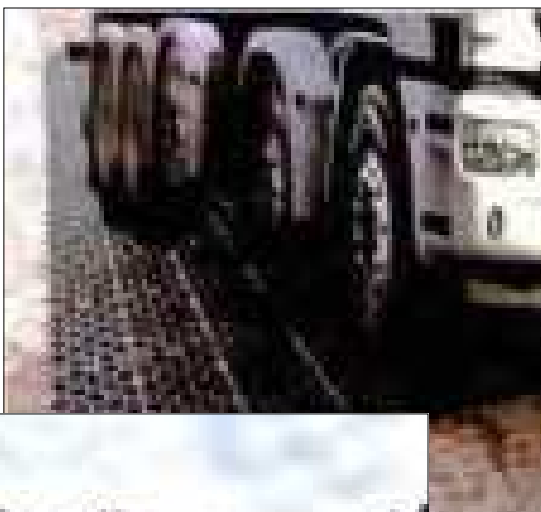
Available mainly in Gray, Black and White Colours in diff. GSM.



### ROAD SURFACE CELL

Basic Structure and Specifications are same as Multi Grow wall.

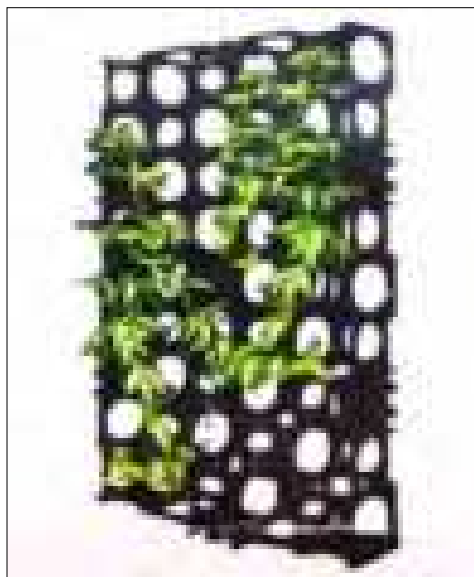
The Cells can be used in any situation where low to medium & heavy use parking surfaces, access roads for mining sites and driveways are required.



### MULTI GROW WALL

Each Multi Grow wall Unit is made with a High-density recycled and UV rays-stable polythene (PE-HD), Weighing <1kg. and available in black colour, The Load bearing capacity is 200 tons/m<sup>2</sup> & Dimensions of the unit is 480mm x 260mm x 51mm.

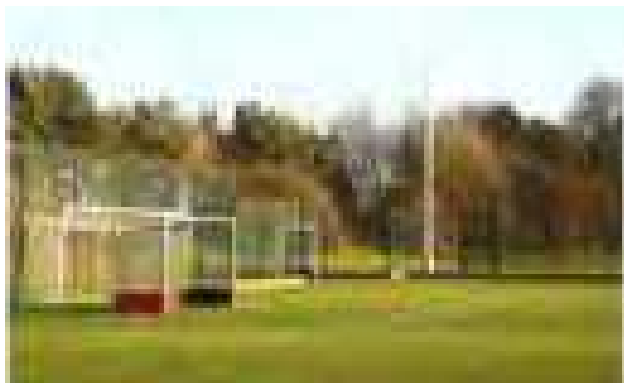
- Modular Planting System & Easy Maintenance
- Easy for Creative planting Design
- Quick Construction & Plant Installation
- Both Vertical & Horizontal Expansion possible



## ARTIFICIAL SPORTS SURFACE

With the modular landscaping solutions, it has been successfully completed sports grounds related projects for various surfaces for sports centres and gymnasiums.

- Sports surfaces for sports centres and gymnasiums.
- Artificial grass for both elite football and lower divisions/training pitches
- Sports and gymnastics mats
- Surfaces for Cricket, Volley Ball, Badminton
- Synthetic surfaces for tennis and multisport (outdoor) Skating etc.



## EASSY WALL

### A New Concept in Greenwall

Easy Hook Module system is one of the latest in many Green wall/ bio wall products introduced by the Modular Landscaping Solutions.

Just like other products, we can incorporate drip irrigation system in the Green wall made with help of Hook Easy module. With this facility we required less external irrigation elements and thus gives us enhanced irrigation efficiency and reduced cost, water flows smoothly throughout the system and maintains the green wall evenly.



## TECHNICAL SPECIFICATION OF THE MODULE:

Height: 130 mm Base : 90 x55 mm Top : 115 x 125 mm

New Modular Design: Better design gives elegant look to the green wall

- Simple Method: Easy to build method.

Eco Friendly: Made with UV stabilized recycled polypropylene material

- Instant Wall: We can create an instant wall by placing pre grown plants in the pots.
- Drainage Holes: Holes at the bottom allows excess water to flow next level.



## BIOWALL ULTRA

### USED AS KITCHEN GARDEN SYSTEM

How it works: it consists of two trays kept one over the other, with lower one providing the water to the upper tray where the plantations are done, the lower tray comes with a water level meter which helps to adjust the water level required in the lower tray.

### Where it can be placed:

- A corner of Kitchen
- Balcony or Verandah
- On the Terrace Area
- Backyard
- Window Cut outs.





# CHAPTER - 4

## HYDROPONICS

Hydroponics has, popularly, been defined as methods of growing plants without soil. The soilless culture defined as biotechnology technique that makes use of natural plant growth phenomena in obtaining better results from plants using inorganic or organic nutrients and standard agronomic practices. The fact is that soilless culture technology is a form of eco-technology that realizes the efficiency and profit from crop plants while maintaining harmony between human activities and the environment.

Thus, hydroponics and organic hydroponics are environment friendly technologies suitable for growing all kind of plants using balanced nutrients in a scientific way. This soilless culture technology not only supplements but also compliments the normal soil condition. It is a clean and scientific eco technology – a smart way to grow the plants.

Hydroponics is highly productive and yield superior quality crop produce round the year, irrespective of the soil and climatic conditions. Organic farming is as good as hydroponic farming albeit low and slow productivity.

### Soilless Culture Techniques:

A soilless culture technique refers to the methods of applying nutrient solution to the roots in an efficient way. There are ten techniques in soilless culture.

#### 1. Static Aerated Technique (SAT):

Plants are grown in a depth of static nutrient solution which is aerated either by providing air space in the root zone or by pumping air in

to nutrient solution in the tank. In organics, a simple pot or bag of organic medium is used. This is sometimes referred to as a “Passive Technique”. Ideally suited for learning the basics of hydroponics or organics and for doing R&D work. Never use this technique for regular growing of plants hydroponically (especially in the tropics) as mosquitoes might breed.

#### 2. Ebb and Flow Technique (EFT):

Plants are grown as a SAT, but the nutrient solution is drained off 3-4 times a day to permit the roots to breathe. This technique is sometimes called “Flood & Drain Technique”(in aggregate culture). In organics plants are grown in organic medium and only plain water is used for flooding. Good for home gardens and commercial nurseries. Almost any type of plants can be grown.

#### 3. Deep Flow Technique (DFT):

A depth of nutrient solution (4-6 cm) is circulated around the roots either by gravity or by using a pump. As the nutrient solution circulates, it absorbs oxygen from the atmosphere. This technique is also referred to as “Dynamic Root” Floatation Technique” and as “Raceways Hydroponics”. Ideal for leafy vegetables and all shallow rooted plants. In organics, fish tank water or any liquid organic nutrient source is used.

#### 4. Aerated Flow Technique (AFT):

This is modified version of DFT. Here, the nutrient solution is profusely aerated by special mechanism. Oxygen level of 10-12 ppm is maintained in the nutrient solution.

The Japanese “Kyowa Hyponica System” and “Styrofoam Float System” adopt AFT, Excellent for growing both leafy and fruit vegetables and certain ornamentals. In organics, fish tank water or any liquid organic source is used.

### **5. Nutrient Film Technique (NFT):**

A thin film of nutrient solution is always in contact with the roots. While the nutrient solution is circulated, the root surface is exposed to the air. This helps the roots to breathe. Numerous modified versions featuring slant /plane feeding, hypertonic feeding, etc. are available. Very good for producing fruit and leafy vegetables. This technique works well both in temperate and tropical regions of the world. In organics, fish tank water or any liquid organic nutrient source is used.

### **6. Gravel Flow Technique (GFT):**

Plants are grown in inert inorganic or organic substrates and the nutrient solution is fed to the roots from beneath the roots. A film of nutrient solution is circulated beneath the substrate. This technique is usually practiced with sand, granite or perlite or other porous substrates which permit free flow of nutrient solution beneath. Commonly practiced in the USA, South Africa, Australia and India for growing lettuces and other kinds of plants. The Bengal System Adopts this technique. In organics, fish tank water or any liquid organic nutrient source is used.

### **7. Sub-Irrigation Technique (SIT):**

Plants are grown in inert inorganic or organic substances and nutrient solution is fed to the roots from beneath the roots through seepage tubes. Though this method of feeding has been practiced in soil cultivation, it has been refined in hydroponics. Nutrients are fed through capillary action of the

growing medium or wicks or any similar water absorbing material that links a pipe or tray containing the nutrient solution to the media surrounding the roots.

### **8. Drip Irrigation Technique (DIT) :**

Like SIT, plants are grown in inert inorganic or organic substrates, and the nutrient solution is fed close to the roots 6-7 times a day in drops or trickles. This technique is called a “Drip Fertigation Technique”. This technique is also referred to as “Surface Watering Technique” if hand watering or flooding is practiced instead of drippers. Deserts in the Middle - East are exporting crop produce because of this technique. Also suitable for the plantation, orchard and landscaping industries.

### **9. Root Mist Technique (RMT):**

A mist of nutrient solution is sprayed every 4-5 minutes on to the roots of the plants that hang from a frame in a rooting chamber. Hydroponic system that are designed using the technique is popularly known as “aeroponics. Good for initiating rooting of cuttings and also for extracting (“milking”) phytochemicals from the roots for medicinal purposes. Also good for growing any type of plants. Selection of nozzles to adjust the droplet size might promote more fine root hairs which in turn might influence nutrient absorption. In organics, fish tank water or any liquid organic nutrient source is used.

### **10. Fog Feed Technique (FFT):**

This is similar to RMT but the droplet size is so very minute (like a cloud) that the nutrient solution can hardly moisten our hand. This technique has yet to be perfected. Good for plants having aerial roots with spongy water absorbing tissues like “valamen”. e.g orchids, anthuriums, etc. In organics, fish tank water or any liquid organic nutrient source is used.



## CHAPTER - 5

### HOME GARDEN FEATURES

Gardens have been established next to homes since time immemorial. The most important characteristics of home gardens are their location adjacent to homes, close association with family activities and a wide diversity of plant species to meet family needs.

**Home gardens are divided based on their features, broadly into:**

1. **Front garden or aesthetic garden:** This is the visual area between the gate of the campus and entry point to the main building. Focus is laid on aesthetic components such as lawns, flower beds, shrubs, trees, edges, hedges, creepers on arches, pergolas, walls, fountains, waterfalls etc. This part of the garden enhances the value of the building, refreshes the mind after hard work outside and makes life more enjoyable both for owners and visitors.
2. **Indoor Garden:** This is mostly a container garden in any part of the house like verandah, balconies, living room, kitchen, bedrooms and bathrooms etc. There is scope to showcase the entire house as a garden and allow one to be close to nature. It is easy to maintain and enjoy an indoor garden especially foliage plants. Potted plants can be placed on pot stands, window-sills, on the floor in pot trays or in corners or can be hanged on specially made hooks.
3. **Back yard or Kitchen Garden:** This is mainly used for growing fruits and vegetables for personal use and also to have some lawn area for a family sit out. Functional value is of prime concern.

4. **Roof Garden:** A rooftop garden is when you build a garden on the roof of a building which is usually done in urban areas. It is an easy way to have a garden experience without needing the land to create the garden. The plants are usually grown in pots or planters especially constructed for the purpose. Flowers & vegetables grown in pots on the roof top provide coolness to the building and also help in creating a habitat for birds. Light pots and pot media are preferred. Water proofing the roof floor is very important. Lawns can also be raised with light soil media and by providing proper drainage.

### HOME GARDEN COMPONENTS

This can be broadly divided into soft and hard landscape components. Soft landscape components consist of various types of plants and hard landscape components comprise of civil works including metallic structures such as arches pergolas etc.

#### **(A) Softscape Garden Components:**

- i. **Trees:** Trees are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, medium or small canopy trees can be grown. Trees can be evergreen and deciduous, based on their leaf shedding character or they can be flowering and non flowering foliage trees.
- ii. **Palms:** Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for



- their symmetrical growth which makes an avenue look beautiful. They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.
- iii. **Shrubs:** Shrubs can be classified as flowering and non flowering. Flowering shrubs need full sun light, and foliage shrubs can grow well under partial sunlight and shade. Location has to be decided based on the height and canopy of the shrubs. Pruning of shrubs helps to get bushy growth.
  - iv. **Climbers:** Climbers are plants which require support to grow. They can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces, over grills and wire meshes.
  - v. **Flower beds :** Seasonal and perennial flower beds can be laid in various shapes and sizes. Flowers in all colours of the rainbow are available. Some species are specific to winter; summer or rainy season and some can be grown throughout the year.
  - vi. **Ground Covers:** These are used to cover the soil surface as an alternative to lawns for avoiding dust and to add colour through flowers or foliage. They also check soil erosion.
  - vii. **Hedges and edges:** Hedges are used for providing privacy, concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc... Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.
  - viii. **Roses :** Many people consider a garden incomplete without rose plants. These are grown for attractive and scented blooms, in beds or as standards and climbers.
  - ix. **Potted plants:** Potted plants are displayed both indoors and outdoors, as groups or in singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give a very good effect.
  - x. **Lawns:** Lawns are areas planted with various types of grasses. They are a major component in any garden. They can be planted in turf form and also as grass slips. The following varieties are available either in carpet or loose form- Korean, Mexican, Fescue, Calcutta doob, Bermuda, Paspalum and St. Augustine.
  - xi. **Rockery:** A rockery is a retaining or protection structure that consists of stacked rocks without mortar, concrete or steel reinforcement. The rocks are stacked in an “interlocking” pattern, and rely on the weight, size, shape, and interface friction of the rock elements to provide overall stability. Selected plants are grown to give an effect of a rocky terrain. Plants best suited to rockeries are those which grow slow and low and are happy in dry areas. These plants usually prefer well-drained soil and less water.
  - xii. **Special garden features:** Special features include Bonsai, Topiary, tray gardens, bottle gardens and specimen plants etc. that are used especially to create an aesthetic effect in a garden.

## (B) Hardscape Garden Components :

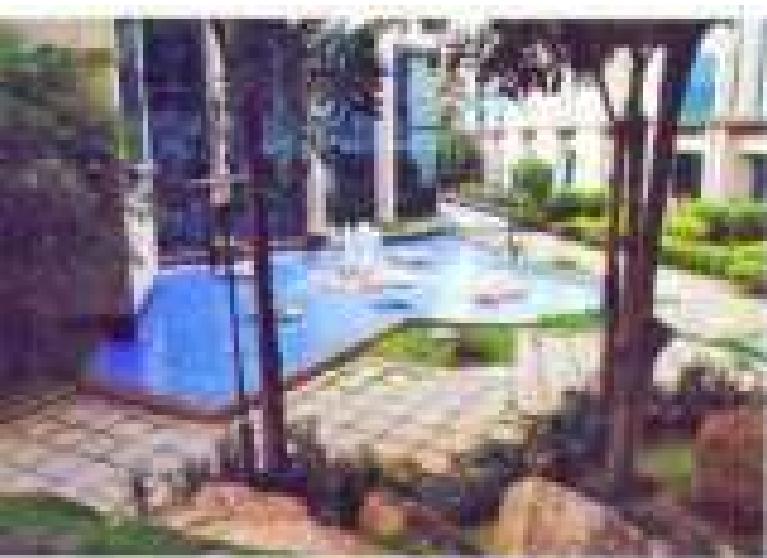
- i. **Arches:** These are used at entry points to the house or a lawn and are covered with creepers. Arches are of different shapes and sizes and can be made of iron pipes/ flat rods, wood, cement bars etc.
- ii. **Pergolas:** Pergolas are umbrella shaped iron or wooden structures covered with

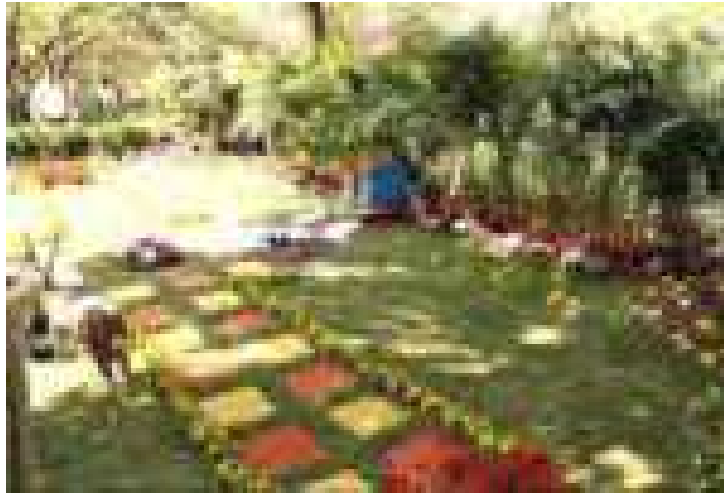
creepers to provide shade over sit-outs and also for elegance.

- iii. **Statues:** These can be art statues or memorials.
- iv. **Pathways, steps, curbs, benches etc:** Functional elements introduced in a garden which are very much essential and practical.
- v. **Water features:** Ponds, flow channels, waterfalls, fountains, sprinklers and swimming pools are essential water

features which can be used in a garden to provide a feeling of peace, calmness and beauty.

- vi. **Tools and Implements for Watering, Drainage and Lighting Systems:** These are the basic needs for any garden. Tools and implements like a pruning Shear, Rake, watering can, drip systems etc. can be used. Nowadays, to showcase a garden, a variety of lighting systems can be designed.





Hydrangea Flowers



Kalanchoe





# CHAPTER - 6

## ROOF GARDENS

### Tips for Roof Garden:

1. Suitable for people living in apartments or buildings without much open area around the house.
2. Ensure the structural strength of the building, before embarking on the project.
3. Provide water proofing to roof top before under taking any construction of planter boxes with the required water proofing material. Use drain cells and geo textile fabric for improving the drainage for lawns, flower beds and planters, before filling with red soil and manure.
4. Try and use materials which are light weight like plastic pots and trays, aluminum pots, fiber glass planters and earthen pots. This helps in reduction of dead load on the terrace.
5. Use of light weight material like peat or sphagnum moss, coco peat, vermi-compost etc. in the soil mixture will help in reduction of weight.
6. For plant propping, provide light supporting structure.
7. Keep the plant growth under check by regular pruning.
8. For shade loving plants provide shade net.
9. Use limited quantity of water daily. Care should be taken to avoid water stagnation.
10. With proper planning, care and precaution, a full-fledged roof garden can be developed and maintained with many Garden features.



# CHAPTER - 7

## PLANT PHYSIOLOGY

### Fundamentals of Plant Physiology and Soil Moisture:

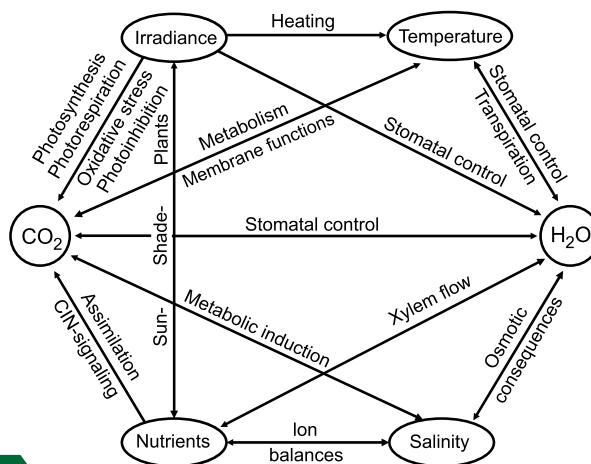
- i. **Photosynthesis:** Photosynthesis is the process of converting light energy to chemical energy and storing it in the bonds of sugar. Plants need only light energy, Carbon-di-oxide and water to make sugar while releasing oxygen. The process of photosynthesis takes place in the chloroplasts using the green pigment chlorophyll. This is essential for survival of life on earth.
- ii. **Osmosis:** The process of absorption of dilute plant nutrients through the roots is osmosis. If the nutrient solution around the absorbing roots is more concentrated than that of plant sap, then such solutions suck plant sap and the plant dies, this process is called as reverse Osmosis.
- iii. **Transpiration:** The process of evaporation of moisture from the plant through leaves is transpiration. This depends on the surface area of the leaf, atmospheric temperature, humidity and wind speeds. If the rate of evaporation is more than absorption of moisture from the soil through roots, the plant wilts and dies.
- iv. **Respiration:** Plants respire through leaves and roots. Periodical loosening of soil near the root zone helps in better aeration and respiration of the plant and it helps in maintaining plant vigour.

### Factors Responsible For Better Plant Growth:

1. **Light:** Plants need light for photosynthesis and growth. Intensity and duration of light needed by a plant differs from species to species. Poor light results in pale leaves or loss of colour. If proper distribution of light is not available on all sides of the

plant, pots need to be rotated regularly. Bright artificial light can substitute natural light.

2. **Humidity:** 40-60% RH is ideal for plant growth. It is very low during summer months. Low humidity leads to tip burn in leaves. Protect the plants from dry winds during summer. To increase humidity, spray fine mist on foliage, sponge the leaves with water or place pots on moist sand, cover the soil around the plant with sphagnum moss/wet paper.
3. **Temperature:** Ideal temperature for indoor plants varies from 15-30°C for different species. Plants prefer uniform temperatures, which can be achieved with good aeration by keeping the doors or at least windows open.
4. **Soil moisture:** Indoor plants need lesser water than outdoor plants. Succulent and thorny plants need water less frequently. Soil in small pots dries quickly than in larger pots. Clay pots need water more frequently than plastic or ceramic pots. For retention of water in the pots loosen top soil, apply mulches, and add charcoal, brick crumbs, and coco peat and water absorbents. Do not over water the plants as this may create anaerobic conditions for the root system.



# CHAPTER - 8

## TREES

For us a tree means flowers, fruits and shade. For a person in a village it means fuel wood, timber, fodder and lots more. For children it is a wonderful place to climb on to and watch animals in action. For elders it is a religious symbol and a pharmacy at home. For some people it is a leaf shedding machine that fills the yard with leaf litter. In urban areas, they are of immense value as they are the only source of greenery amidst the concrete jungle, adding beauty to the city surroundings with their lush foliage, colorful flowers and beautiful shapes. Beside the aesthetic value, they help in controlling pollution, regulating temperature and as wind breakers. Trees are dominant elements of a garden and contribute substantially to the garden atmosphere. They are available in many shapes, sizes, foliage and blooms. The selection of trees depend on the architecture of the building, the purpose for which they are planted whether a single plant as a focus of attention, or a cluster of plants for mass effect, the position available, whether in shade, semi-shade or open sunshine, waterside, rock areas etc.,

Trees are grown for shade, cooling effect, screening, reducing dust, sound and air pollution. Based on available space, large or small canopy trees can be grown. Trees can be classified as evergreen (which do not shed leaves) and deciduous (which shed leaves during a particular season of the year) or as flowering and foliage trees.

### **Trees are an important component of a garden.**

- They Provide shade during summer and shelter during rainy season.

- Help in preventing soil erosion.
- Provide good nesting places for birds.
- Check air and sound pollution.
- Obstruct entry of dust and smoke into the house.
- Create required privacy.
- Generate fragrance in and around the house with scented flowers.
- Make the campus colourful with multicoloured flowers and foliage.
- Improve environment by creating humidity and coolness.
- Act as a background to the lawns and other garden features.
- Act as natural protection system for shade loving potted plants.

### **Tips for Planting & Maintaining Trees:**

- Plant the trees and water them properly. Next day press at the base and stake the plants. Pressing is done to remove the air pockets created during planting. If air pockets are not removed, they will act as precursors to infections.
- Pruning and training by removal of lower branches results in a balanced plant growth.
- Regular weeding, mulching and watering in the plant basins during first three years of planting are essential.
- Periodic pruning of dried branches carefully with a pruning saw is desirable.

Apply copper oxi-chloride paste to the cut ends.

- Trees help us in many ways. Plant & protect them.
- Trees hold the soil with their roots and prevent it from getting eroded by heavy rains and winds.
- Trees in upland areas trap rainwater and prevent flooding of lowlands during heavy rains.
- Trees help to reclaim wastelands by improving soil texture and fertility.
- Tree roots create paths into the soil, through which water percolates down for use as ground water.
- Tree roots and leaf litter act as barriers to runoff water, and when stored for a period of time, it decomposes to form leaf mold manure which is excellent for the growth of plants.
- By releasing water in the atmosphere from tiny pores in their leaves, trees cool and refresh the air; this process also reduces dust pollution as the dust particles in the air stick to the water vapor thus released.
- Trees produce oxygen through the process of photosynthesis

S. No.	Name	Colour	Height	Flowering Season
1.	Bauhinia Var	White, pink, purple	Small to medium	Nov-Mar
2.	Cassia fistula	Yellow	Small	Feb-Apr
3.	Cassia javanica	Pink, white	Medium	Jly-Sep
4.	Cassia nodosa	Orange -Scarlet	Medium	Jly-Sep
5.	Colvillia racemosa	Pink	Tall	Jly-Sep
6.	Erythrina indica	Scarlet	Medium	Mar-Apr
7.	Erythrina crista-galli	Scarlet	Small	Year round
8.	Jacaranda	Blue	Medium	Oct-Feb
9.	Lagerstroemia floriregine	Purple, pink	Medium	Jul-Aug
10.	Delonix regia	Orange	Big	Mar-July
11.	Peltophorum	Yellow	Big	Year Round
12.	Plumeria sp.	White	Medium	Oct-Mar
13.	Spathodea companulata	Orange	Tall	Oct-Mar
14.	Tecoma argentia	Yellow	Small	Feb-Mar
15.	Tecoma gaudi chaudi	Yellow	Small	Year Round
16.	Tabebuia rosea	Pink	Small	Feb-Mar
17.	Saraca indica	Orange	Small	Apr-Jun
18.	Cordia sebestena	Orange	Small	Year Round





Magnolia Grandiflora



Callistemon Pollandi



Aegle Marmelos



Pithecellobium SP



Saraca Indica



Cordia (Yellow)



Cordia Sebestena



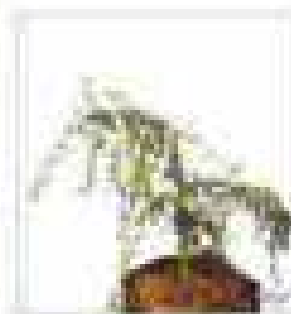
Golden Melaleuca



Artabotrys



Azadirachta Indica Vergated



Opercularia Decary



Delonix Regia



Spathodea Campanulata



Melaleuca Linearlifolia



Cassia Spectabilis



Milletia Reticulata



Terminalia Mentaly



Cochlospermum Religiosum  
(Double)



Erythrina Cristagalli



Lagerstroemia



Bamboo (Black)



Simarouba Glauca



Brassaia Actinophylla



Alstonia Scholaris



Plumeria Obtusa



Leucophyllum Frutescens



Dillenia Indica



Gauva



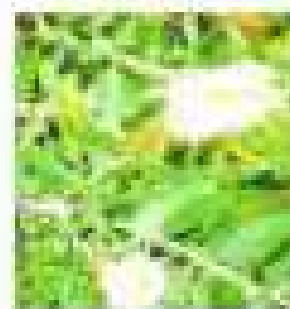
Ficus Carica



Bauhinia Alba



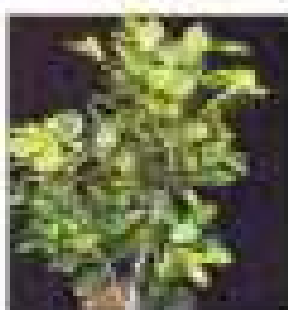
Citharexylum Spinosum



Melaleuca Armillaris (White)



Couroupita Guianensis



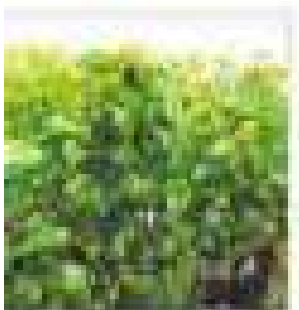
Artocarpus Hetrophyllus



Erythrina Blackiena



Chorisia Speciosa



Sterculia Alata



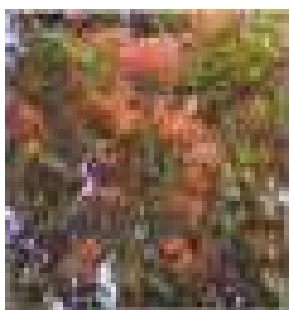
Colvillea Racemosa



Solanum Vergated



Mango



Cassia Marginata



Giant Bamboo



Ficus Createrisperma



Tabebuia Pallida



Sterculia Foetida



Millingtonia Hortensis



Anthocephalus Cadamba



Thespesia Populnea



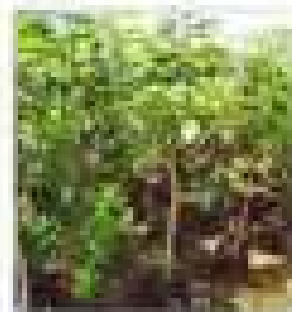
Mesua Ferrea



Jacaranda



Ficus Bengalensis



Crataeva Religiosa



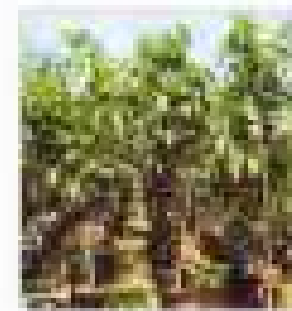
Agathis Robusta



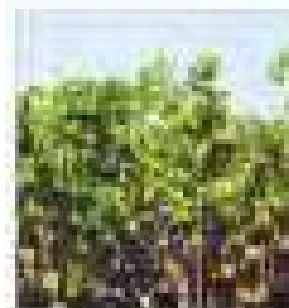
Cassia Fistula



Bauhinia Purpurea



Tabebuia Rosea



Markhamia Lutea



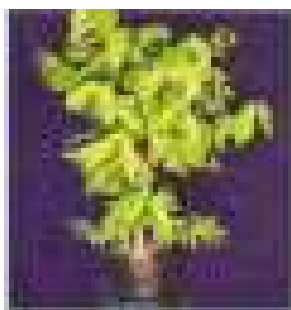
Pachieia Aquatica



Ficus Roxburghii



Cassia Alata



Cananga Odorata



Kigelia Pinnata



Callistemon Pollandi



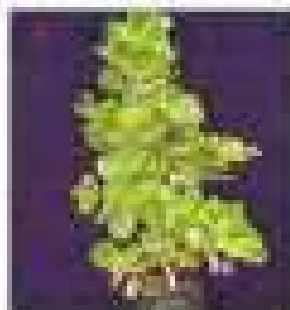
Swietenia Mahagoni



Plumeria Singapore Dwarf



Crescentia Cujete



Clusia Rosia Variegata



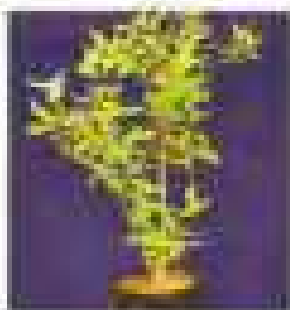
Clusia Rosea



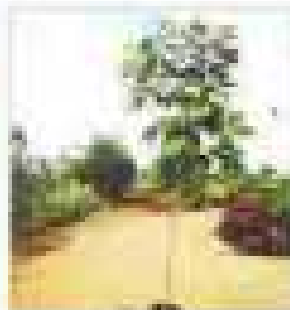
Solanum Macranthum



Bombax Ellipticum



Nyctanthes Arbortristis



Pterospermum Acerifolium



Cochlospermum Regligosum



Bixa Orellana



Madhuca Latifolia



Schizostachyum Brachycladum



Thevetia



Plumeria Pudica



Guaiacum Officinale



Aphanomixus Polysytachya





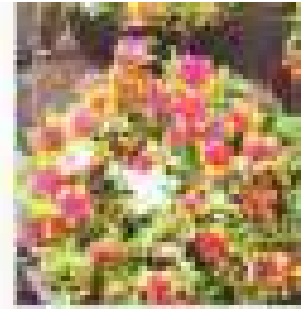
Milletia Ovalifolia



Cattleya Orchid



Quisqualis Indica



Portulaca Oleracea



Kadamba Dwarf



Monstera Deliciosa Variegated



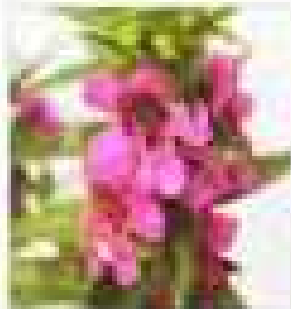
Hanging



Hanging



Angelonia Serena Pink



Angilonium Red



Kalanchoe Variegated



Kalanchoe



Aquatic Plant



Philodendron Magestic



Canna Dwarf



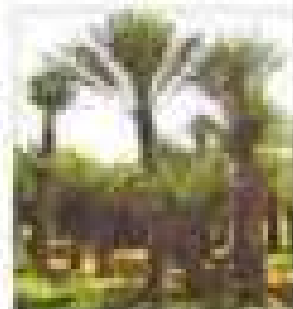
Episcia Cupreata



Bamboo Variegated



Neodypsis Decaryi



Phoenix Sylvestris



Podocarpus



Ficus elastica

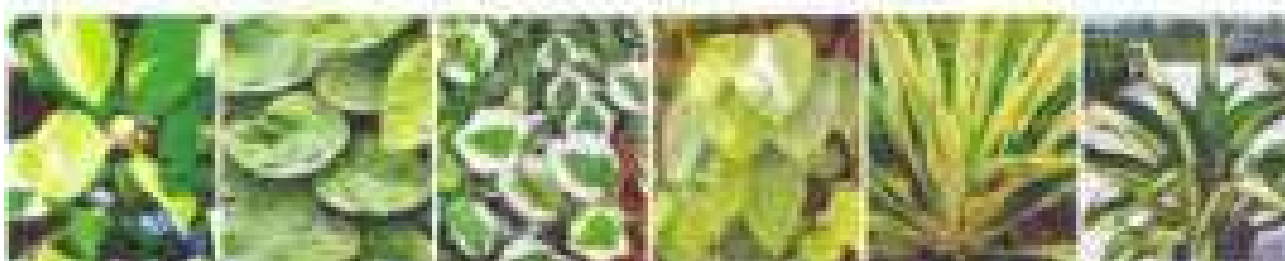
Ficus elastica

Ficus lyrata

Ficus macrophylla  
hillii

Ficus macrophylla

Ficus mysorensis



Ficus nitida

Ficus pumila  
wall creeper

Ficus pumila  
variegata

Ficus religiosa

Furcraea foetida  
variegated

Furcraea foetida  
variegated



Gardenia  
jasminoides

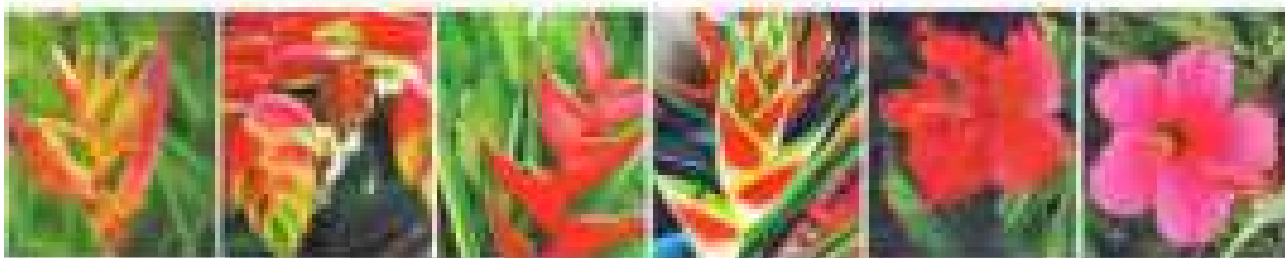
Galphimia glauca

Hamelia patens  
variegata

Hamelia patens

Heliconia caribaea

Heliconia latispatha  
Starwiz



Heliconia  
psittacorum

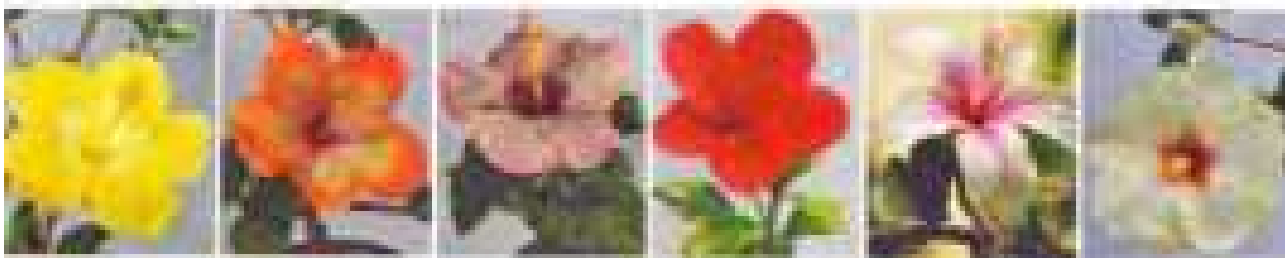
Heliconia rostrata

Heliconia stricta  
huber

Heliconia  
wagneriana

Hibiscus rosa  
sinensis

Hibiscus rosa  
sinensis pink



Hibiscus rosa-  
sinensis hawaiian  
variety

Hibiscus rosa-  
sinensis hawaiian  
variety

Hibiscus rosa-  
sinensis hawaiian  
variety

Hibiscus rosa-  
sinensis viceroy  
variety

Hibiscus rosa-  
sinensis hawaiian  
variety

Hibiscus rosa-  
sinensis hawaiian  
variety



Cordea lutea

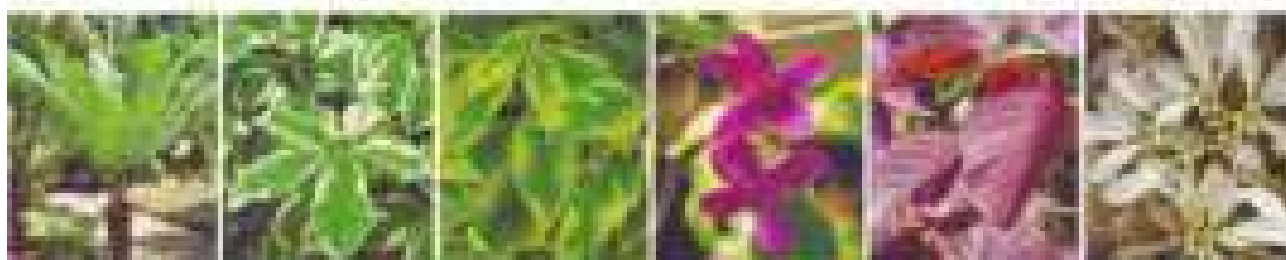
Crossandra  
infundibuliformis

Crossandra regular

Crossandra yellow

Datura metel

Cycus revoulta



Cycus circinalis

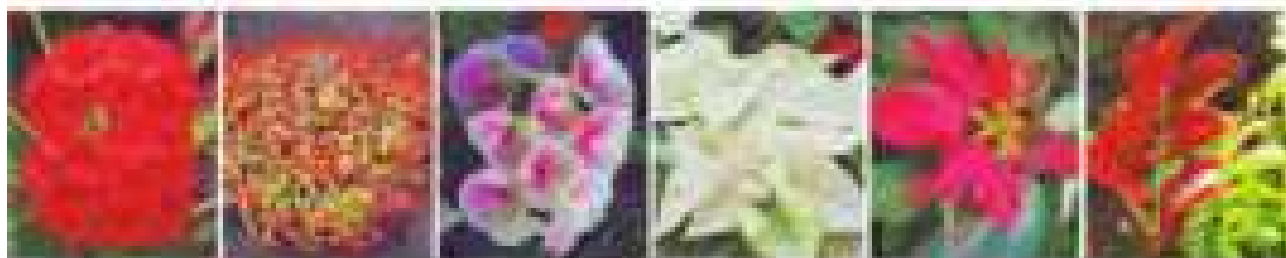
Duranta variegated

Duranta golden  
speciosa

Eranthemum  
laxiflorum

Euphorbia  
Cotinifolia

Euphorbia  
leucocephala



Euphorbia milii  
visofflora

Euphorbia milii  
Desert rose

Euphorbia milii  
Hybrid

Euphorbia-  
pulcherrima White

Euphorbia-  
pulcherrima red

Excoecaria bicolour



Ficus benjamina  
(black)

Ficus benjamina  
bushy king

Ficus benjamina  
Panda

Ficus benjamina  
rigenold

Ficus benjamina  
variegata

Ficus bnjamina  
variegata



Ficus benjamina  
variegata

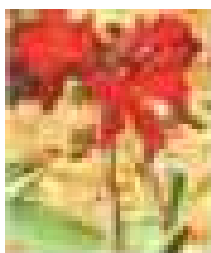
Ficus benjamina

Ficus binnendijkii  
yellow (long island)

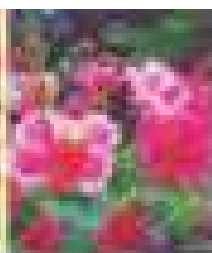
Ficus binnendijkii

Ficus carica  
(Angeer)

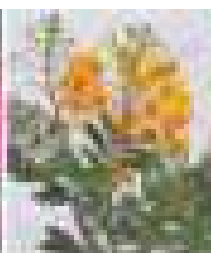
Ficus elastica  
burgundy



Cannas dwarf red



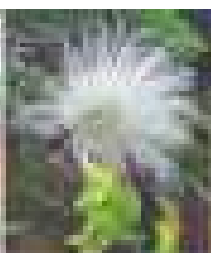
Caesalpinia pulcherrima Pink



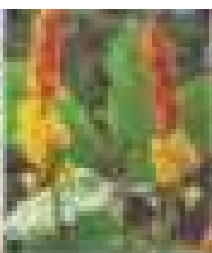
Caesalpinia pulcherrima (Yellow)



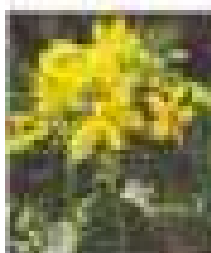
Calliandra deep red



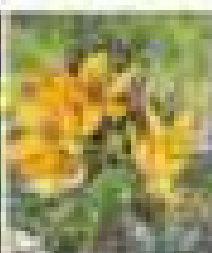
Calliandra protoricensis (Milk way)



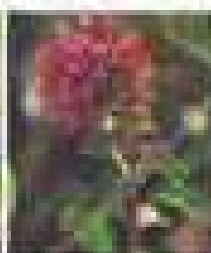
Cassia alata



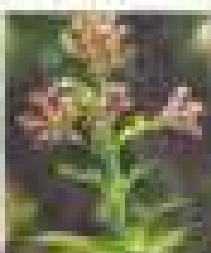
Cassia glauca



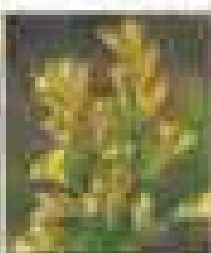
Cassia biflora (Bicapsularis)



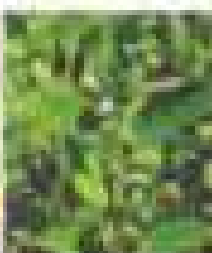
Cestrum elegans (Night queen red)



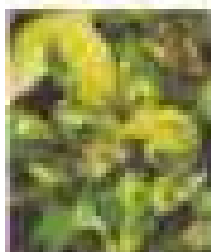
Cestrum (Night queen pink)



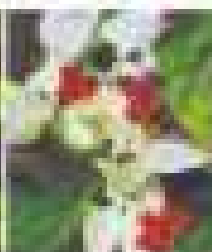
Cestrum aurantiacum (Night queen yellow)



Clerodendron inerme



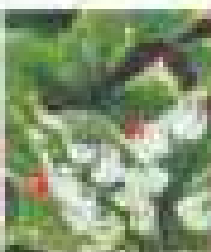
Clerodendron inerme variegated



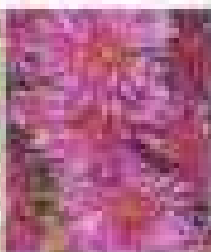
Clerodendron thomsonae



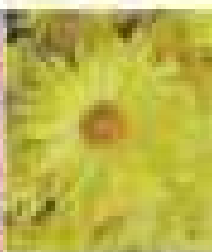
Clerodendron bungei



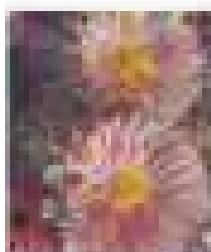
Clerodendron variegata



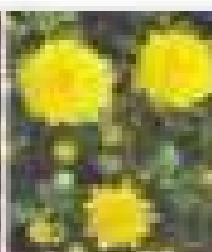
Chrysanthemums Kanchil



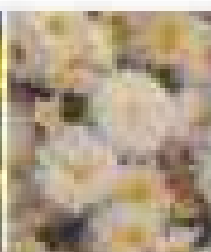
Chrysanthemums Kargil



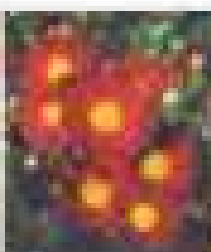
Chrysanthemums Karnal Pink



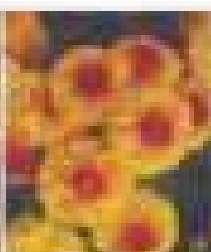
Chrysanthemums Kundan



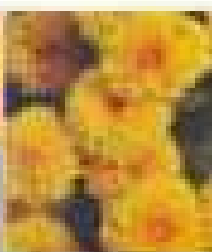
Chrysanthemums Lalit



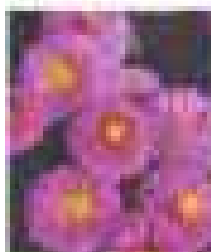
Chrysanthemums Lalpani



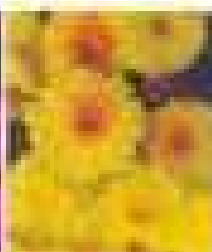
Chrysanthemums Little Darling



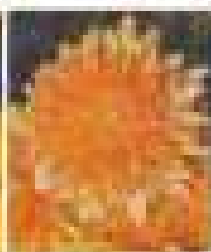
Chrysanthemums Little Orange



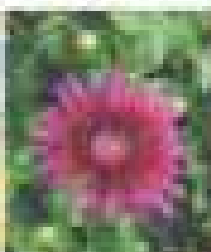
Chrysanthemums Little Pink



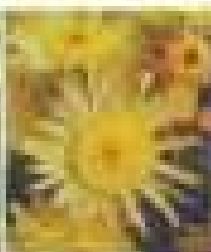
Chrysanthemums Haldighati



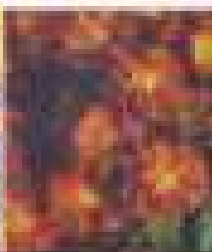
Chrysanthemums Thaichin Queen



Chrysanthemums Queen

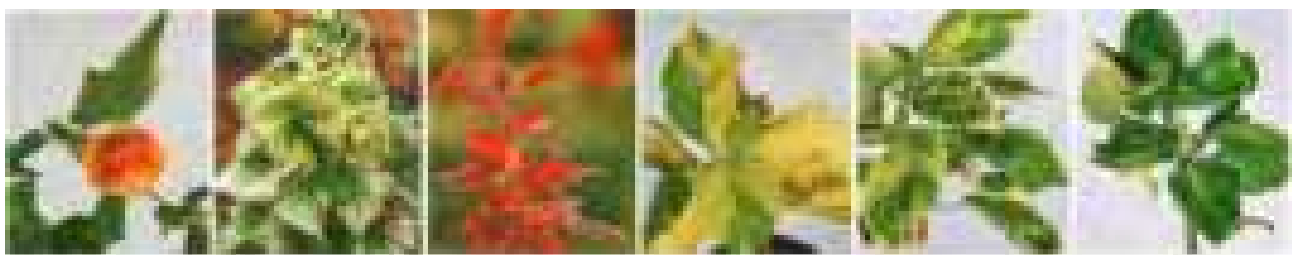


Chrysanthemums Ranbil



Chrysanthemums Red Stone





Abutilon  
hybridum

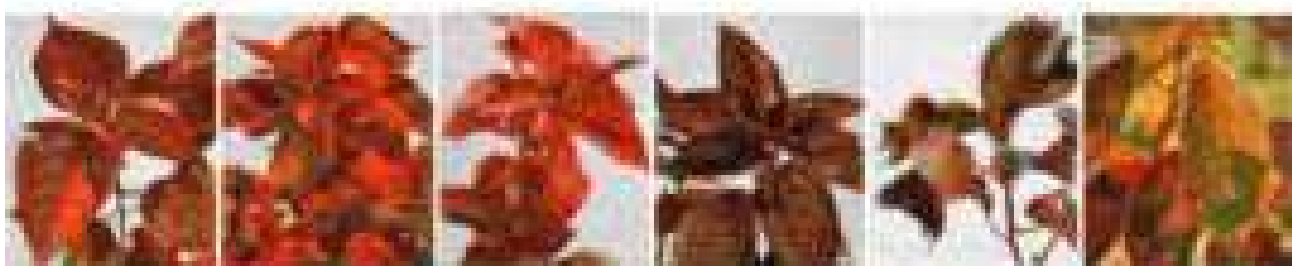
Acalypha  
wilkesiana philippine

Acalypha  
wilkesiana inferno

Acalypha  
wilkesiana ceylon  
lime

Acalypha  
wilkesiana tahiti  
plain

Acalypha  
wilkesiana hoffmannii



Acalypha  
wilkesiana lousiana  
red

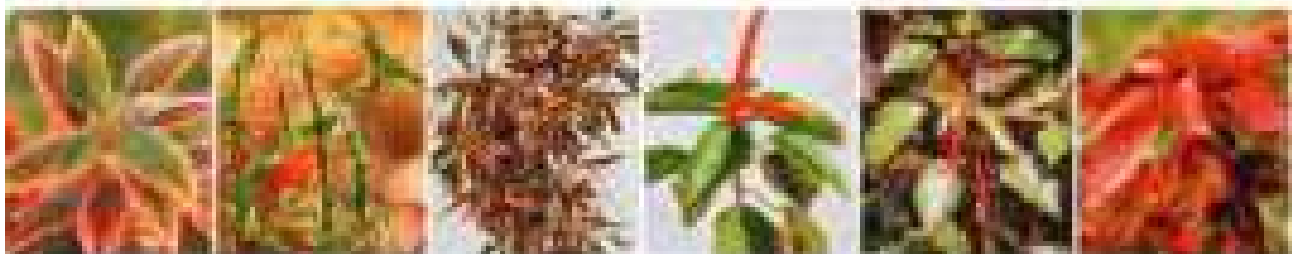
Acalypha  
wilkesiana dwarf

Acalypha  
wilkesiana brazen

Acalypha  
wilkesiana moorea  
chocolate

Acalypha  
wilkesiana moorea  
twisted

Acalypha  
wilkesiana  
bourbonstreet



Acalypha  
godseffiana  
heteropylla bronze

Acalypha  
godseffiana  
heteropylla variegata

Acalypha  
godseffiana  
heteropylla / kilauea

Acalypha  
hispida indica

Acalypha  
hispida rubra

Acalypha wilkesiana  
microphylla



Allamanda nerifolia

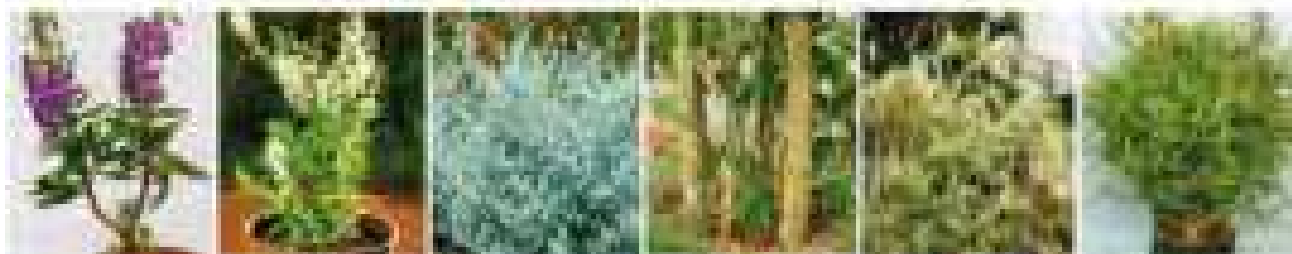
Allamanda violacea

Adenium  
arabicum

Adenium  
obessum grafts

Adenium  
obessum grafts

Adenium  
obessum  
variagatged



Angelonia  
angustifolia

Angelonia  
angel mistwhite

Artemisia  
arborescens lavender

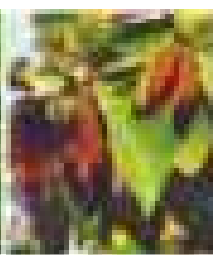
Bambusa balcooa  
(giant bamboo)

Bamboo salsa  
maquonia

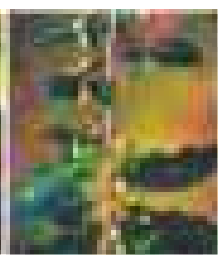
Bambusa variegated  
new



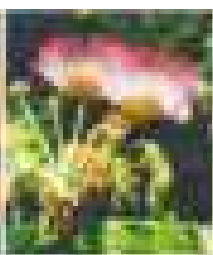
Prosopis juliflora



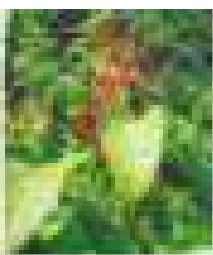
Sterospermum suberifolium



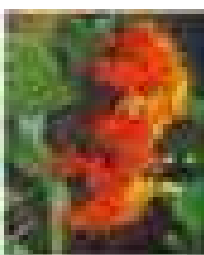
Putranjiva roxburghii



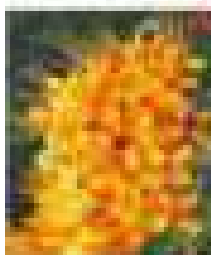
Samanea saman rain tree



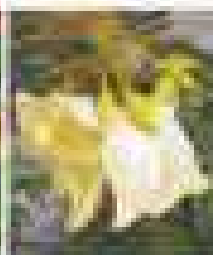
Santalum album sandal wood



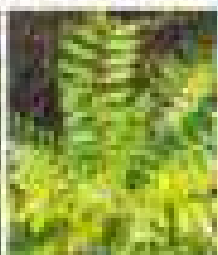
Saraca asoca ashoka tree



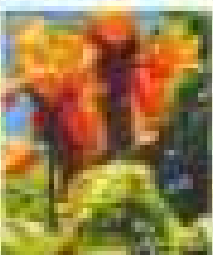
Saraca cauliflora



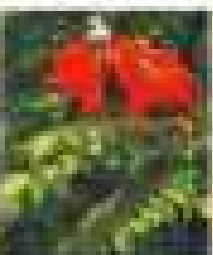
Sesbania grandiflora



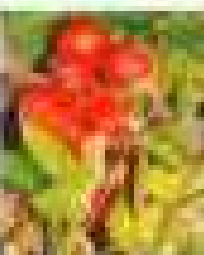
Simarouba glauca



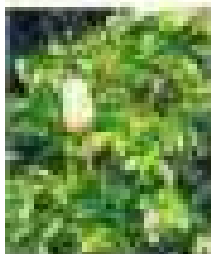
Spathodea campanulata tulip tree-yellow



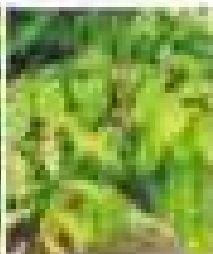
Spathodea campanulata tulip tree-orange



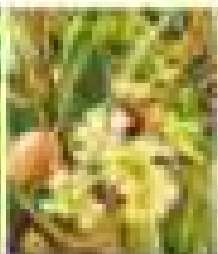
Sterculia foetida china badam



Swietenia macrophylla



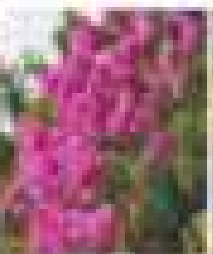
Swietenia mahagoni



Syzygium cumini kala jamun



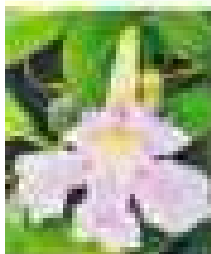
Tabebuia argentea



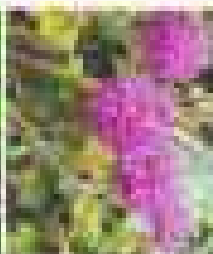
Tabebuia palmeri



Tabebuia chrysantha



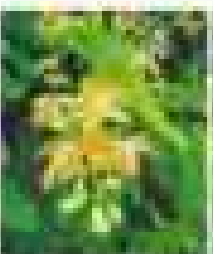
Tabebuia pallida



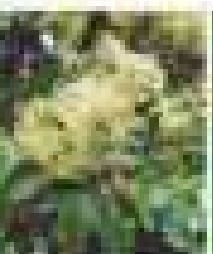
Tabebuia avellanedae



Tabebuia rosea



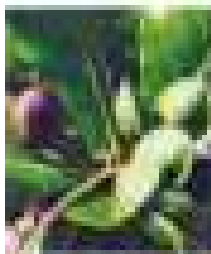
Tamarindus indica tamarind



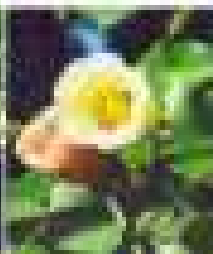
Tectona grandis teak wood



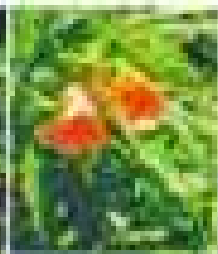
Terminalia arjuna



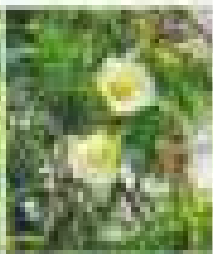
Terminalia catappa



Thespesia populnea



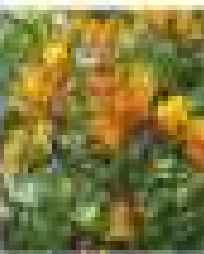
Thevetia peruviana (Orange)



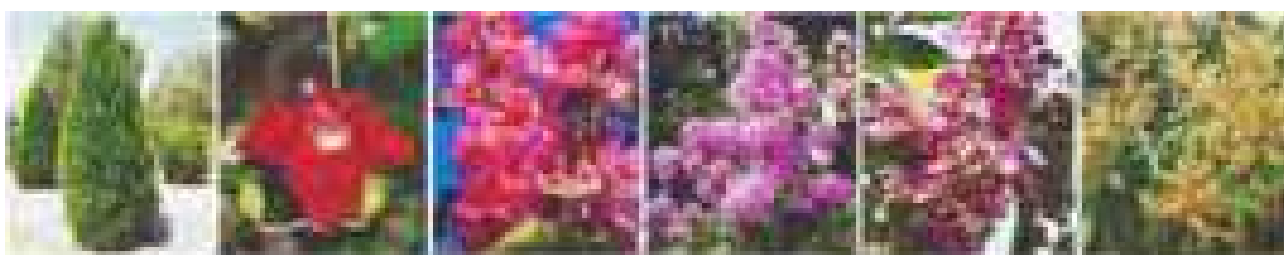
Thevetia peruviana (white)



Thuja orientalis



Tipuana tipu



*Juniperus chinensis*

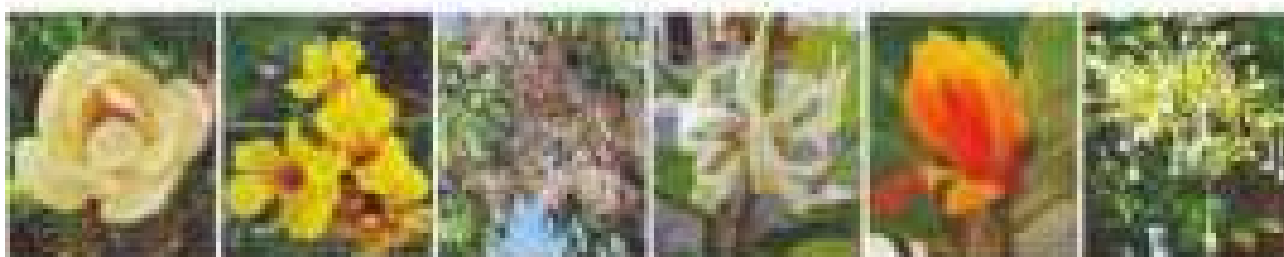
*Kigelia pinnata*

*Lagerstroemia speciosa rosea*

*Lagerstroemia speciosa*

*Lagerstroemia thorelli*

*Mangifera indica*



*Magnolia grandiflora*

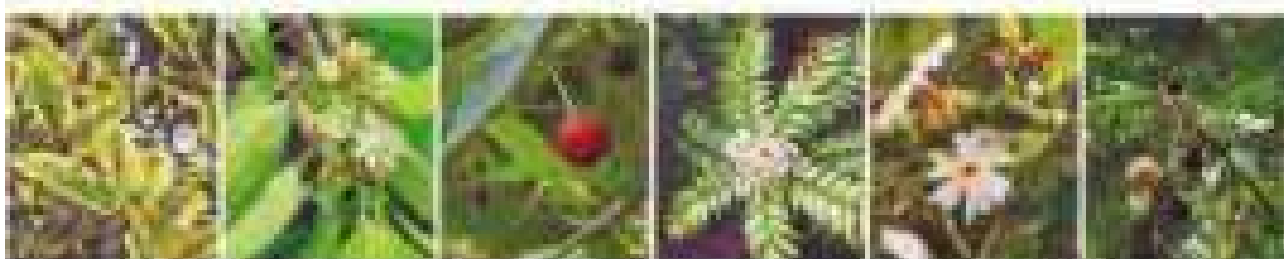
*Markhamia platycalyx*

*Melia azedarach*

*Michelia champaca alba*

*Michelia champaca*

*Milligtonia hortensis*



*Mimusops elengi variegata*

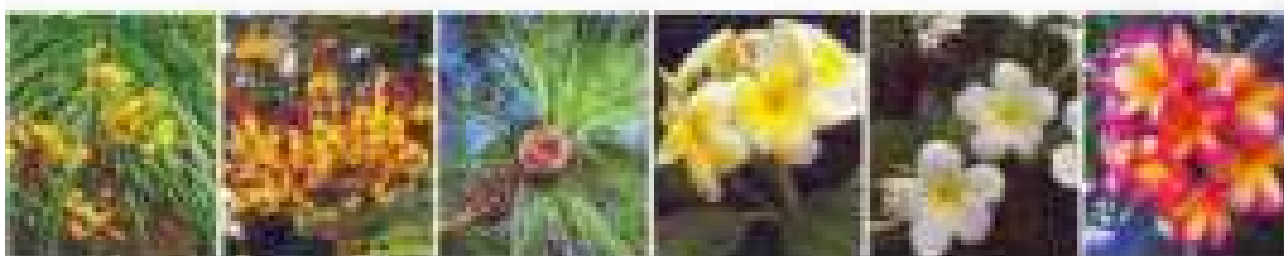
*Mimusops elengi*

*Muntingia calabura singapore cherry*

*Murraya koenigii curry leaf*

*Nyctanthes arbor-tristis parijatham (coral jasmine)*

*Parkia biglandulosa*



*Parkinsonia aculeata*

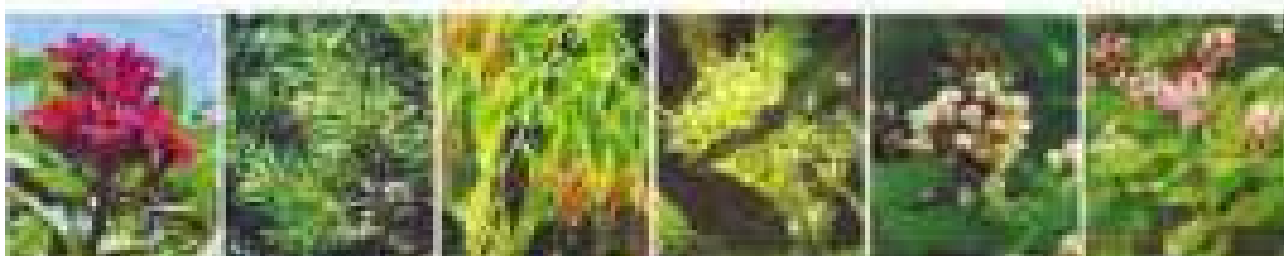
*Peltophorum pterocarpum*

*Pinus longifolia*

*Plumeria lutea Frangipani*

*Plumeria obtusa Frangipani*

*Plumeria rubra forma tricolour Frangipani*



*Plumeria rubra Frangipani*

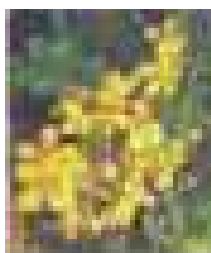
*Podocarpus macrophyllus*

*Polyalthia longifolia pendula variety*

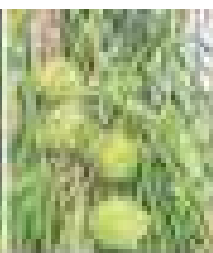
*Polyalthia longifolia*

*Pongamia pinnata white flowers*

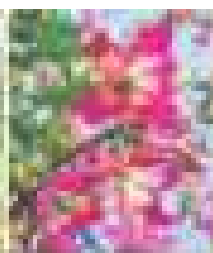
*Pongamia pinnata light pink flowers*



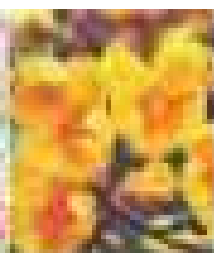
Cassia siamea



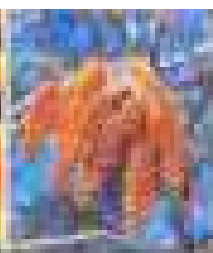
Casuarina  
equisetifolia



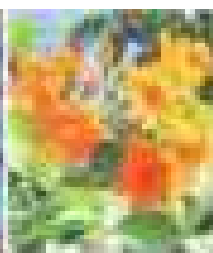
Chorisia speciosa



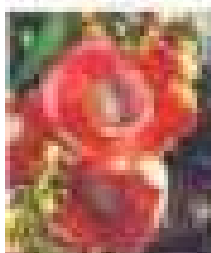
Cochlospermum  
religiosum



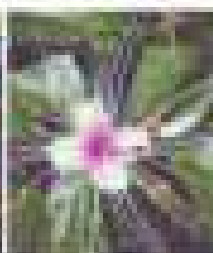
Colvillea racemosa



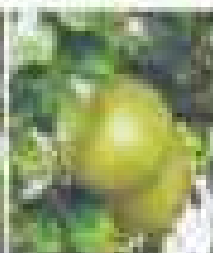
Cordia sebestena



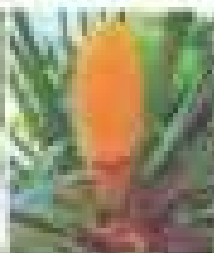
Couroupita  
guianensis



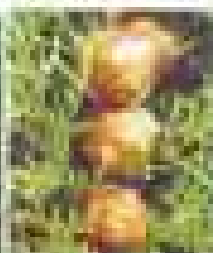
Crataeva religiosa



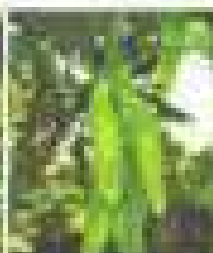
Crescentia cujete  
beggars bowl



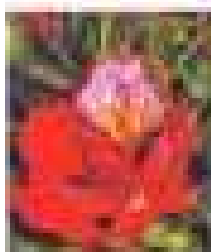
Cycas circinalis



Cupressus  
sempervirens



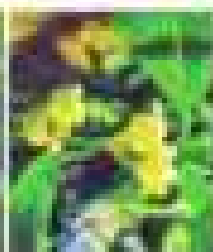
Dalbergia sissoo



Delonix regia



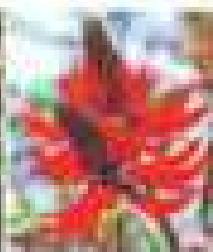
Dillenia indica



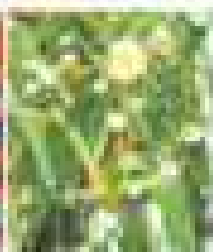
Diospyros  
peregrina



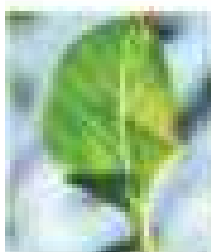
Erithrina crista-galli



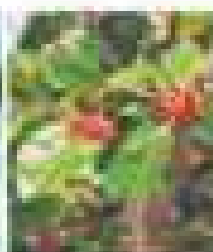
Erythrina indica



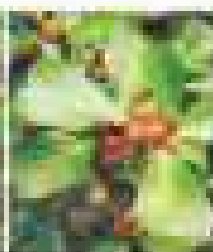
Eucalyptus  
citriodora



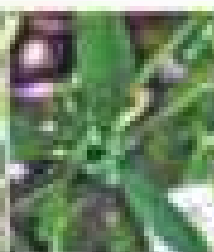
Ficus benghalensis  
krishne



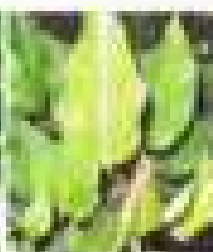
Ficus benghalensis



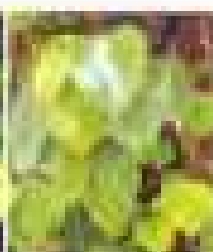
Ficus craterostoma



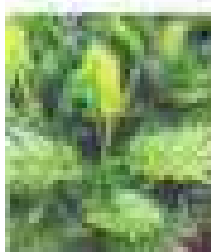
Ficus hispida



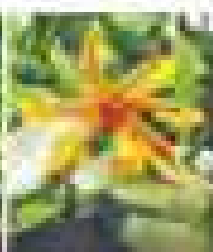
Ficus infectoria



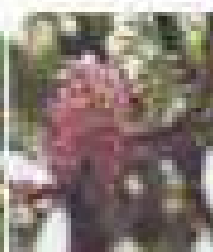
Ficus religiosa



Filicium decipiens



Gardenia latifolia



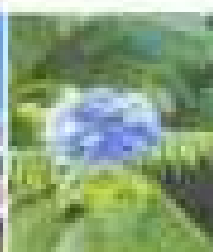
Gliricidia sepium



Grevillea robusta

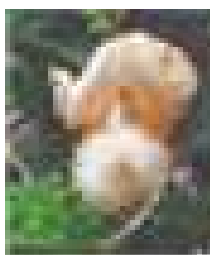


Jacaranda filicifolia

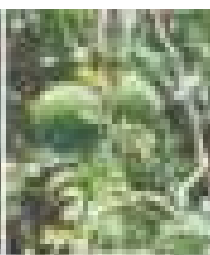


Jacaranda  
mimosifolia

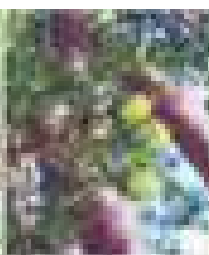




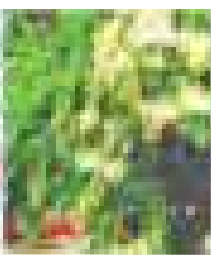
*Adansonia digitata*



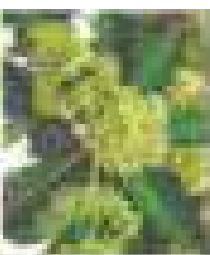
*Aegle marmelos*



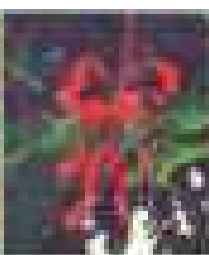
*Agethis robusta*



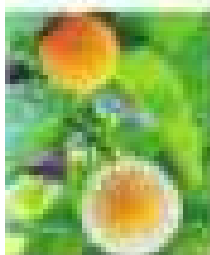
*Albizzia lebbek*



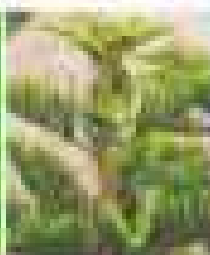
*Alstonia scholaris*



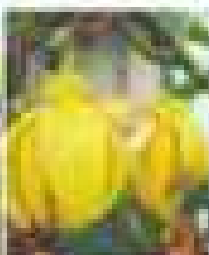
*Amherstia nobilis*



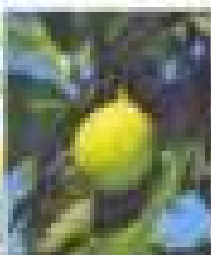
*Anthocephalus indicus Kadamba*



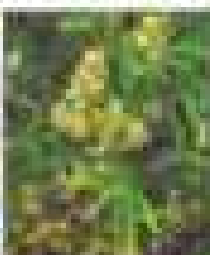
*Araucaria cookii*



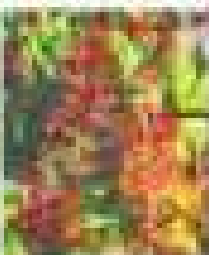
*Artabotrys*



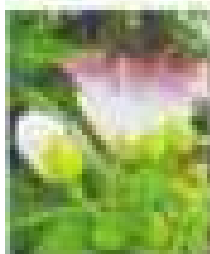
*Artocarpus altilis*



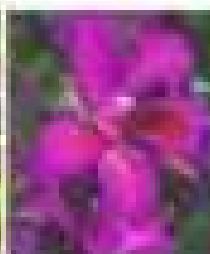
*Azadirachta indica*



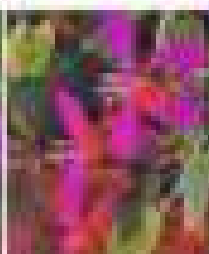
*Barringtonia acutangula*



*Barringtonia asiatica*



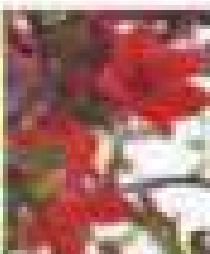
*Bauhinia blakeana*



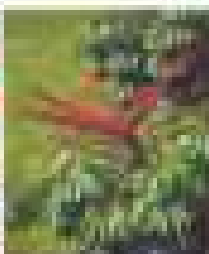
*Bauhinia purpurea*



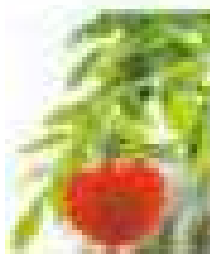
*Bixa orellana*



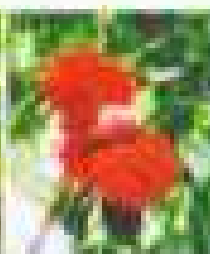
*Bombax ceiba*



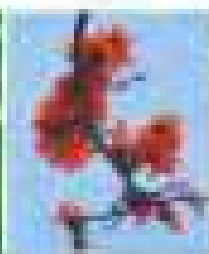
*Brassaia actinophylla*



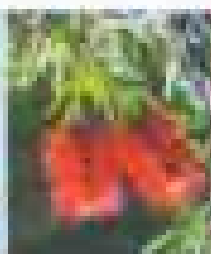
*Brownea ariza*



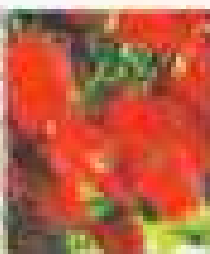
*Brownea coccinea*



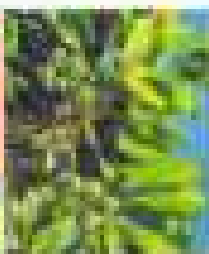
*Butea monosperma*



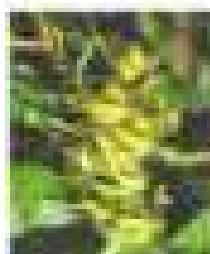
*Callistemon citrinus*



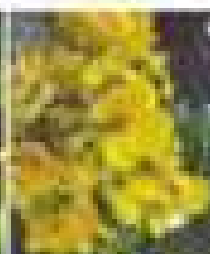
*Callistemon pollandi*



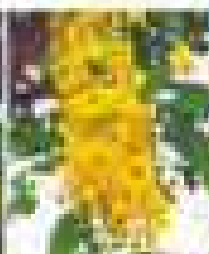
*Calophyllum inophyllum*



*Cananga odorata*



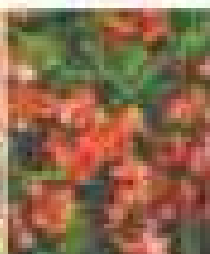
*Cassia excelsa*



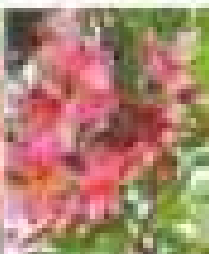
*Cassia fistula*



*Cassia javanica*



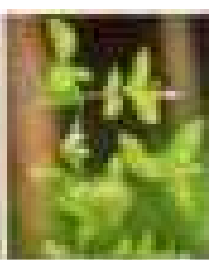
*Cassia marginata*



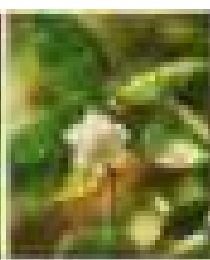
*Cassia nodosa*



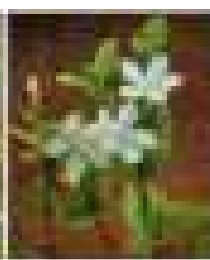
Jasminuim  
Compact disc



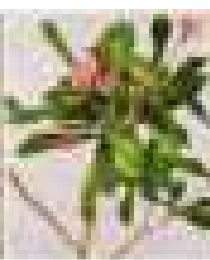
Jasminuim



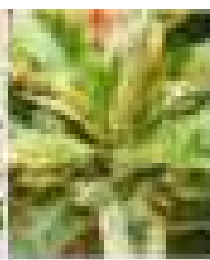
Jasmine



Jasmine



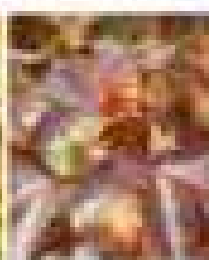
Jatropha  
panduraefolia



Jatropha  
panduraefolia  
varigata



Jatropha  
panduraefolia  
varigata



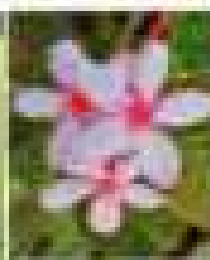
Jatropha  
panduraefolia



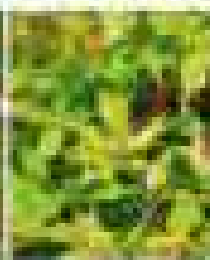
Jatropha  
panduraefolia  
varigata



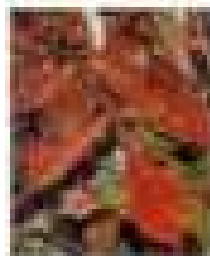
Kopsia  
singapurensis



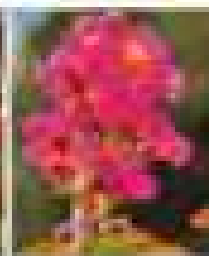
Kopsia



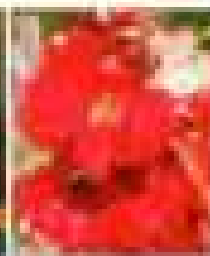
Leea coccinea  
green



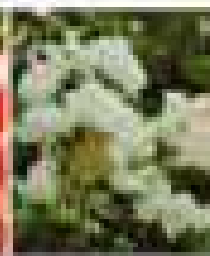
Leea coccinea  
rubra



Lagerstroemia  
indic Pink



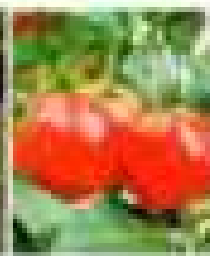
Lagerstroemia  
indica Red



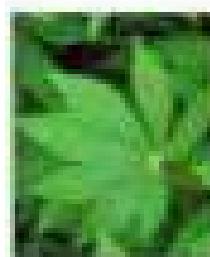
Lagerstroemia  
indica White



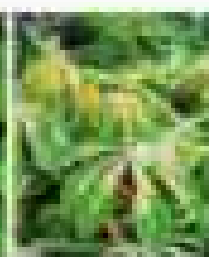
Malpighia  
coccigera



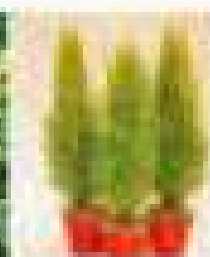
Malpighia glabra  
West indian cherry



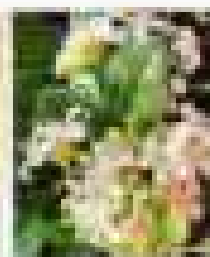
Manihot Esculenta  
Green



Manihot Eseulenta  
varigeta



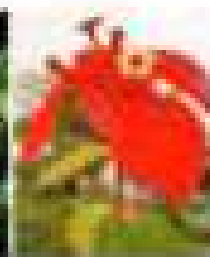
Melaleuca golden  
crest



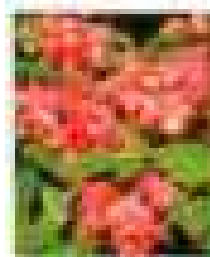
Murraya exotica



Murraya paniculata



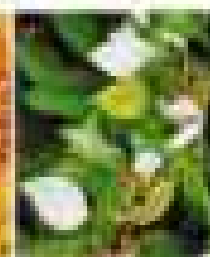
Mussaenda  
erythrophylla  
Scarlet



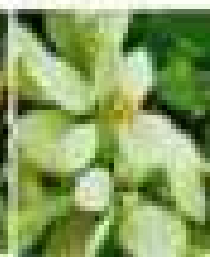
Mussaenda  
erythrophylla rosea



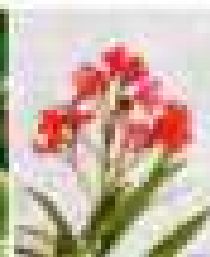
Mussaenda  
Frondosa mustard



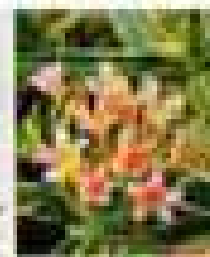
Mussaenda  
Frondosa



Mussaenda  
Philippica aurorae

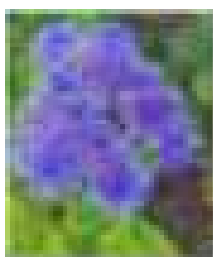


Nerieum olender

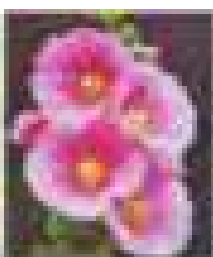


Nerieum olender  
variegata

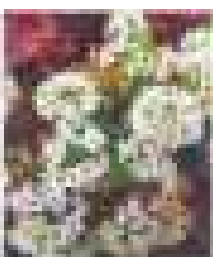




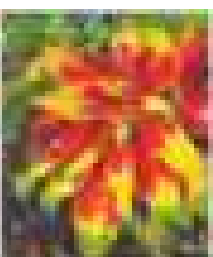
Ageratum  
houstonianum floss  
flower



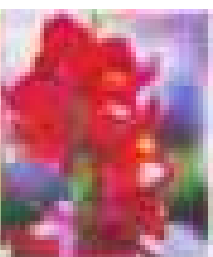
Althaea rosea  
Holly hock



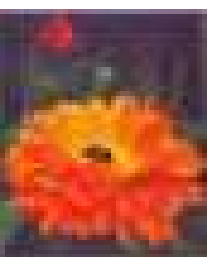
Alyssum Madwo



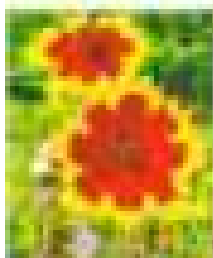
Amaranthus  
tricolor Joseph's  
cost



Antirrhenum majus  
Snap dragon



Calendula  
Calendula flower



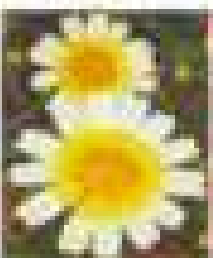
Calliposis Corepis



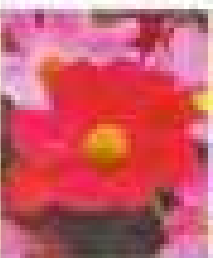
Celosia Cocks  
comb



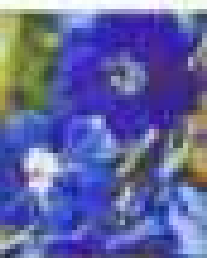
Centaurea cyanus  
Cornflower



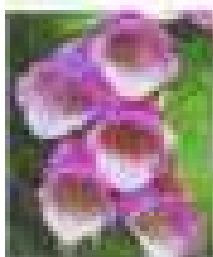
Chrysanthemum  
coronarium Annual  
Chrysanthemum



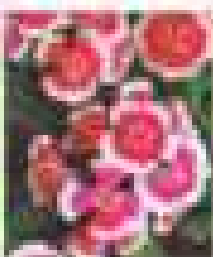
Cosmos Mexican  
aster



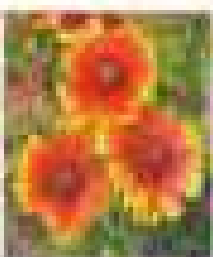
Delphinium spp  
Larkspur



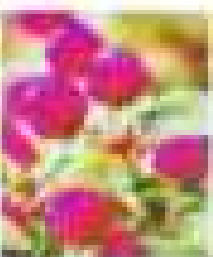
Digitalis purpurea  
Fox glove



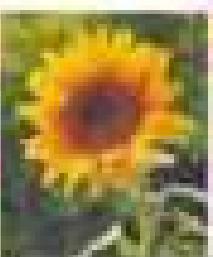
Dianthus  
caryophyllus Fairy  
queen



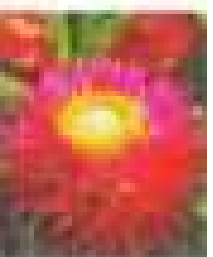
Gaillardia pulchella  
Blanket flower



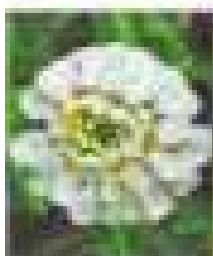
Gomphrena  
globosa Bachelor  
button



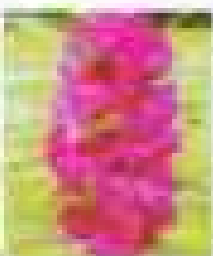
Helianthus  
annuus Sunflower  
ornamental



Helianthus annuus  
Straw/paper flower



Iberis sempervirens  
Candytuft



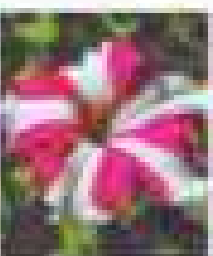
Impatiens balsa  
balsam



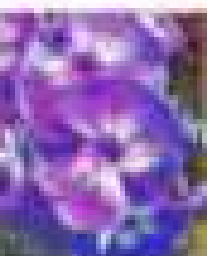
Flax



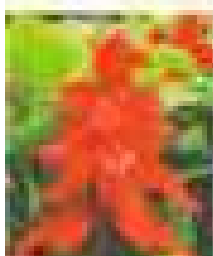
Pansy



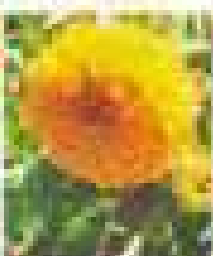
Petunia grandiflora  
Picoti variety



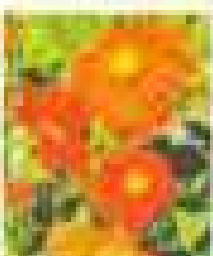
Phlox drummondii  
Phlox



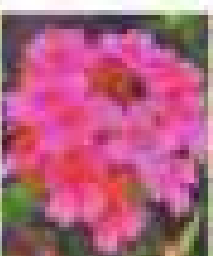
Salvia splendens  
Salvia red



Tagetes sp  
marigold



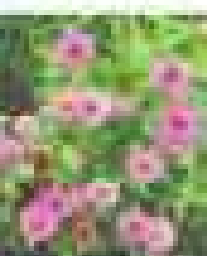
Torenia sp  
Torenia



Verbena Flower  
Verbena

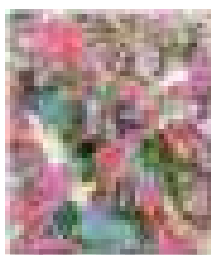


Zinnia elegans red  
Youth and old



Zinnia linerals  
Perennial zennia

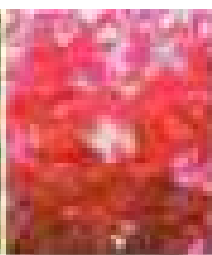




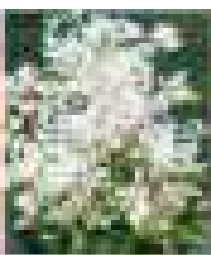
Alternanthera  
amoena



Alternanthera  
bettzickiana  
varigeta



Alternanthera  
bettzickiana



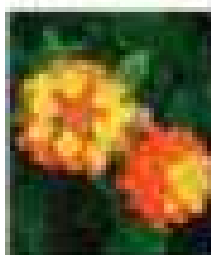
Alternanthera  
snowball



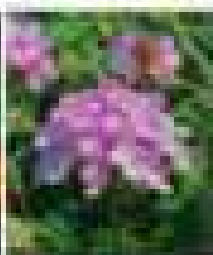
Asystasia gangetica



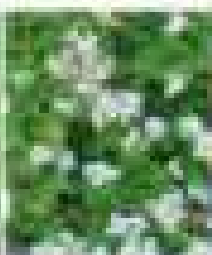
Lantana camara red



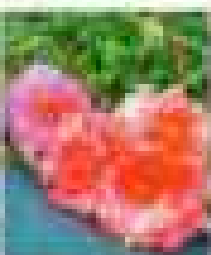
Lantana camara red



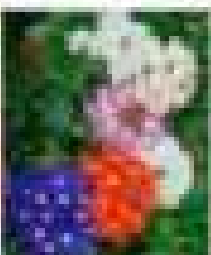
Lantana sellowiana  
purple



Lantana sellowiana  
white



Porchulaca



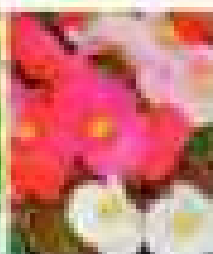
Verbina



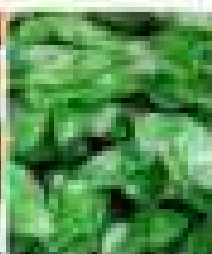
Wedelia trilobata



Aspidistra elatior



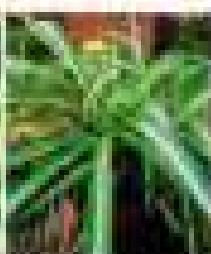
Begonia  
semperflorens



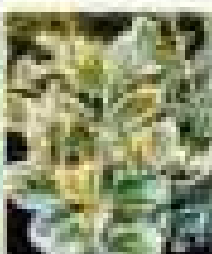
Callisia Repens



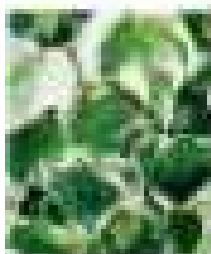
Chlorophytum  
comosum milky  
way



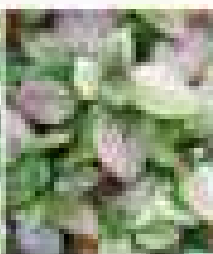
Chlorophytum  
comosum  
vittatum



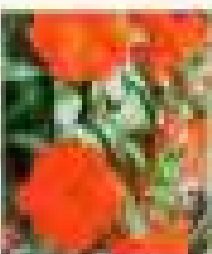
Euonymus  
japonicus  
albomarginatus



Hedera canariensis



Hemigraphis  
colorata



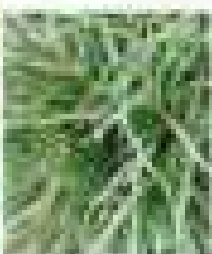
Impatiens  
linearifolia



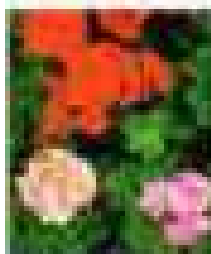
Liriope muscari  
variegata



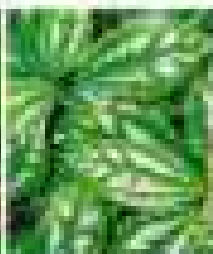
Liriope platyphylla



Liriope platyphylla



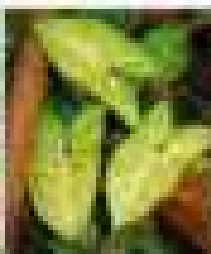
Pelargonium  
hortorum



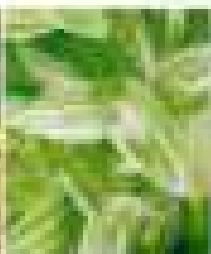
Pilea cadierei



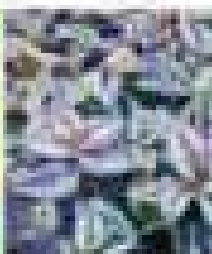
Rhoco spathacea  
vittata



Syngonium  
podophyllum white  
butterfly



Tradescantia  
albiflora albobittata



Zebrina pendula



*Aechmea chantinii*

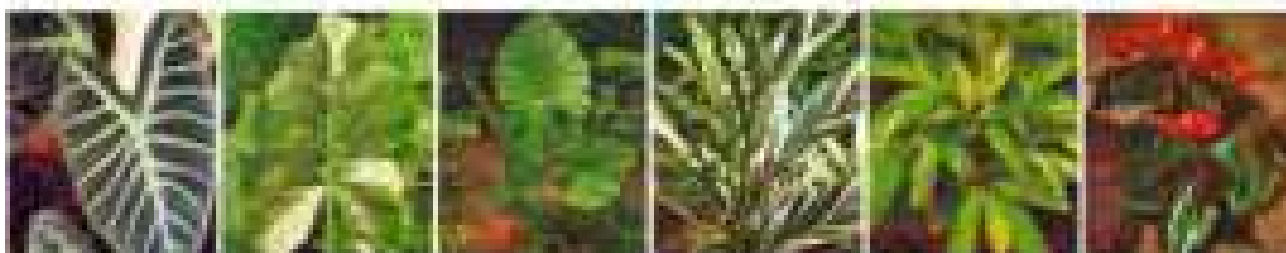
*Aglaonema colour*

*Aglaonema commutatum elegans*

*Aglaonema commutatum maculatum*

*Aglaonema commutatum*

*Alocasia amazonica*



*Alocasia korthalsii*

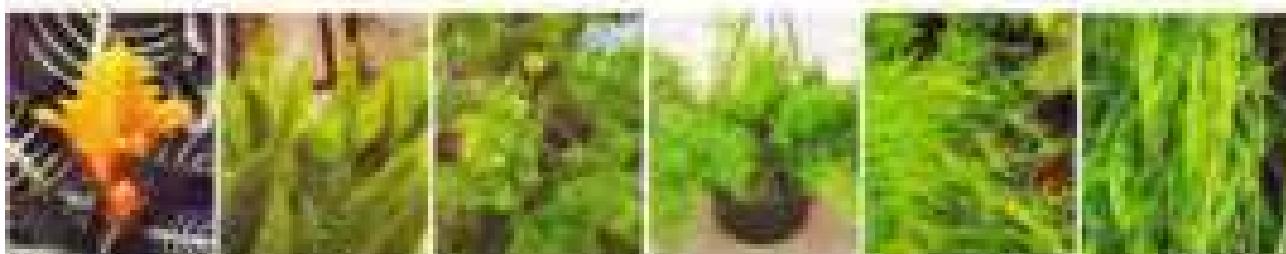
*Alocasia macrorrhiza variegata*

*Alocasia macrorrhiza*

*Alpinia sanderae*

*Alpinia zerumbet*

*Anthurium andraeanum*



*Aphelandra squarrosa*

*Asparagus densiflorus myers*

*Asparagus densiflorus myriocladus*

*Asparagus densiflorus sprengeri*

*Asparagus plumosus*

*Asparagus setaceus pyramidalis*



*Aspidistra elatior 'variegata'*

*Begonia rex*

*Begonia semperflorens red pearl*

*Bromelia balansae*

*Caladium hortulanum canbidum*

*Caladium hortulanum attala*



*Calathea insignis*

*Calathea rufibarba*

*Codiaeum variegatum gold dust*

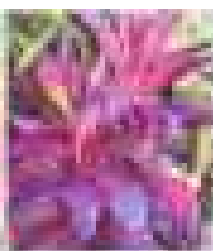
*Codiaeum variegatum mammy*

*Codiaeum variegatum petra*

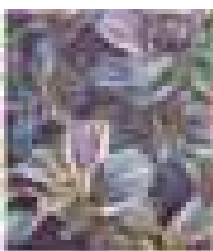
*Codiaeum variegatum*



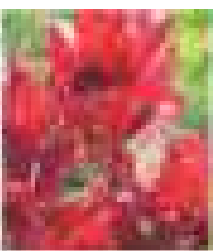
Coleus



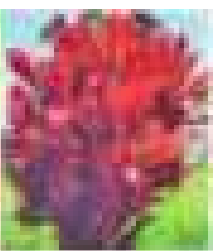
Cordylone  
terminalis



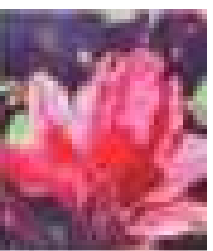
Cordylone  
terminalis 'miss  
andrea'



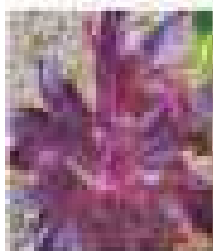
Cordylone  
terminalis red ti



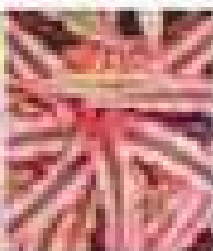
Cordylone  
terminalis rubra



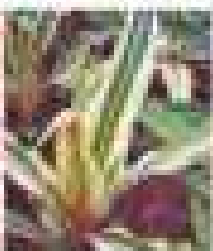
Cordylone  
terminalis va baby  
doll



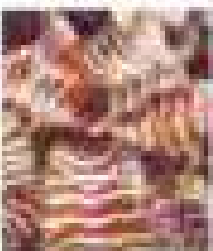
Cordylone terminalis  
vs fruticosa



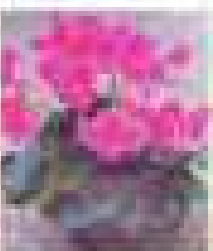
Cryptanthus  
bivittatus



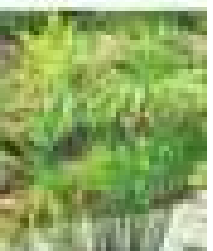
Cryptanthus  
bromeliades



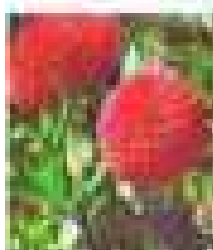
Cryptanthus  
zonatus



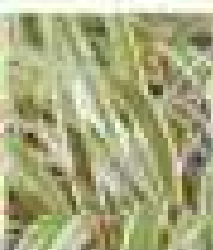
Cyclame persicum



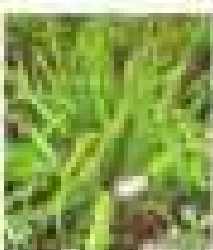
Cyclamen persicum



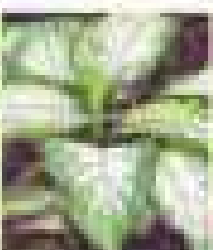
Dahlia



Dianella tasmanica  
variegata



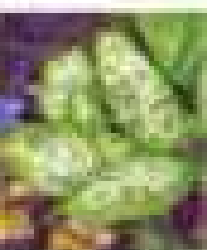
Dianella tasmanica



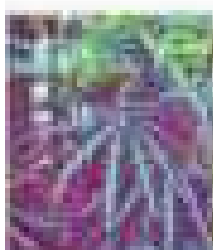
Dieffenbachia  
amoena



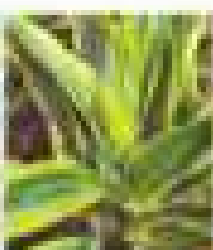
Dieffenbachia  
bausei



Dieffenbachia  
maculata



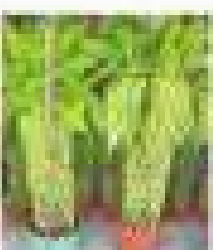
Dizygotheca  
elegantissima



Dracaena fragrans  
massangeana



Dracaena marginata



Dracaena  
sanderiana gold



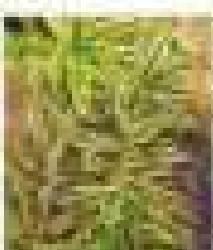
Dracaena  
sanderiana green



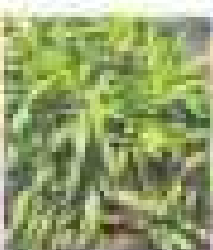
Dracaena  
sanderiana white



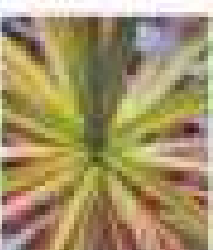
Dracaena  
sanderiana



Dracaena song of  
india



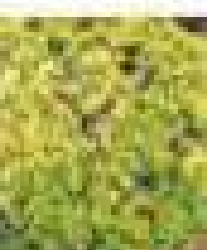
Dracaena song of  
jamaica



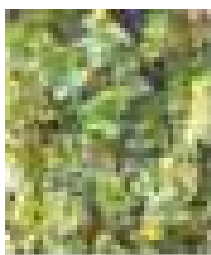
Dracaena tricolour



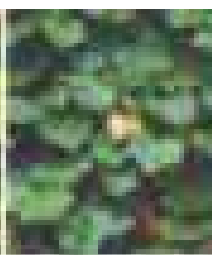
Epipremnum  
pinnatum



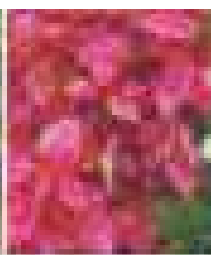
Euonymus japonicus  
yellow queen



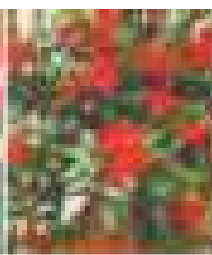
Hedera canariensis  
variegata



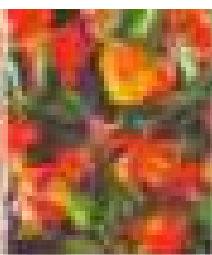
Hedera canariensis



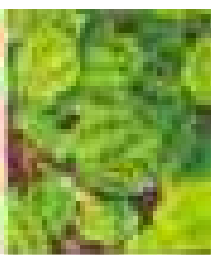
Hypoestes  
sanguinolenta



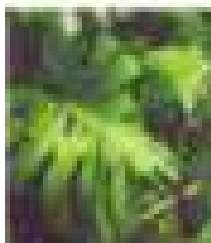
Impatiens  
linearfolia



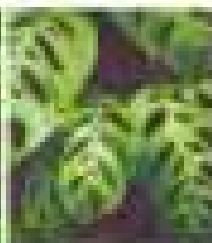
Impatiens  
walleriana



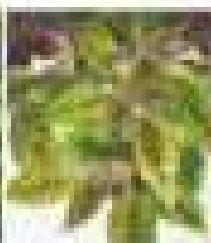
Maranta leuconeura



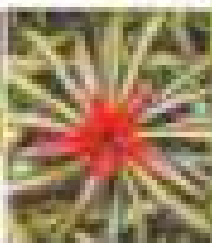
Monstera deliciosa



Monstera obliqua



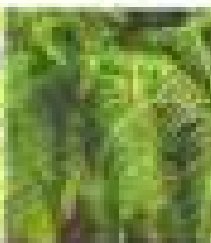
Nautilocalyx  
frogetii



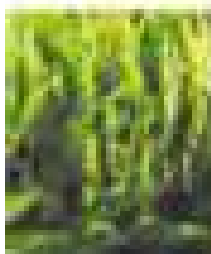
Neoregelia  
carolinae



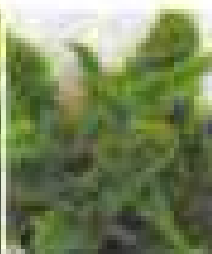
Nephrolepis  
biserrata furcans



Nephrolepis  
biserrata 'macho'



Nephrolepis  
cordifolia



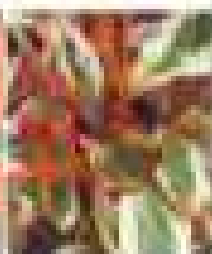
Nephrolepis  
exaltata



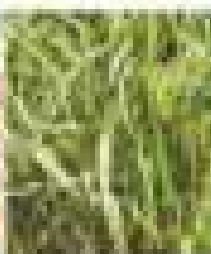
Nephrolepis green  
lady



Pelargonium  
hortorum



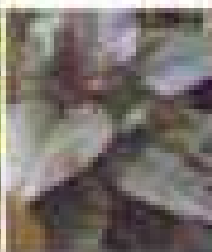
Peperomia  
clusiifolia variegata



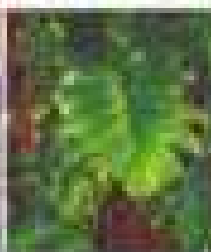
Phalaris  
arundinacea  
variegata



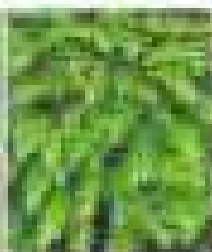
Philodendron  
bipinnatifidum



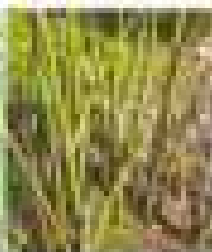
Philodendron  
congo



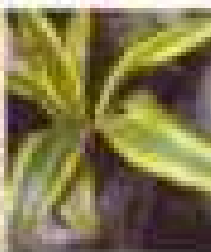
Philodendron  
lacerum



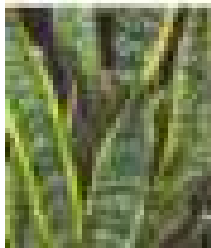
Philodendron  
xanadu



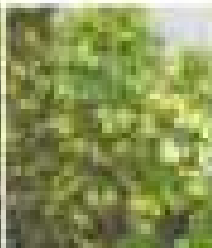
Sansevieria  
cylindrica



Sansevieria  
guineensis



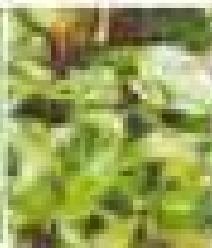
Sansevieria  
trifasciata



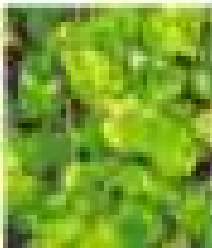
Schefflera  
arboricola variegata



Schefflera  
arboricola



Scindapsus aureus  
marble queen

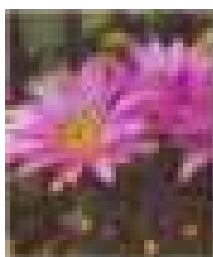


Scindapsus aureus

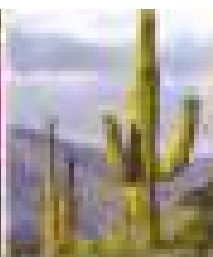


Spathiphyllum  
wallisii

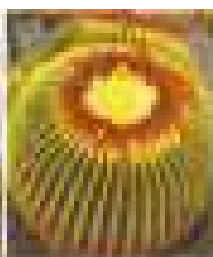




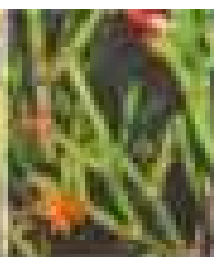
*Acanthocalycium violaceum*



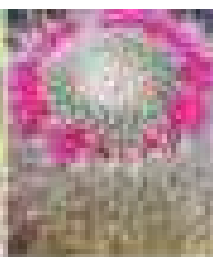
*Carnegiea gigantea*



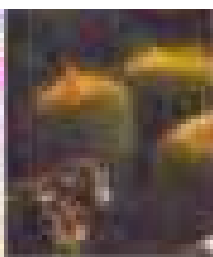
*Echinocactus grusonii*



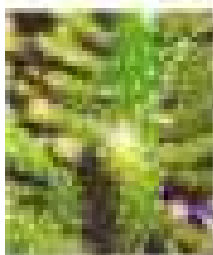
*Hatiora salicornioides*



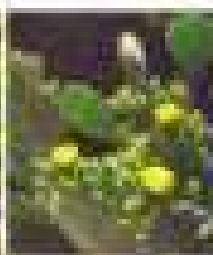
*Mammillaria hahniana*



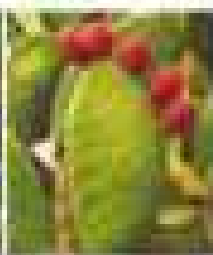
*Notocactus leninghausii*



*Opuntia cylindrica*



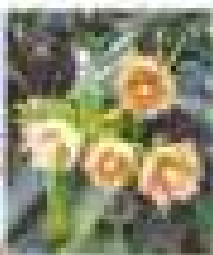
*Opuntia falcata*



*Opuntia ficus indica*



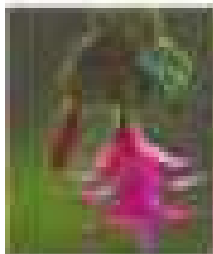
*Pachycereus pringlei*



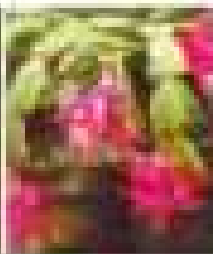
*Pereskia aculeata*



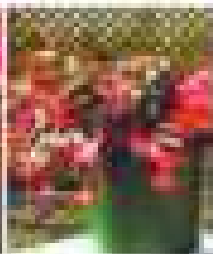
*Pereskia bleo*



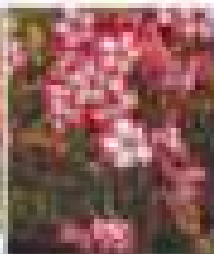
*Schlumbergera bridgesii*



*Schlumbergera russelliana*



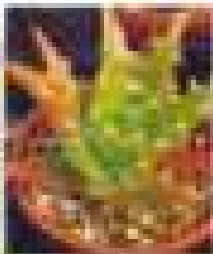
*Zygocactus truncatus*



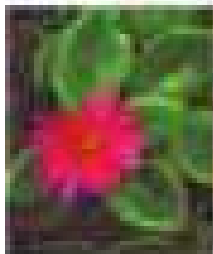
*Adenium obesum*



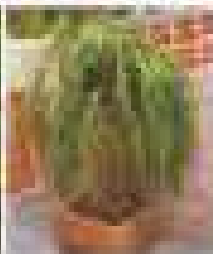
*Agave angustifolia*



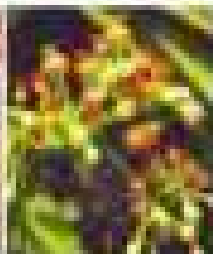
*Aloe abyssinica*



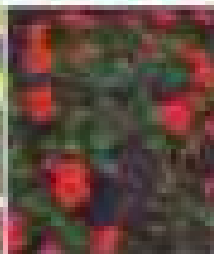
*Aptenia cordifolia*



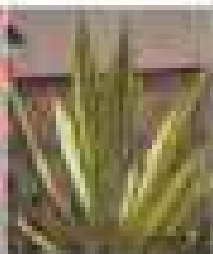
*Beaucarnea recurvata*



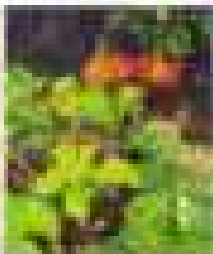
*Butea monosperma*



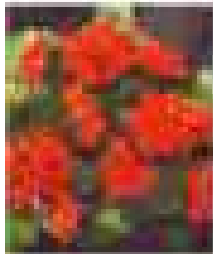
*Cissus quadrangularis*



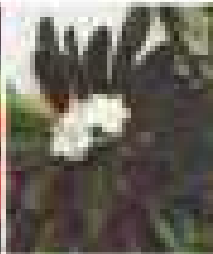
*Euphorbia milii*



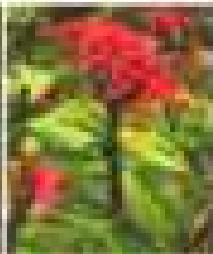
*Furcraea gigantea*



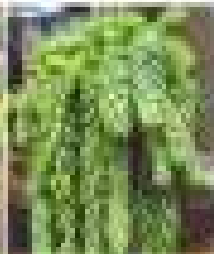
*Kalanchoe blossfeldiana*



*Pachypodium lamerei*



*Pedilanthus tithymaloides*



*Sedum morganianum*



*Senecio radicans*



*Yucca aloifoliana*



KLN Yadav Park Erragadda



Chacha Nehru Park, Masab Tank



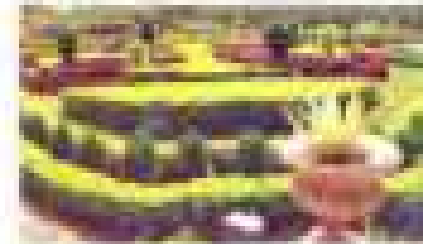
Japanese Garden, Jubilee Hills



Clock Tower Park, Secunderabad



Lotus Pond, Jubilee Hills



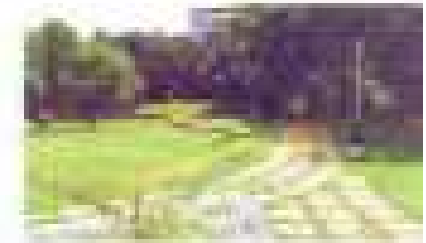
Krishna Kant Park, Yousufguda



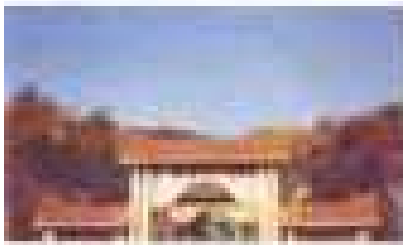
Krishna Kant Park, Yousufguda



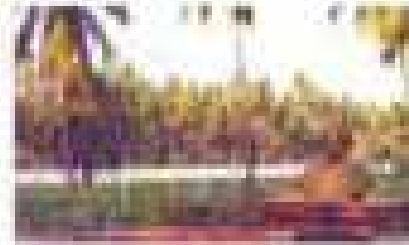
Krishna Kant Park, Yousufguda



Krishna Kant Park, Yousufguda



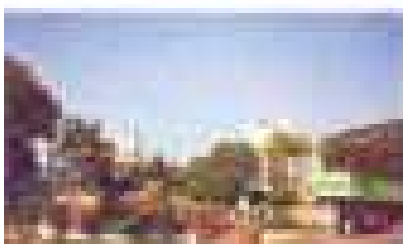
Indira Park, Tankbund



Indira Park, Tankbund



Dr. Marri Channareddy Memorial Rock Garden, Indira Park



Road Island near G.H.M.C. Head Office



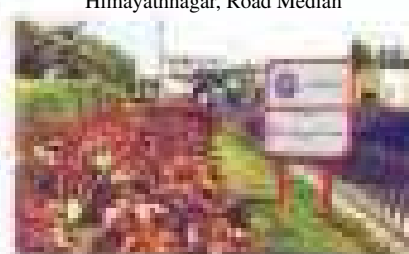
Tirumala Tirupathi Devasthanam Temple, Himayathnagar, Road Median



Herbal Garden, Ashwini Layout, Jubilee Hills



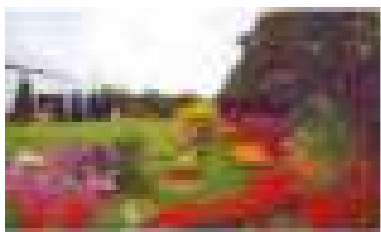
Colony Parks



Road Median at Gachibowli



Hitex Road Median, Hi-tech City



Golconda Textiles, Manneguda, Vikarabad



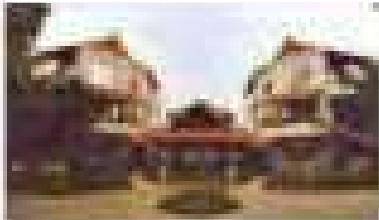
Green Valley Farm, Yenkapally Village, Vikarabad



Dr. V. Venkat, Villa No. 446, Pragati Green Villas, Proddutoor, Shankerpally



Pragati Green Meadows and Resorts Ltd.



Pragati Green Meadows and Resorts Ltd.



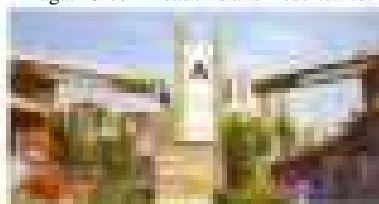
Pragati Green Meadows and Resorts Ltd.



Aparna Kanapy Tulip Apts, Owners Association



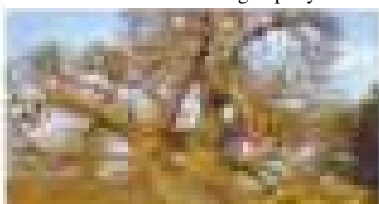
Trendset Winz Owners Welfare, Association Serlingampally



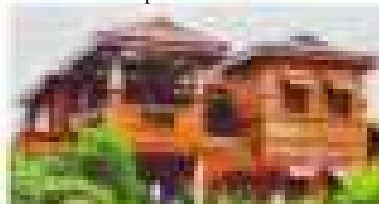
Aparna Sarovar



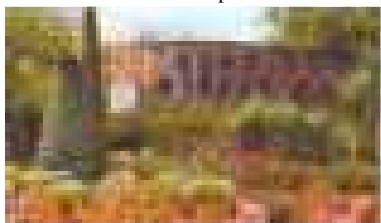
Aalankrita Resorts & SPA, Thumkunta, Shameerpet



Adansonia Digitata (Boabab Tree) 500 Years Old Tree near Golconda Fort



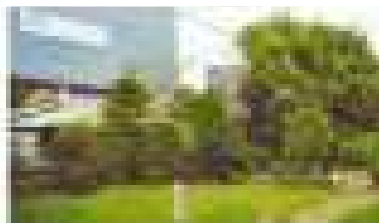
Aalankrita Resorts & SPA, Thumkunta, Shameerpet



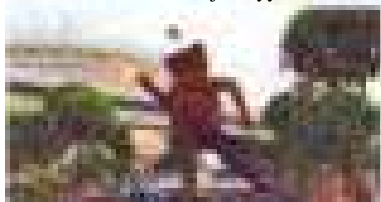
Rock Garden, Sanjeevayya Park



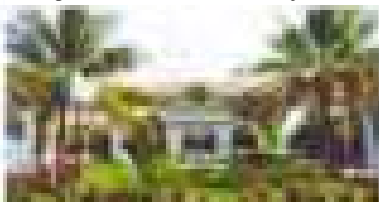
Basava Tarakam Indo-American Cancer Hospital Research Institute Banjara Hills



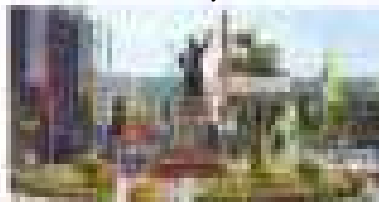
AFTON Chemicals Hyderabad Pvt. Ltd.



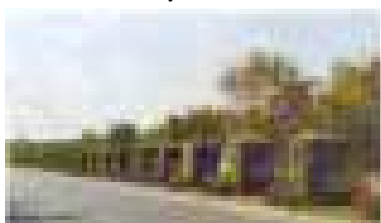
Potted Plants on Road Island near Cyber City Towers



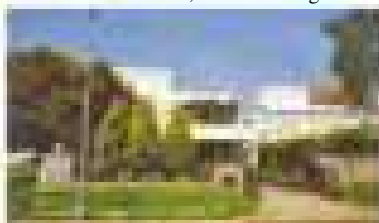
Lahari Resorts, Bhanur Village



Road Island at Minister Road Junction



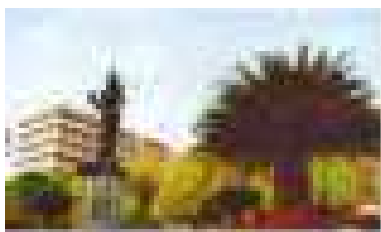
Nagpur National Highway Road Median



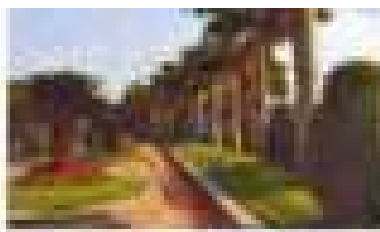
Mr. K Bhoopal Reddy, Villa No.-15, Micasa Stering Kompally



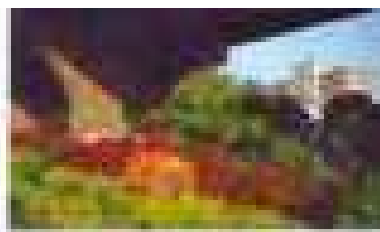
Raheja Mindspace Hi-tech City



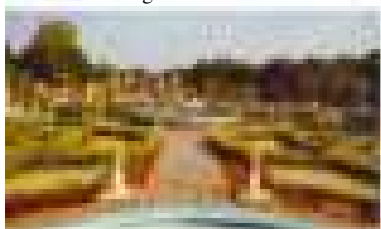
Telugu Thalli Island



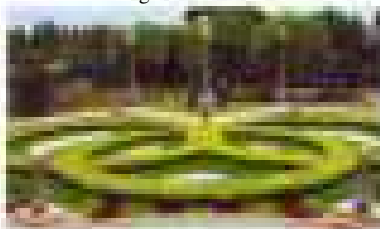
Telugu Thalli Island



Telugu Thalli Flyover



NTR Gardens



Kohinoor Garden, NTR Gardens



NTR Gardens



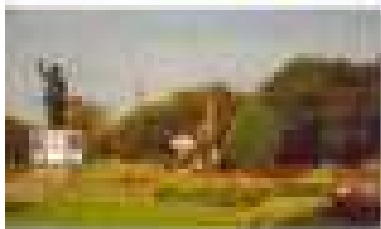
Japanese Garden, NTR Gardens



NTR Gardens



NTR Memorial Garden



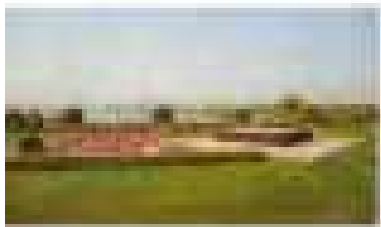
Indira Gandhi Island, Necklace Road



Road Median at Kothaguda Junction



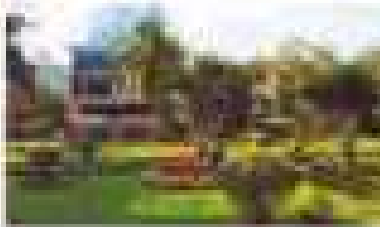
P.V. Gyana Bhoomi, Necklace Road



P.V. Gyana Bhoomi, Necklace Road



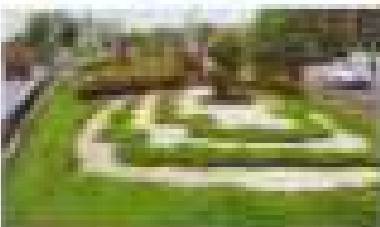
Lumbini Park



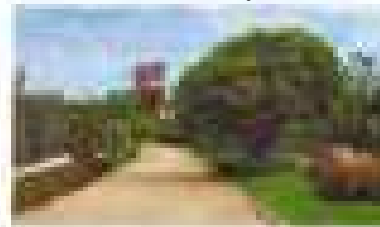
Buddha Purnima, Project Office



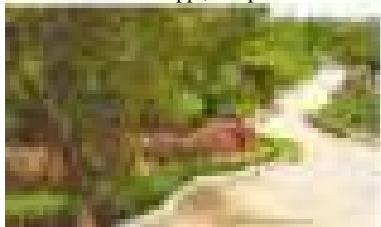
Road Island Opp., Shilparamum



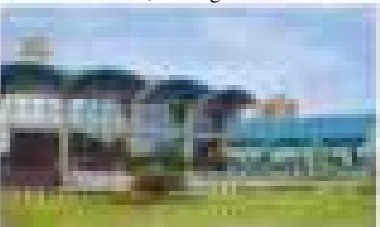
Zen Garden, Kothaguda Junction



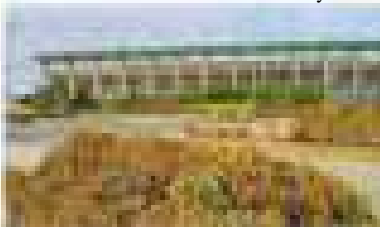
KBR National Park Walkway



KBR National Park Walkway



Railway Station, Necklace Road



Garchibowli Stadium



# CHAPTER - 9

## PALMS

Palms require very small ground space for growth. They can either have clear, round, upright trunk with a majestic ever green crown or clustering habit. Their root system does not require large surface area or depth in the ground. They are elegant to look at and well known for their symmetrical growth which makes an avenue look beautiful.

They remain evergreen and do not litter the ground with leaves. Therefore, palms are more suitable and ideal for narrow passages and narrow strips of land, boundaries and near the building.

**Note:** Tips for planting can be adopted as in trees.

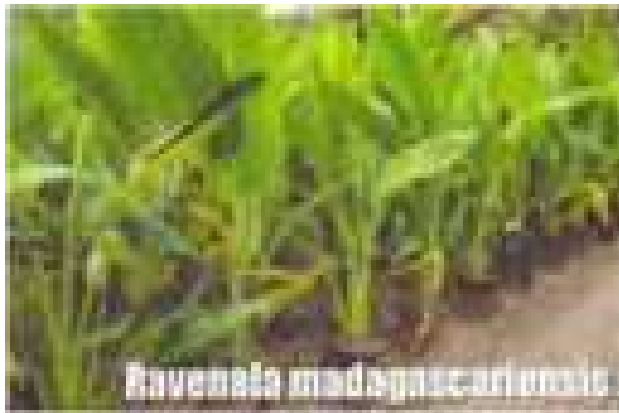
### PALMS : 1

S. No.	Plant Name	S. No.	Plant Name
1.	Adonidia merrillii green	16.	Borassus aethiopum (African palmyra palm)
2.	Adonidia merrillii golden (Christmas palm)	17.	Borassus flabellifer (Palmyra palm)
3.	Archontophoenix alexandrae (King palm)	18.	Brahea armata (Blue hesper palm)
4.	A. cunninghamiana (Piccabean palm)	19.	Butia capitata (Wine palm)
5.	Archontophoenix myolensis (Myola palm)	20.	Butia paraguayensis
6.	Areca catechu cv.alba	21.	Caryota mitis (Clustering fish tail palm)
7.	Areca catechu dwarf (Dwarf betel nut palm)	22.	Caryota urens (Fish tail palm)
8.	Areca catechu (Betel nut palm)	23.	Chameadorea costaricana (Pacaya palm)
9.	Areca macrocalyx (Kawiwi palm)	24.	Chamaedorea elegans (Parlour palm)
10.	Areca triandra (Triandra palm)	25.	Chamaerops humilis (European fan palm)
11.	Areca vestiaria (Langlois palm)	26.	Coccothrinax argenata (Silver thatch palm)
12.	Arenga obtusifolia (Langkap palm)	27.	Cocos nucifera (East coast tall)
13.	Arenga pinnata (Black sugar palm)	28.	Cocos nucifera (Ceylon orange)
14.	Arenga tremula (Dwarf sugar palm)	29.	Cocos nucifera dwarf (Dwarf coconut)
15.	Bismarckia nobilis (Bismarck palm)	30.	Cocos nucifera (Malayan golden yellow)

## PALMS : 2

31.	Copernicia hospita (Cuban wax palm)	46.	Livistona chinensis (Chinese fan palm)
32.	Cyrtosrtachys renda (Sealing wax palm/ lipstick)	47.	Livistona rotundifolia (Foot stool palm)
33.	Dypsis decaryi (Triangle palm)	48.	Nypa fruticans (Mangrove palm)
34.	Dypsis leptocheilos (Red neck palm)	49.	Phoenix dactylifera (Date palm)
35.	Dypsis lutescens (Golden cane palm)	50.	Phoenix roebelenii(Pygmy date palm)
36.	Elaeis guineensis (African oil palm)	51.	Phoenix sylvestris (Indian date palm)
37.	Euterpe oleracea (Assai palm)	52.	Pritchardia pacifica (Fiji fan palm)
38.	Howea forsteriana	53.	Pritchardia thurstonii (Thurston palm)
39.	Hyophorbe lagenicaulis (Champagne palm)	54.	Pseudophoenix ekmanii (Cacheo palm)
40.	Hyophorbe verschaffeltii (Spindle palm)	55.	Ravenea rivularis (Majestic palm)
41.	Latania loddigesii(Blue latan palm)	56.	Rhapis excelsa (Lady palm)
42.	Latania lontaroides (Red latan palm)	57.	Rhapis humilis (Slender lady palm)
43.	Latania verschaffeltii (Yellow latan palm)	58.	Roystonea regia (Cuban royal palm)
44.	Licuala grandis( Licuala palm)	59.	Washingtonia filifera (Petticoat palm/ desert fan palm)
45.	Licuala peltata (Giant fan palm)	60.	Wodyetia bifurcata (Foxtailpalm)







*Cycas oleosa*



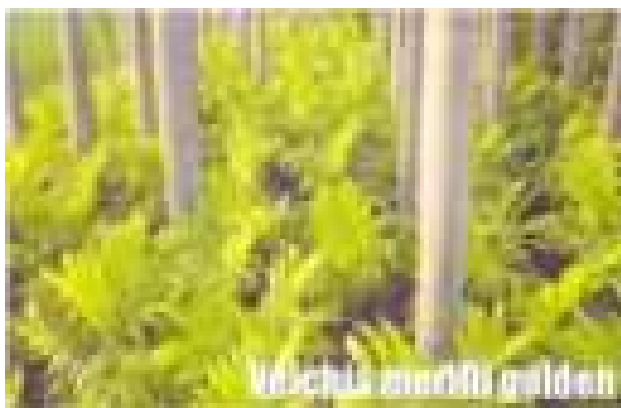
*Lobelia telekii (described)*



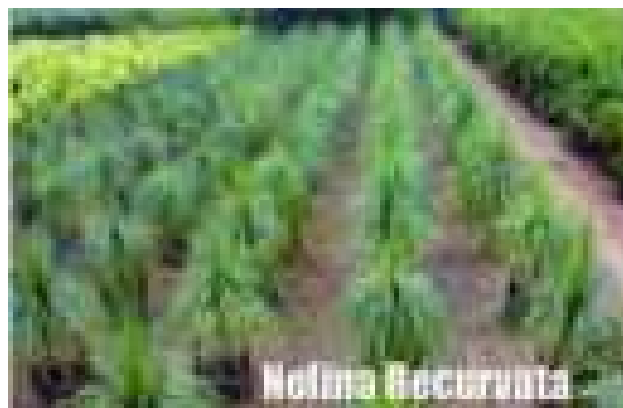
*Cycas circinalis*



*Navea revoluta*



*Navea revoluta*



*Navea revoluta*

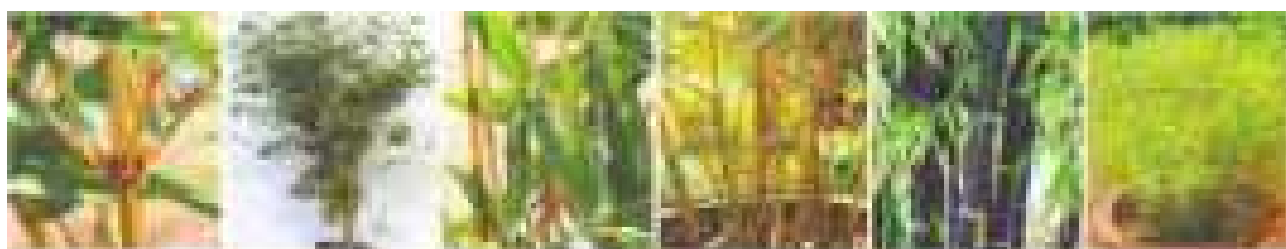


*Washingtonia filifera*



*Symplocos laevis*





*Bambusa vulgaris vittata* (Golden bamboo)

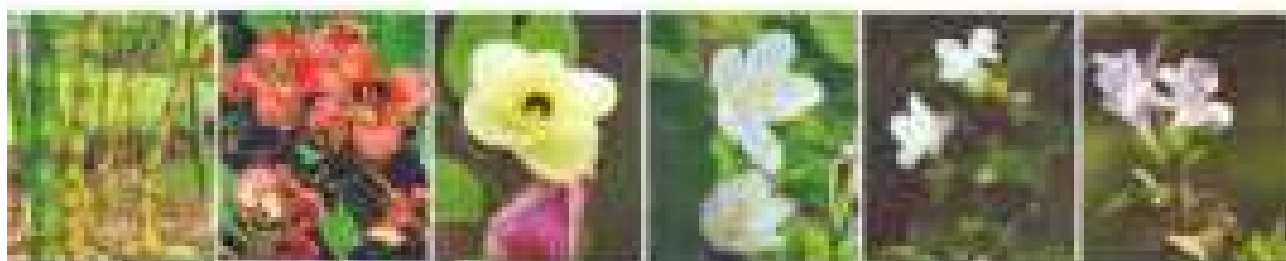
*Bambusa multiplex* (Hedge bamboo)

Bamboo golden

*Bambusa vulgaris wamin Strita* (Buddha belly variegated)

*Bambusa vulgaris* Back bamboo

*Bambusa* Bamboo grass



*Bambusa ventricosa* (Buddha Belly)

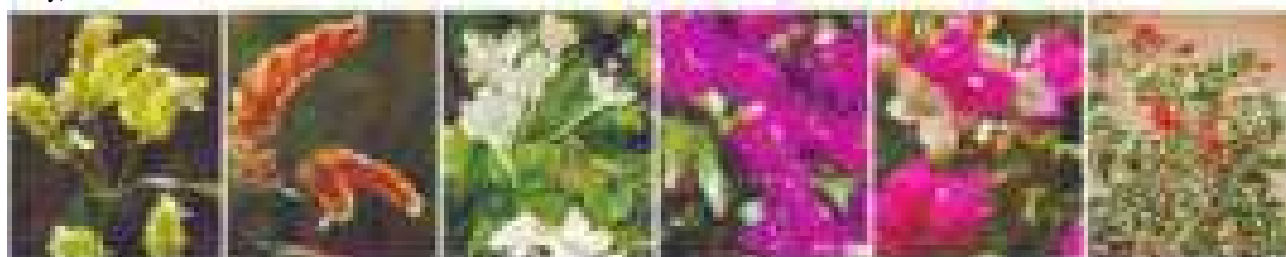
*Bauhinia galpini*

*Bauhinia tomentosa*

*Bauhinia acuminata*

*Barleria cristata* Candida (White)

*Barleria cristata* Candida (Pink)



*Beloperona gutatta* (Yellow)

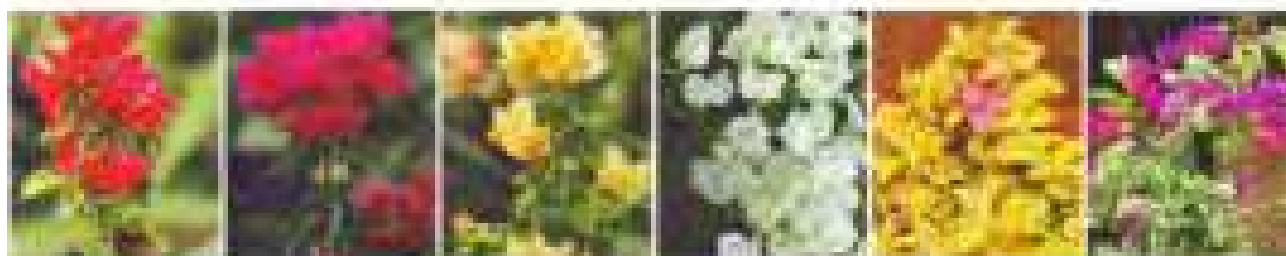
*Beloperona gutatta* (Red)

*Brunfelsia americana*

*Bougainvillea glabra*

*Bougainvillea thimma*

*Bougainvillea* Dr. Rao



*Bougainvillea*

*Bougainvillea* rosevelt delight

*Bougainvillea* lady mary baring

*Bougainvillea* subra white

*Bougainvillea* gold capalio

*Bougainvillea glabra* variegated



*Bougainvillea* Chitra

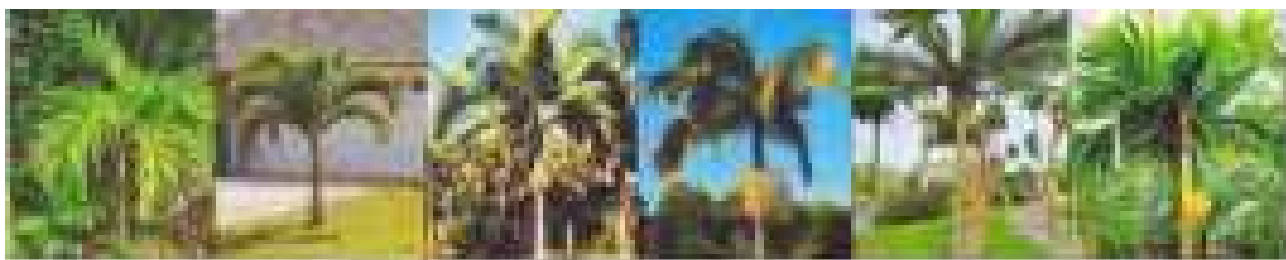
*Bougainvillea* mahara Coopacta red

*Buxus*

*Beaucarnea recurvata* Nolina variegated

*Beaucarnea recurvata* Nolina

*Cannas* variegated



Adonidia merrillii  
Golden viregia  
palm

Adonidia merrillii  
Green vitchia palm

Archontophoenix  
Alexandrac (king  
palm)

Archonotophoenix  
Cunninghamiana  
piccabeen palm

Archontophoenix  
Myolensis (myola  
palm)

Areca catechu  
cv.alba Betel nut  
palm



Areca catechu  
Dwarf betel nut  
palm

Areca catechu  
Betel nut palm

Areca macrocalyx  
Kawiwi palm

Areca triandra  
Triandra palm

Areca vestiaria  
Langlois palm

Arenga obtusifolia  
Lang kap palm



Arenga pinnata  
Black sugar palm

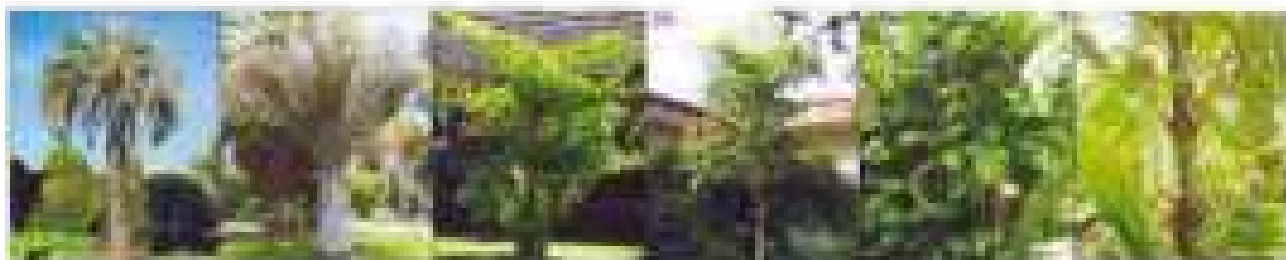
Arenga tremula  
Dwarf sugar palm

Bismarckia nobilis  
Bismarck palm

Borassus  
aethiopum African  
palmyra palm

Borassus flabellifer  
Palmyra palm

Brahea armata  
Blue hesper palm



Butia capitata  
Wine palm

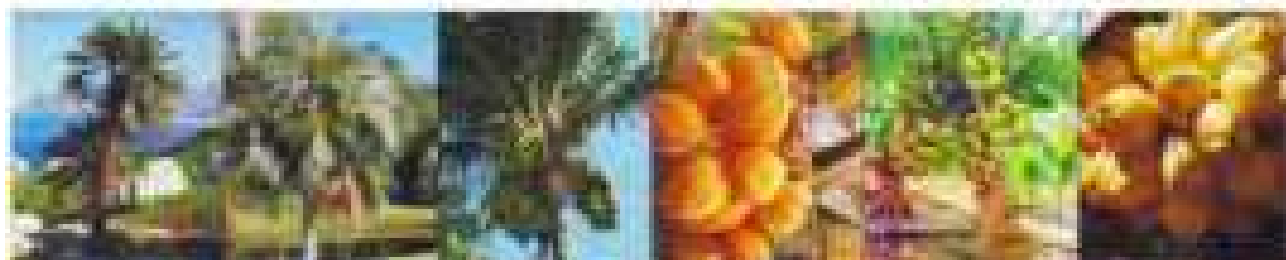
Butia  
paraguayensis

Caryota mitis  
Clustering fish tail  
palm

Caryota urens  
Giant fish tail palm

Chamaedorea  
costaricana Pacaya  
palm

Chamaedorea elegans  
Parlour palm



Chamaerops  
humilis European  
fan palm

Coccothrinax  
argentata Silver  
thatch palm

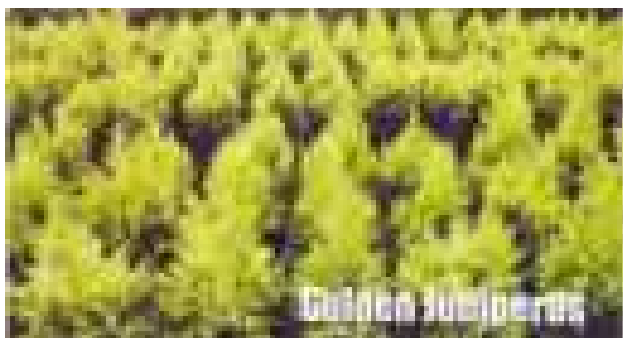
Cocos nucifera  
Coconut (east coast  
tall)

Cocos nucifera  
Coconut (ceylon  
orange)

Cocos nucifera  
dwarf Coconut

Cocos nucifera  
Coconut malayan  
golden yellow







# CHAPTER - 10

## SHRUBS

Shrubs are usually woody or semi-woody perennial plants with branches arising from the base of the plants and growing up to heights of 1-4 meters. Most of the shrubs are hardy and grow in all types of soil.

Shrubs can be classified into three groups according to the requirement of sunlight for growth and flowering.

- Plants that show normal growth and flowering in full sun,
- Grow only in partial shade,
- Can grow well both in sunny and semi-shady conditions.

Shrubs are usually grown for their showy flowers or beautiful foliage. Pruning of plants helps to get bushy growth. The practice of clipping shrubs into ornamental shapes, known as topiary, has been in vogue for centuries. Flowering shrubs need sun light and foliage shrubs grow well under partial sunlight and shade. Location can be decided based on the height and canopy of the plant.

### Tips for Planting & Maintaining of Shrubs:

- Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
- Maintain 2' to 6' distance between pits, depending on the growth potential of the plant.
- Fill the pits with dug out soil; 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ Kg super phosphate and 100 gms of folidol dust.
- Plant the selected shrubs or creepers, water well, stake the plant next day. Regular watering is required thereafter.
- Run and train the shrubs and creepers for controlling plant size, shape and giving a bushy growth.
- Take up weeding and mulching in the basin on a regular basis.
- Regular care is required to protect the plants against pests and diseases.

### Common Shrubs:

Drought Resistant				Water Loving			
1.	Allamanda	11.	Jasmine	1.	Dambeya	1.	Crotons
2.	Bougainvillea	12.	Justicea	2.	Gardenia	2.	Coleus
3.	Caesalpineia	13.	Lantana	3.	Murraya exotica	3.	Phyllanthus
4.	Cassias	14.	Lagerstromia	4.	Mussaenda	4.	Eranthemums
5.	Cestrum	15.	Plumeria	5.	Plumbago	5.	Acalyphas
6.	Euphorbia	16.	Tecomas	6.	Ixora	6.	Aralias
7.	Hamelia	17.	Thevetia	7.	Lemonia		
8.	Hibiscus			8.	Pentas		
9.	Holmskoildea			9.	Bottle Brush		
10.	Roses			10.	Calliandra		

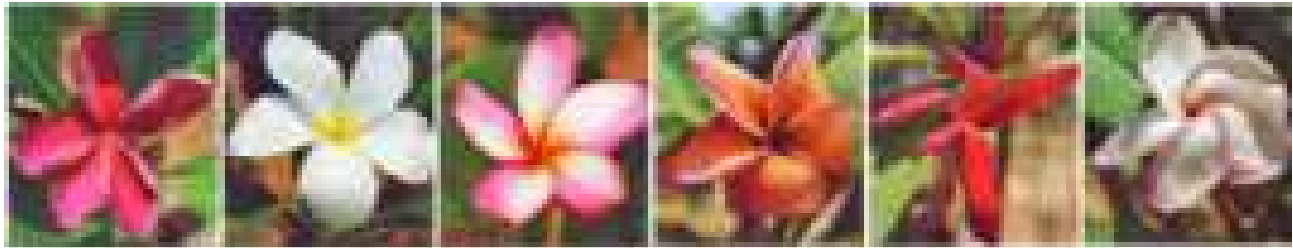
## FLOWERING AND FOLIAGE SHRUBS

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Achania malvaviscus	Malvaceae	Cutting	A quick growing medium-sized shrub. Produces red mauve colour half opened hibiscus-like flowers throughout the year.
2	Acalypha sanderiana	Euphorbiaceae	„	A small shrub with dark broad green leaves. Produces drooping catkins of crimson flowers. Flowers throughout the year. Prefers shady places. A wilkesiana have copper coloured leaves.
3	Artabotrys odoratis-simus (Hara Champa)	Annoniaceae	Seed	A small evergreen hardy shrub. Produces strongly fragrant flowers of green colour turning yellow on ripening.
4	Barleria cristata	Acanthaceae	Cutting	A bushy small shrub growing up to a height of 1.5 —1.8 m. produces blue flowers almost all the year round.
5	Caesalpinia pulcherrima (Poinciana pulcherrima) (Peacock flower)	Leguminosae	Seed or layers	A medium-sized shrub growing up to a height of 2.4-3 m. Produces red and yellow flowers almost all round the year with profuse flowering during rains and summer.
6	Caryopteris mastacanthus	Verbenaceae	Cutting	A medium-sized shrub reaching up to a height of 2.4-3 m. with dark green leaves. Produces handsome blue flowers.
7	Codiaeum variegatum	Euphorbiaceae	Cutting and goote	Handsome, medium sized shrub with numerous shades of leaves. Leaves may be twisted, thin or very broad.
8	Cestrum nocturnum (Rat ki Rani)	Solanaceae	Cutting	A soft wooded shrub growing 1.5 m. in height. Produces small pale green flowers. Flowers open at night and are highly fragrant. Flowers during March-April and in July-August. C. drummondii, produces white scented flowers throughout the year.
9	Euphorbia pulcherrima (Poinsettia)	Euphorbiaceae	Cutting	A tall shrub reaching up to a height of 2.4-3.0 m. Produces light yellow or yellow flowers on the terminals. Flowers throughout the year.
10	Duranta repens	Verbanaceae	Seed or Cutting	A small thorny shrub with light yellow leaves. Bears blue or white flowers in clusters during rains. The berries are also very attractive, makes an effective hedge variety with variegated leaves look more pretty.

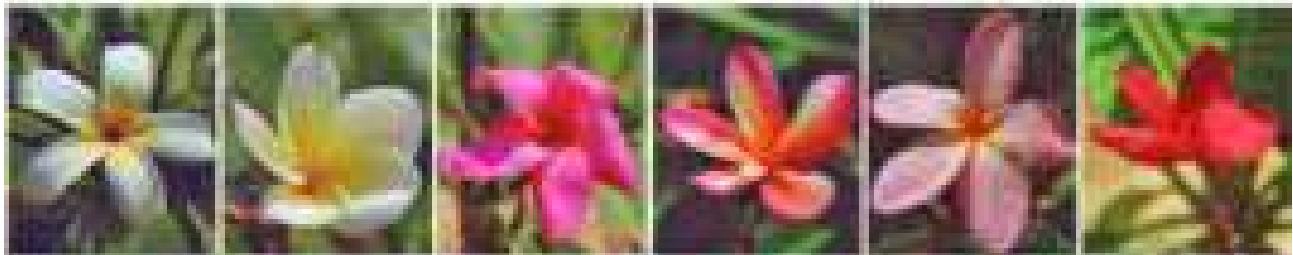
S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
11	Gardenia florida	Rubiaceae	Air-layering Cutting	A tall evergreen shrub with shining green leaves. Produces white highly fragrant flowers during summers and rains.
12	Gossypium spp.	Malvaceae	Cutting	Produces white flowers during rains.
13	Hamiltonia-suaveo-lens	Rubiaceae	„	A medium-sized shrub with coarse leaves. Produces sweet scented white or blue tinged flowers during winter months. Responds well to pruning.
14	Hamelia patens	„	„	A strong bushy shrub attaining a height of 3.0-4.5 m with attractive foliage of small green and greenish bronze leaves. Produces orange yellow tubular flowers during winters. Good as an ornamental hedge.
15	Hibiscus mutabilis	Malvaceae	„	A large deciduous shrub of 3-4.5m height with large leaves. Produces large handsome double flowers of white, pink and yellow shades during September—October.
16	Hibiscus rosa-sinensis	Malvaceae	Cutting	Flowers are single or double and appear throughout the year. Colour ranges from deep red, bright red, white red with white strips.
17	Hibiscus syriacus	Malvaceae	Cutting	White or purple blue flowers white single or double forms.
18	Ixora rosea (Rukmini)	Rubiaceae	Layering	A medium-sized shrub with handsome foliage. Produces pink fragrant flowers during March-April. I. lutea produces yellow flowers of large size.
19	Ixora coccinea	Rubiaceae	Layering	A medium shrub with handsome foliage. Produces abundant bright red flowers during rains.
20	Jasminum humile (Yellow Jasmine)	Oleaceae	Cutting	A dwarf shrub reaching up to a height of 1.5-1.8 m. Produces bright yellow flowers in April--June.
21	Jasminum sambac (Mogra Bela)	„	„	A dwarf spreading shrub growing up to 0.9-1.2 m height. Bears creamy white flowers during May to August which are sweet scented.
22	Jasminum sambac (var. Motia Bela)	„	„	A dwarf spreading shrub reaching to a height 0.6-0.9 m. Bears pure white highly fragrant flowers in May to August. The flowers open loosely and look like a star in shape.

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
23	Lagerstroetnia app (Sanwani)	Lytharaceac	„	A medium-sized deciduous shrub. Bears flowers of pink, mauve and white colour during May to August. Responds well to pruning.
24	Murraya exotica (Kamni)	Rutaceae	Seed	A medium-sized, evergreen shrub with glossy green pinnate leaves. Produces sweet scented white flowers during May – August. Makes an excellent shrub and hedge.
25	Nerium indicum	Apocynaceae	Cutting	A tall, evergreen shrub reaching a height of 3.0-4.5 m. Bears white pink flowers in single double during May– November. Well suited for dry localities. Scented flowers appear on top of branches.
26	Russelia equisetifolia	Scrophulariaae	„	A dwarf, spreading, evergreen and graceful shrub. Produces bright red flowers. Well suited for rockeries and for hanging baskets R. coccinea produces red or scarlet flower. Plant is erect and leaves are small.
27	Stachytrpheta rosea	Verbenaceae	Cutting	A medium-sized, soft wooded shrub. Produces spikes of rose red colour flowers almost throughout the year.
28	Tecoma stans (Yellow elder)	Bignoniaceae	Seed	A tall, erect, globrous shrub growing up to a height of 3– 4 5 m. Produces flowers of yellow colour in panicles during rains and summers. Well suited for dry localities, can be used as a hedge
29	Tabernaemontana divaricata (Chandni)	Apocynaceae	Cutting	An evergreen, hardy shrub with glossy foliage. Produces pure white scented single cr double flow ers during summers and rains.
30	Thevetia neriifolia	„	Cutting or Seed	A tall, evergreen shrub attaining a height of 3-3 6 m. Produces yellow white and bronze funnel-shaped flowers all the year round.
31	Thanbergia ereeta	Acanthaceae	Cutting	Dwarf, hard shrub produces blue funnel shaped flower all the year round.

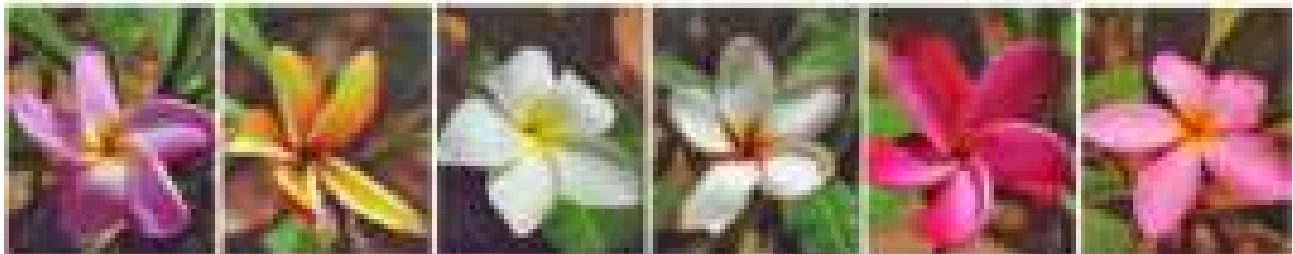




Plumeria acuminata Grove farm    Plumeria acuminata Hon kong    Plumeria acuminata Incarnation    Plumeria acuminata India    Plumeria acuminata India    Plumeria acuminata Kane sun burst



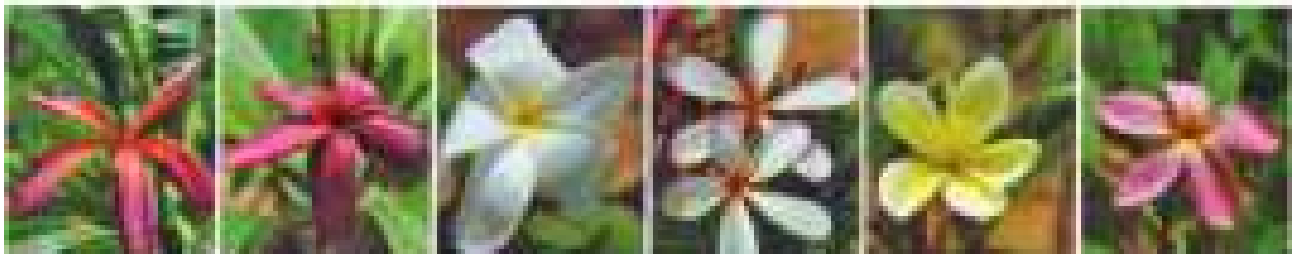
Plumeria acuminata Kaiulaia    Plumeria acuminata Kaneohe    Plumeria acuminata Kaneo ho sunrise    Plumeria acuminata Keywest-elizabeth    Plumeria acuminata Kona hybrid    Plumeria acuminata Keywest red



Plumeria acuminata Lisa marie    Plumeria acuminata Madam pon    Plumeria acuminata Madison white    Plumeria acuminata Mary susan    Plumeria acuminata Miami rose    Plumeria acuminata Mori



Plumeria acuminata Nebel gold    Plumeria acuminata Petersons gold    Plumeria acuminata Plastic pink    Plumeria acuminata Pink pansy    Plumeria acuminata Powder pink    Plumeria acuminata Puu kahea



Plumeria acuminata Rin wheel    Plumeria acuminata Ruby le    Plumeria acuminata Samoan fluff    Plumeria acuminata Singapore plumeria    Plumeria acuminata Tangerine    Plumeria acuminata Temple tree/Frangi pani



Heliconia Mathiasae



Heliconia Caribaea Bihai



Heliconia Carubaea Purpurea



Heliconia Pedro Orteiz



Eltingera Elatior



Heliconia Bihai Lobster Claw



Heliconia Indica Spectabilis  
Var Rubra



Alpinia Pink



Heliconia Strkta Firebird



Heliconia Orthotricua



Heliconia Orthotricua Tricolor



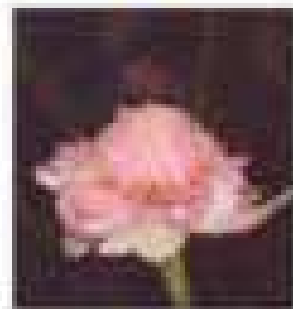
Heliconia Orthotricha



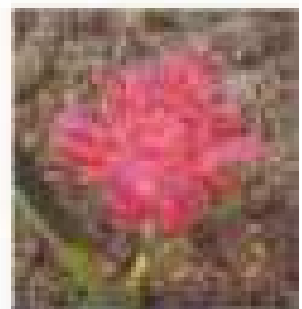
Etlingera Elatior (White)



Torch Ginger (Red)



Torch Ginger (Pink)



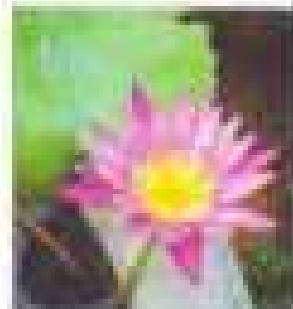
Torch Ginger Rose



Water Lily



Water Lily



Water Lily



Bulrush



Quisqualis Indica Double



Passiflora Incarnata Hybrid



Passiflora Vitifolia



Pyrostegia Venusta



Stictocardia Macalusoi



Ipomoea Horsfalliae



Ipomoea Morning Glory  
Indica



Ipomoea Wood Rose



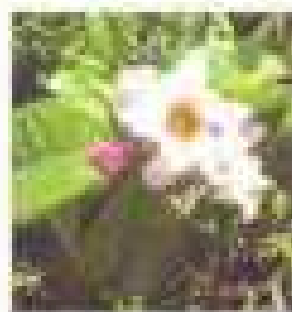
Thunbergia Grandiflora



Thunbergia Mysorensis



Petrea Volubilis



Strophanthus Gratus



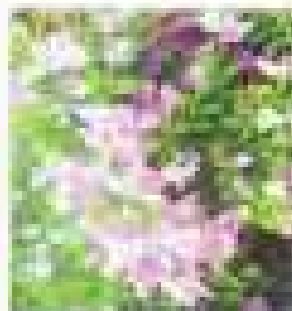
Bougainvillea



Bougainvillea



Bougainvillea



Bougainvillea



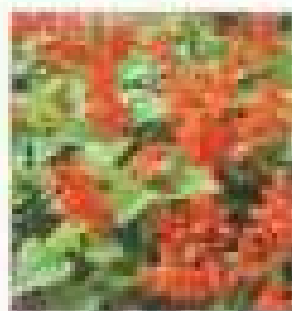
Annuals



Annuals



Annuals



Annuals



Duranta



Duranta



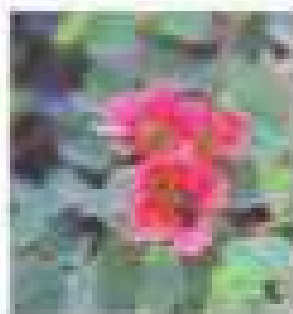
Erythrina Variegata



Nerium Oleander



Mussaenda



Bauhinea Galpini



Buxus



Crinum Black



Agave



Agave



Cryptanthus



Cryptanthus



Agave



Agave



Agave



Agave



Sansevieria



Sansevieria



Sansevieria



Echinocactus Gursonii





Juniperus (New Variety)



Juniperus



Juniperus



Juniperus



Phalaris Arundinaria Variegata



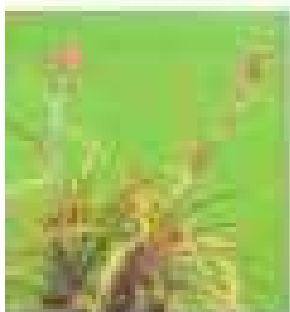
Pennisetum



Hypoestes



Chlorophytum



Ananas



Manihot Esculenta



Jatropha Varigated Inteferrima



Jatropha Hybrid Inteferrima



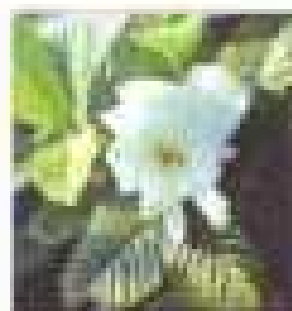
Clivia Miniata



Pandanas Baptistii



Asparagus Meyrii



Gardenia Jasminoides



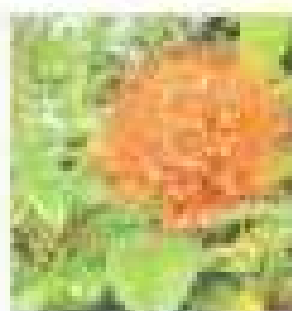
Rhododendvon Azalea



Desmodium Pulchellum



Dillenia Suffruticosa



Combretum Constrictum



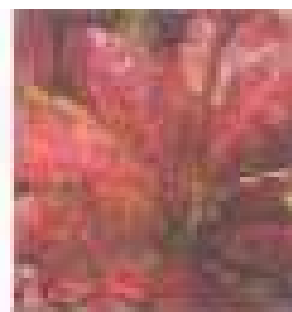
Codiaeum



Codiaeum



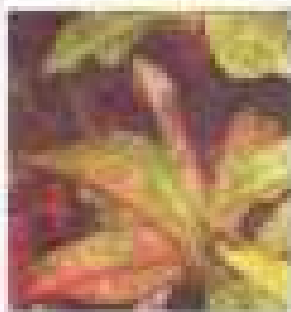
Codiaeum



Codiaeum



Codiaeum



Codiaeum



Adenium



Dracaena Angustifolia



Arundingacea



Calathea - Majestila  
Rosea - Lineata



Calathea - Majestila  
Uaralbo - Lineata



Stromanthe Sanguinea  
Varigated



Zingiber Zerumbet



Alpinia Zerumbet



Calathea Zebrina



Calathea Makoyana



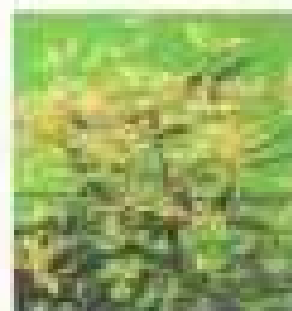
Anthurium



Aralia



Aralia



Nandina Domestica



Asplenium



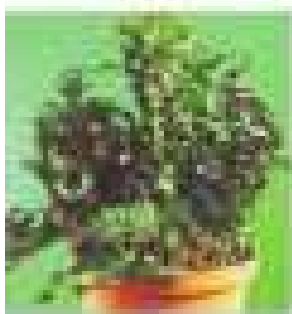
Asplenium



Pteris Cretica



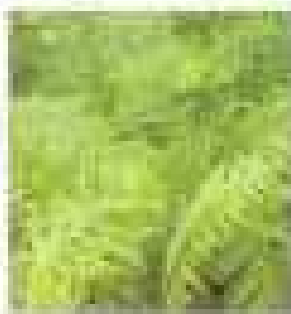
Platycerium



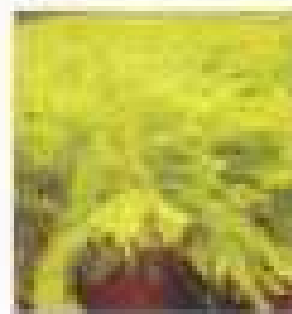
Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



Nephrolepis



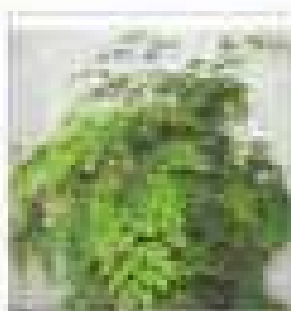
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Nephrolepis



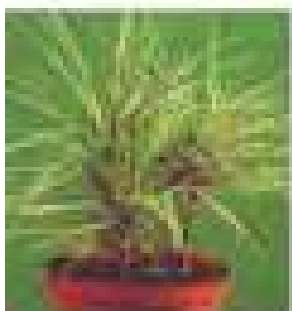
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Adiantum



Adiantum



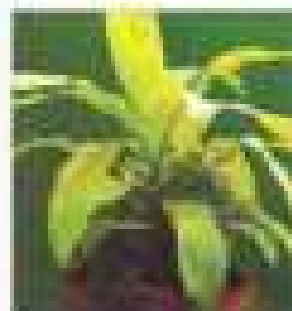
Dracaena



Dracaena



Dracaena



Dracaena



Aglaonema



Aglaonema



Aglaonema



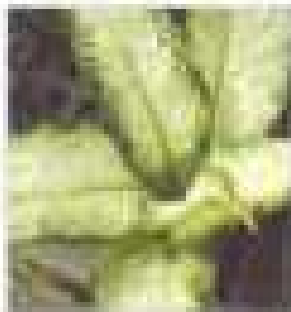
Aglaonema



Dieffenbachia



Dieffenbachia



Dieffenbachia



Dieffenbachia



Aglaonema



Cordyline



Cordyline



Cordyline



Spatiphyllum



Spatiphyllum



Aphelandra



Alocasia



Philodendron



Philodendron



Philodendron



Philodendron





Plumeria Rubra



Plumeria Hanging



Plumeria Singapore White



Heliconia



Veitchia Merrilli



Bauhinea Variegated



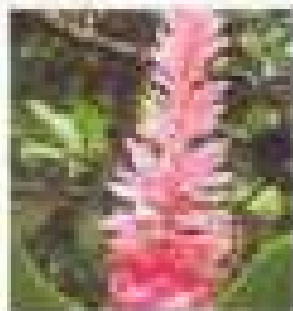
Amarylis Variegated



Coccoloba Uvifera



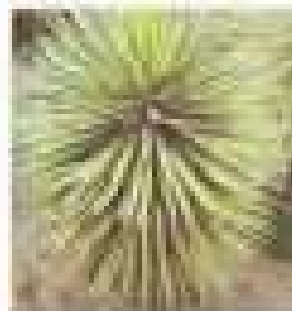
Cryptostegia Grandiflora



Alpinea (Pink Ginger)



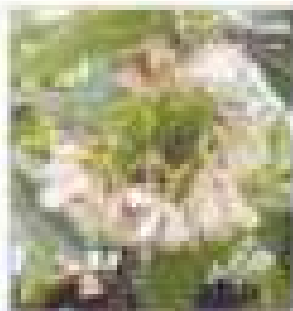
Ornamental Banana Variegated



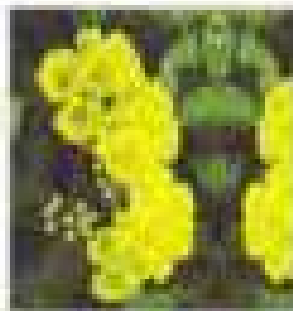
Agave Variegated



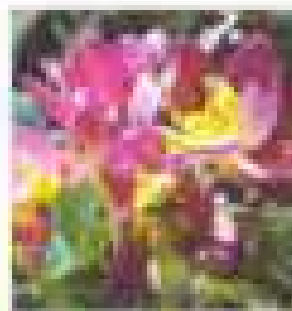
Caronda Carambola



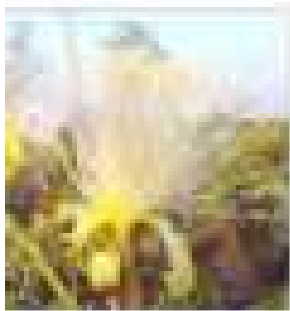
Elaeocarpus Angustifolia



Cordea Lutea



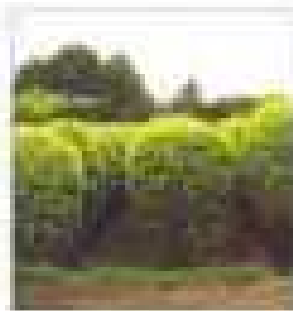
Spathoglottis Chameleon



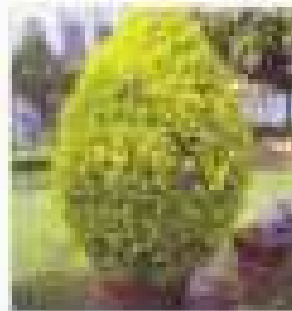
Bombax Ellypticum



Passiflora



Ficus Topiary



Melleleuca Topiary



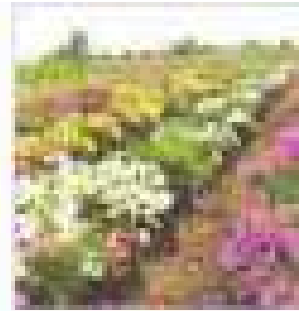
Bougainvillea



Bougainvillea



Bougainvillea



Bougainvillea



Bauhinia Blackeana



Alocasia Blackmagic



Clethra



Spathiphyllum Sensation



Allamanda Peach



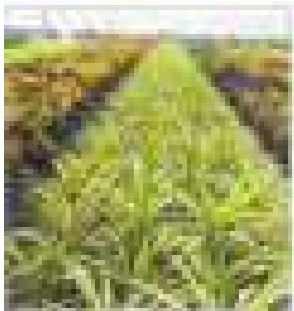
Anthurium Veitchii



Anthurium



Staghorn Fern



Pandanus



Mandevilla Bolivienensis



Colvillea Racemosa



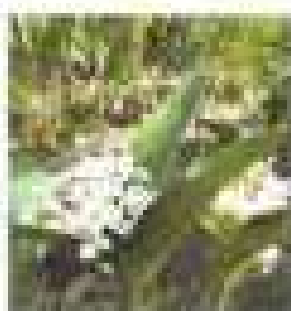
Schefflera



Cordia Sabastena



Triplaris Surinamensis



Acocanthera Oblongifolia



Oncoba Spinosa



Haemanthus Multiflorus



Adansonia Perrieri



Dioon Edule



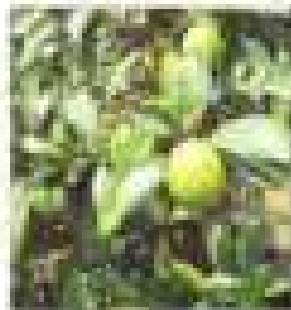
Mucuna Benetti (Jadevine Red)



Michelia Champaca



Datura Arborea



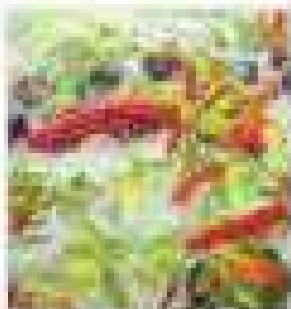
Ornamental Chinese Orange



Codiaeum



Gardenia Dwarf



Combratum



Combretum Constrictum



Filicium Decipiens



Solanum Macaranthum



Barringtonia



Schefflera Haicolour



Ochna Kirkii (Tom & Jerry Plant)



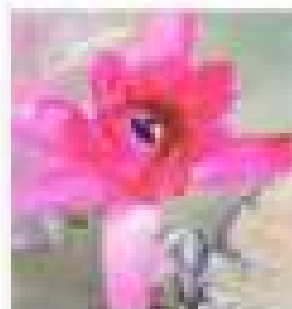
Water Lily



Water Lily



Water Lily



Water Lily

# CHAPTER - 11

## HEDGES & EDGES

Plants grown in series in straight line or a smooth wave to serve as a barrier or screen are termed as hedges. They provide a natural background to a garden, like a frame to a picture which maybe external or internal. An external hedge is tall and may replace the compound wall. It also serves as a protection against wind. It may be 1.5 to 2.5 meters (5 to 9 feet) height. The internal hedge separates different parts of the garden and is not so tall. It may vary from 30 to 90 cm (1 to 3 feet). Hedges may be of deciduous or evergreen plants. They may be flowering or non flowering plants. Hedges are generally created with fast growing plants so as to get the effect immediately as screen, or wind-break. They have a capacity to grow tall and are evergreen.

### Essentials of a good hedge:

It needs to be thick and dense; it should have evergreen foliage from bottom to top; it should withstand regular pruning and be trim and neat. If it is a flowering hedge its bloom should not clash with the colour scheme.

Hedges are used for concealing unwanted and ugly locations or as a back ground to lawns, flower beds etc and for providing privacy. Edges are used as demarcating lines to lawns, flower beds, pathways etc. and low height is maintained with regular pruning with shears.

### Tips for Laying Hedges and Edges:

1. Dig trenches of 1' width and 1' depth. Loosen the bottom of trench and expose to sun for about 15 days.
2. Fill the trench with dug out soil if it is good or red soil. Mixed with 25 kg compost or 10 kg vermi-compost, 2.5 kg Neem cake and 1 kg Super Phosphate per 10' length of the trench; 25 Gms of foliol dust., and water the filled trench for settling.
3. Plant rooted cuttings of the selected plant material at 4" - 6" gap and water. During rainy season with high humidity, uprooted cuttings can also be planted, at close range of 2"-3" spacing in two rows.
4. Water well thereafter.
5. First shearing should be done at 9" - 1' height for edges and at 1' - 1.6" height for hedges to get bushy growth right from ground level. Further shearing at regular intervals to maintain desired height, shape and compactness. Shearing can be done for maintaining desired shapes.
6. Manure once in six months or whenever growth and vigour retards at the base of the trench and regular mulching also needs to be undertaken



## Ornamental Hedges /Edges:

S. No.	Name	Planting Distance (cm)	Stands Pruning	S. No.	Name	Planting Distance (cm)	Stands Pruning
1.	Aclypha sp.	30-45	Poor	9.	Lantana sp.	30-45	Well
2.	Bougainvillea sp.	90-120	Well	10.	Murraya exotica	45-60	Well
3.	Cuphea	15-20	Poor	11.	Mynea erecta	15-45	Well
4.	Duranta sp.	30-45	Well	12.	Pedilanthus	15-20	Well
5.	Konocarpus	30-45	Well	13.	Ashoka pendula	90-100	Well
6.	Hemelia Patens	30-45	Well	14.	Tecoma stans	60-90	Poor
7.	Clerodendron inerme	15-20	Well	15.	Phyllanthus	30-45	Poor
8.	Justicia sp.	20-30	Well	16.	Crasulla (Jade)	20-30	Well

## Protective Hedges:

1.	Carissa Carandas (Karonda)	20-60	Light
2.	Inga dulcis	90-100	Well
3.	Lawsonia inermis (Mehendi)	45-60	Well
4.	Parkinsonia aculeata	90-100	Light

## A-ORNAMENTAL HEDGES

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
1	Acalypha	Aclypha sunderiana Euphorbiaceae	30-45	Cutting	Makes a good hedge because of attractive coloured leaves ; can be trained up to a height of 0 9-1.2 m. Does not stand trimming well and is susceptible to low temperature.
2	Bougainvillea	Bougainvillea spp. Nyctaginaceae	90-120	Cutting air & ground layering	Most of the varieties make an effective beautiful and hardy hedge, produces pretty flowers almost all the year round. Stands trimming well. Can be trained up to a height of 0 9-1.2 m.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
3	Cupressus	Cupressus macro carpa	30-45	Seed Cutting	Makes an excellents, evergreen dense hedge. Stands trimming well. Does better in cool area.
4	Duranta	Duranata plumeri Rubiaceae	30-45	Cutting and Seed	Beautiful, effective and hardy hedge. Stands trimming well. Variety with variegated leaves is better.
5	Hamelia	Hamelia patens Rubiaceae	30-45	Cutting	Makes a good attractive hedge with coloured foliage. Stands trimming well. Can be trained up to a height of 1 2-1.8 m.
6	Hibiscus	Hibiscus rosasinensis Malvaceae	30-45	Cutting	Makes an excellent hedge, stands trimming well. Can be trained to a height of 0 9-1 2 m. Produces attractive tubular flowers almost throughout the year.
7	Justicia	Justicia grandus Acanthaceae	22.5-30	Cutting	Makes dwarf hedge. Stands trimming well. Can be trained up to a height of 0 3-0 6 m
8	Lantana	Lantana spp. Verbenaceae	30-45	Cutting	Several varieties of Lantana make vigorus hardy and drought resistant hedge Produces flowers of different hue. Stands trimming well. Should not be planted close to residence.
9	Dadonia	Dadonia viscosa	22-30	Cutting and Seed	A quick-growing and ornamental hedge. Stands clipping well. Requires attention during summers.
10	Murraya (Kamni)	Murraya exotica Rutaceae	45-60	Seed	Makes a pretty hedge, because of its deep green compound leaves. Produces white highly fragrant flowers during July—Aug. and Feb.—March. Stands trimming very well.
11	Mayenia	Meyenia erecta Acanthaceae	15-45	Cutting	Makes pretty dwarf hedge. Produces beautiful purple flowers. Can be trained to a height of 0.6-0.9 m.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
12	Ashok	Polyalthia longifolia Anonaceae	90-100	Seed	Makes an effective hedges when properly trained and trimmed. The foliage is very attractive.
13	Surinam Cherry	Eugenia uniflora Myrtaceae	60-90	„	Makes a hardy, beautiful and effective hedge. Red berries look very attractive. Fruits can be utilized for making jam and jelly. Can be trained to a height of 1.2-1.5 m. Does not require much irrigation or trimming.
14	Jaint	S sbenia sesban Leguminosae	22.5-30	„	A quick-growing and short-lived hedge Stands trimming well. Produces yellow flowers during rains and summers.
15	Mehndi	Lawsonia inermis Lythraceae	30-45	Seed and Cutting	A slow-growing drought resistant and effective hedge. Stands trimming very well. Can be trained to a height of 1.2-1.5 m.
16	Tecoma	Tecoma stans Bignoniaceae	60-90	Seed	Makes an ornamental hedge. Produces bright yellow flowers almost throughout the year. Does not stand trimming well. Can be trained to a height of 1.2-1.5 m.
17	Chandnee (Single)	Tabernaemontana coronaria Apocynaceae	60-90	Cutting	A fairly quick growing beautiful hedge Produces white flowers in abundance. Foliage very shiny. Stands trimming nicely. Can be trained to a height of 0.9-1.2 m.
<b>B-PROTECTIVE HEDGES</b>					
1	Karounda	Carissa carandas Apocynaceae	120-150	Seed	It is slow growing, drought resistant plant. It makes a very effective hedge due to long thorns. Light annual pruning is needed. Fruits make excellent jam and jelly.

S. No.	English and Common Name	Botanical name and Natural order	Planting distance (cm)	Method of propagation	Description
2	Natal plum	Carissa grandiflora Apocynaceae	60-90	Seed and gootee	A low, slow growing and drought resistant plant. Follage deep green. Produces fine white flowers almost through-out the year. Closely planted, hedge is almost impenetrable. Fruit can be utilized for making jam and jelley. Can be trained up to a height of 0.6-0.9 m.
3	Jangali karounda	Carissa bispinosa Apocynaceae	120-150	Seed	A tall, vigorous, thorny and drought resistant plant. Makes a dense and compact hedge. It makes a better hedge than Karounda. Well cared plants make almost an impenetrable fence, because of big stout thorns. Fruits can be utilized for making jam, jelly and refreshing drinks.
4	Karna Khatta	Citrus karna Rutaceae	60-90	Seed	A useful plant for hedge purposes Single row planting makes a very effective hedge. Can be trained to a height of 1.2-1.5 m.
5	Turanj	C. medica Rutaceae	90-100	Seed and cutting	Same as above.
6	Madras Thorn	Inga dulcis Leguminosae	60-90	Seed	Makes a beautiful and effective hedge when planted in double row. Stands trimming well. Can be trained to a height of 0.9-1.2 m.
7	Parkensonia	Parkensonia aculata	60-90	Seed	A quick-growing effective drought resistant hedge plant. Effective up to a height of 1 2-1.5 m. Double row planting is much more effective.



# CHAPTER - 12

## GROUND COVERS

Plants which are used to cover the soil surface as an alternative to lawns are termed as ground covers. They help in preventing dust pollution and to add colour through flowers or foliage. They also check soil erosion.

They enhance the aesthetic appearance of any garden. They can be classified into three groups according to the requirement of sunlight for growth and flowering.

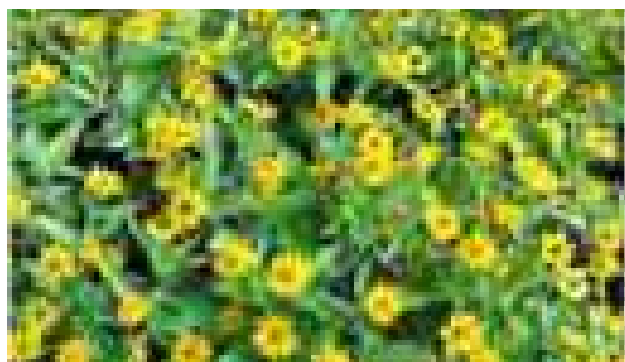
- Plants that show normal growth and flower in full sun

- Grow only in partial shade
- Grow well in full sun and semi shade conditions.

Groundcovers are useful in the garden for covering bare patches of soil beneath trees or shrubs or for covering steep banks where access is difficult. Their roots also help to stabilize soil on steep slopes and check erosion. Ground cover plants brighten up otherwise dull areas and will suppress weeds, making them ideal for a low-maintenance garden.

### Groundcovers:

S. No.	Plant Name	S. No.	Plant Name	S. No.	Plant Name
1.	Alternanthera sp.	11.	Verbena	21.	Impatiens linearifolia
2.	Asystasia gangetica	12.	Wedelia trilobata	22.	Liriope muscari variegata
3.	Senecio confucius	13.	Aspidistra elatior	23.	Liriope platyphylla
4.	Zebrina pendula	14.	Begonia semperflorens	24.	Liriope platyphylla
5.	Ruellia sp.	15.	Callisia Repens	25.	Dianella tasmanica
6.	Syngonium sp.	16.	Chlorophytum sp.	26.	Aptenia caudifolia
7.	Rhoeo spathacea vittata	17.	Pelargonium hortorum	27.	Scindapsis sp.
8.	Lantana sellowiana	18.	Euonymus japonicas	28.	Sansiveras
9.	Pilea sp.	19.	Hedera canariensis	29.	Setcreasea
10.	Portulaca	20.	Hemigraphis colorata	30.	Spathyphyllum





# CHAPTER - 13

## CLIMBERS

Plants which have special structures to climb on supports are defined as climbers. These special structures may be tendrils, modified leaf stalks, rootlets or hook like thorns. The name rambler is usually used for climbing forms of roses which produce clusters of flowers.

Climbers can be trained on arches, pergolas, walls, trees and on pandals. Climbers can be used for screening even in narrow spaces over grills and wire meshes.

### Tips for Planting & Maintaining of Climbers

1. Dig pits of 8 cft (cubic feet) and loosening bottom of the pit, expose to sun for at least 2 weeks or burn the pit with leaf trash.
2. Maintain 4' to 6' between pits.
3. Fill the pits with dug out soil, 10 kg well decomposed cattle compost or 5 Kg vermi-compost, 1Kg neem cake and ½ kg super phosphate and 100 gms of folidol dust.
4. Plant the selected climber, water well, stake the plant next day. Regularly water thereafter.
5. Prune and train the climbers for controlling plant size, shape and giving a bushy growth.
6. Take up weeding and mulching in the basin on a regular basis.
7. Regular care is required to protect the plants against the pests and diseases.

### Common Climbers:

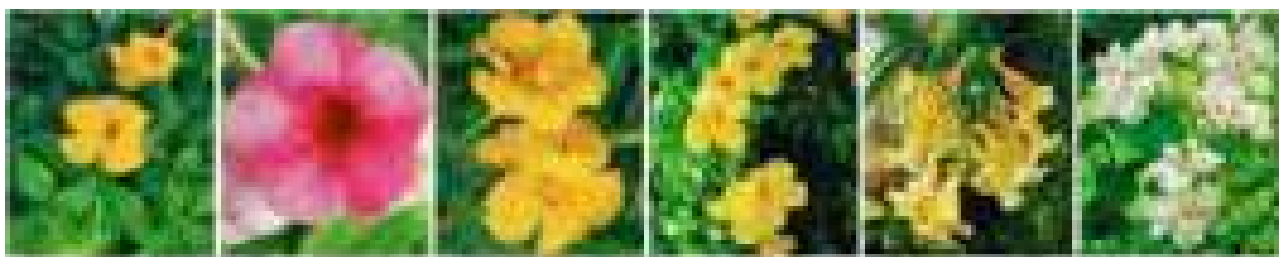
S. No.	Name	Common Name	Flower colour	Flowering season	Type	Propagation
1.	Agamosma caryophyllata	Maiati lata	White	Rainy	H	C
2.	Allamanda cathartica	.....	Yellow	AYR	L	CL
3.	Antigonon leptopus	.....	Rosy	AYR	L	S
4.	Aristolochia grandiflora	Birth wart	Purple	Summer, Rainy	L	CL
5.	Beaumontia purpuria	Nepal Trumpet	White	Winter	H	CL
6.	Bougainvilles sp.	.....	Multi	Summer	H	CL
7.	Bignonia purpuria	.....	Purple		L	L
8.	Bignonia venusta	Golden Shower	Orange		L	L
9.	Cleorodendron splendence	.....	Scarlet	Winter	L	C,S
10.	Ficus repens	Wall creeper	...	....	L	C,L
11.	Areca vestiaria (Langlois palm)	Madhavi Lily	Yellow	Winter	L	S,L
12.	Ipomea horsfolliae	.....	Crimson	Winter	H	G,L
13.	Jacquemontia	.....	Blue	AYR	L	C,L
14.	Jasminum SP.	Motia	White	Summer	L	C,L

## Climber

S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
1	Allamanda cathartica var. grandiflora	Apocynaceae	Ground Layering	A climbing plant with bright green leaves grandiflora Layering leaves. Produces big showy yellow flowers from June—Nov. A violacea produces violet-purple flowers.
2	Antigonon alba	Polygonaceae	Seed	A quick growing climber. Produces lovely spray of white flowers during rains and in winter. A. leptopus bears flowers of rose colour.
3	Asparagus plumosus	Liliaceae	„	A highly ornamental evergreen dwarf climber. The foliage finely divided. Prefers shady places. A. spengri is a dwarf climber with white fragrant flowers.
4	Adenocalymma alliaceum	Bignoniaceae	Ground Layering	Produces pale mauve flowers in large clusters all the year round.
5	Banisteria laurifolia	Malpighiaceae	Ground Layering	A strong extensive climber with dark olive coloured leaves. Bears abundance of bright golden yellow flowers from December to March.
6	Bignonia venusta (Pyrostegia venusta)	Bignoniaceae	„	A quick growing evergreen creeper. Produces in abundance rich yellow tubular flowers from December to March.
7	Bignonia gracilis	„	„	A slender, creeper with pretty yellow flowers. Flowers are seen from Nov. till March
8	Bougainvillia spp.	Nyctaginaceae	Ground and air Layering	Bougainvillas are the most colourful garden plants. They are vigorous growing heavy creepers. Cultivated for showing brightly coloured bracts. Can be trained as standard, hedge and pergola. The important spp. are the following. Budding is possible.
9	B. Spectabilis	Nyctaginaceae	Ground and air Layering & Cutting	A quick-growing creeper. Bears rosy purple colour bracts from Jan. to March.
10	B. Mahatma Gandhi	„	„	Bears pink and purple bracts.
11	B. Louis Wathen	„	„	Bracts bright orange turning pinkish on maturity.
12	B. Mrs. Butt	„	„	A free bloomer with deep crimson bracts.
13	B. Mary Palmer	„	„	Rose pink and white bracts are borne on the same branch.



S. No.	Scientific and Common Name	Natural order	Method of propagation	Description
14	B. Sannet	„	„	Bright rosy purple bracts. Plant makes a compact growth.
15	B. Magnifica	„	„	Produces bright large mauve Colour bracts.
16	B. Snow queen	„	„	A beautiful variety bearing white bracts green veins.
17	B. Thima	„	„	Similar to Mary Palmer except the leaves are varigated.
18	B. Shubhra	„	„	Produces white large bracts on the terminals.
19	Clerodendron splendens	Verbenaceae	Layering	A dwarf evergreen creeper with dark green foliage. Bears profuse beautiful flowers from Dec.-Feb. of vermilion colour.
20	Ficus ripens	Urticaceae	Cutting	A creeping species of fig foliage. Evergreen, without much branching.
21	Ipomea pulchella	Convolvulaceae	Seed	A quick growing, evergreen ex-tensive green creeper. Bears purple flowers during winters.
22	Jasminum grandifloram	Oleaceae	Layering	A small evergreen climber with bright green leaves. Produces pure white star-shaped frag-rant flowers during summer months.
23	Lonicera japonica	Caprifoliaceae	„	A rambling evergreen creeper. Bears white fragrant flowers which turn yellow later.
24	Porana paniculata	Convolvulaceae	„	A strong evergreen creeper. Produces very small white flowers in great abundance during October–November.
25	Quisqualis indica (Rangoon creeper)	Combretaceae	„	A strong, evergreen, bushy, climber. Produces shining scarlet and white flowers in abundance throughout the year. Suitable for training on buildings and walls.
26	Tecoma grandi flora	Bignoniaceae	„	A strong woody creeper. Bears orange coloured flowers in abundance almost throughout the year.
27	Thubergia grandiflora	Acanthaceae	„	A strong evergreen extensive climber. Bears large bell-shaped blue coloured flowers from October till December.
28	Jacquemontia penantha	Convolvulaceae	„	Produces bell- shaped flower of ultramarine blue colour all year the round.
29	Passiflora recemosa (Passion flower)	Passiflorae	„	Large flowers with whitish green sepals during winter.



Allamanda  
cathartica  
Hendersonii

Allamanda  
cathartica violacea

Allamanda  
cathartica  
Williamsii

Allamanda  
cathartica

Anemopaegma  
chamberlaynii

Aritigonon  
Leptopus Alba



Antigonon  
leptopus

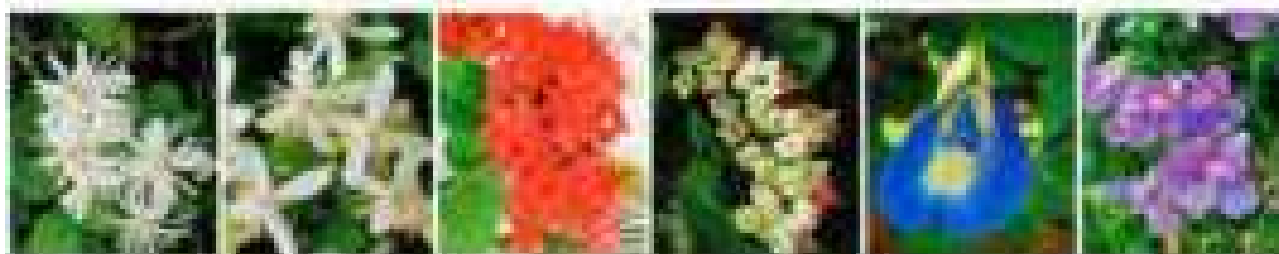
Aristolochia  
elegans

Arrabidaea  
magnifica

Beaumontia  
grandiflora

Campsis  
grandiflora

Campsis radicans



Clematis flammula

Clematis gouriana

Clerodendrum  
splendens

Clerodendrum  
thomsonae

Clitoria ternatea

Clytostoma  
purpureum



Combretum  
coccineum

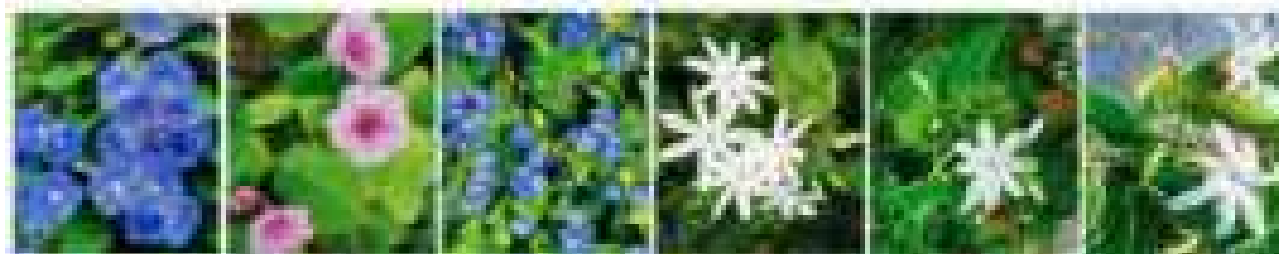
Cryptostegia  
grandiflora India  
rubber vine

Echites  
caryophyllata

Ficus pumila (wall  
creeper) variegata

Ficus pumila (wall  
creeper)

Ipomoea horsfalliae



Ipomoea learri

Ipomoea pes-  
caprae

Jacquemontia  
violacea

Jasminum  
angustifolium

Jasminum  
auriculatum

Jasminum nitidum

					
Jasminum sessiliflorum	Lonicera japonica Japanese honey suckle	Lonicera sempervirens Trumpet honey suckle	Odontadenia grandiflora	Pandorea jasminoides	Passiflora violacea Purple passion flower
					
Passiflora caerulea Blue passion flower	Passiflora coccinea Red passion flower	Passiflora decaisneana	Petrea volubilis purple wreath	Phaedranthus buccinatorius Splendent flower	Podrancia ricasoliana
					
Pseudocalymma alliace Garlic vine	Pyrostegia venusta Golden shower	Quamoclit coccinea Star ipomoea	Quamoclit pinnata Cypress vine	Quisqualis densiflora	Quisqualis indica double Ragoon climber
					
Quisqualis indica Ragoon climber	Senecio confusus Mexican daisy	Stephanotis floribunda	Stigmaphyllon periplocifolium	Thunbergia alata	Thunbergia grandiflora
					
Thunbergia mysorensis	Trachelospermum jasminoides	Vallisneria heynei	Tristellateia australasica	Vernonia elaegnifolia	Wisteria sinensis

# CHAPTER - 14

## ROSES

### I. Introduction

The rose has been loved and cherished from very ancient times. In modern age, its importance has become still greater because rose breeders have been increasing its range of colours while at the same time adding valuable characters like disease resistance and a longer period of flowering. It is a versatile plant and the fantastically large number of types available is one of the reasons for its great popularity. There are now roses for every purpose and even the person with only a tiny plot of land will find there are varieties available to him which will provide a welcome splash of colour to a wall or furnish quantities of exquisite cut flowers. Now-a-days, roses are grown throughout the country and perhaps no flower is more loved in India. The rose is valued for purposes of worship and for making garlands in our country. Recently the Rose Society of India has laid out a beautiful National Rose Garden in New Delhi.

### II. Climate

The climatic conditions of India are well suited to rose cultivation. Roses need bright sunshine and free ventilation. Sunshine for six hours is ideal for better growth and flowering.

In the northern plains, roses flower best during winter whereas in the temperate hilly regions of the Himalayas in summer. Western part of India have excellent agro-climatic conditions for rose growing. The plains of eastern India are suitable for the cultivation of many rose cultivars. Bangalore

has mild climate Where roses can be grown for flowers throughout the year.

### III. Soil

Although any soil is good for rose cultivation provided it has proper drainage, the ideal soil should be medium loam having sufficient organic matter, pH of 6.0 -7.5. The land where the external drainage is poor and water stagnates during monsoon should not be selected for rose growing. In very heavy soils, gravel and sand may be mixed into the bed to allow drainage. The land with high water table is not suitable for rose beds.

### IV. Layout of Beds

The plan of rose garden and design of the beds should be simple and informal. Rose beds may be of various design, depending upon the liking of the grower. However, rectangular beds are advantageous for maintenance. The width of the beds should be such that operations like weeding, hoeing, forking, cutting of flowers etc, can be done from both the sides of the bed, without stepping into the bed. A plot size of 6.0 x 1.2m or 6.0 x 1.65m is suggested for better management of rose plants. The length can be increased to a limited extent depending upon the specific situations.

### V. Growth and Flowering

Factors like genetic or inherent factors, climatic or environmental factors such as light, temperature, moisture, aeration and managerial factors like nutrition and soil conditions influence growth and flowering.



## A. Genetic factors

Like other plants, growth and flowering behaviour of roses is governed by genetic factors. The range of variability in roses is very great. There are tall cultivars growing several metres high and are suitable for planting in backdrop and as hedges. On the other hand, miniature roses with dwarf habit and producing small flowers are also available. Several cultivars are bushy in nature while many are climbers and ramblers. A wide choice of cultivars with long sturdy stems having nice flower forms suitable for cut-flowers are also available today. Similarly, there are cultivars blooming in different periods and producing varied yield and quality of flowers. Some possess high quality perfume.

## B. Environmental factors

Along with genetic factors, environmental factors play an important role on growth and flowering.

### 1. Light

Light is one of the most important factors influencing the growth and flowering of roses. This may vary with intensity, duration and quality of light. The total plant weight may be reduced by the decrease in light intensity, and the number of flowers produced increases with increased radiation.

Plants growing under shade produce thinner leaves with low chlorophyll content. However, because of high light intensity and the consistent rise in temperature, summer grower apply a light shading material on the roof of the glasshouse. Colour of rose flowers is also influenced by the high intensity of light. The influence of duration of light is most marked and spectacular on growth and in inducing or suppressing flowering.

### 2. Temperature

Temperature affects the quantity and quality of the plant and the flower. At a

night temperature of 15.5°C the quality and quantity of roses produced are considered to be satisfactory. Low temperature also brings about the development of pigment in the leaves stems or flowers. The stem and flower buds need an exposure to cool temperature for their expansion. Winter chilling is necessary for flower bud formation.

### 3. Humidity

Humidity plays an important role in the incidence of pests and diseases affecting the growth and flowering. Certain diseases like mildew's are associated with high relative humidity. Its importance, however, lies in the internal water conditions of the plants. By maintaining reasonably high humidity, the internal deficiency of water will be less. Enlargement of cells is caused by water and, therefore, we should prevent the loss of water from the plants so that leaves and flowers would be larger and stems longer.

### 4. Aeration

Proper soil aeration and an exchange of air in green house are also desirable for the normal growth and development. Compact soils have restricted aeration which impedes the activity of roots affecting the plant growth. Air circulation ensures an adequate supply of carbon dioxide and oxygen for physiological processes occurring in the plant and also reduces the relative humidity which may cause serious infections. Carbon dioxide is an important factor in photosynthesis in increasing the stem length and dry matter.

## C. Plant management practices

Pruning, pinching, disbudding, deshoots, defoliation and deflowering are the plant management practices done for rose cultivation.

### 1. Pruning

Pruning is an important operation regulating the growth and flowering of roses. Pruning

in roses is explained in detail the cultivation section. Following are some other plant management practices which influence the vegetative growth and production of flowers.

## **2. Pinching**

Removal of a part of terminal growing portion of stem is called pinching. It reduces the plant height but promotes auxiliary branching and also prevents maturity of flower bud.

## **3. Disbudding**

Removal of undesirable buds is known as disbudding. Keeping only the central bud and removal of others cause development of a quality bloom.

## **4. Deshooting**

Deshooting is generally followed in Hybrid Tea roses. Young vegetative shoots developing from the axils of leaves of basal and lateral shoots are removed to allow only one terminal shoot. In several rose cultivars such side shoots develop from the eyes down the stem below the terminal flower bud. If these shoots are not inched off at the initial stage, plants become much branched and produce a number of small flowers.

## **5. Defoliation**

Although defoliated plants produced about twice as many shoots as un-defoliated, many of them are blind and the total number of flowers is less. Complete defoliation causes atrophy of almost all flower buds. Removal of only mixture leaves causes about 50% blindness. Removal of only young leaves, however does not cause blindness.

Leaf removal on dormant shoots results in the production of short and nonflowering shoots. Removal of the upper most leaf at the time of pinching results in highly significant increase in flower production. Leaf removal from semi mature shoots is more effective on flower production than from young shoots. Flower quality, is also not reduced by this practice.

## **6. Deflowering**

Removal of faded flowers is called deflowering. If the spent blooms are not removed in time, there is a chance of developing fruit bearing seeds. Once the hips are formed and reach the advance stage of development, growth and flowering are severely reduced during the season. Cutting of faded flowers forces strong laterals which produces a good quality flower.

## **VI. Propagation**

Among propagation methods, budding is most popular in our country because it produces better quality flowers and faster growth of plants. Other methods like, seed propagation, layering, grafting are also important. For more details on budding and grafting refer booklet No.6, "Propagation of Fruit Trees".

### **1. Budding**

Budding is the most popular and successful method for multiplying roses. It provides larger number of plants than cuttings, layering or grafting, as a single shoot of the desired scion furnishes a number of buds for budding. Shield or T- budding is the method ordinarily used. On the selected rootstocks, the buds are inserted into a T-shaped incision and then tied with suitable wrapping material. It takes 3-4 weeks for the buds to unite. The side branches of the stocks are removed which compete with the scion for supply of nutrients and water.

### **2. Grafting**

Inarching or grafting is another method of propagating roses but the cost of a grafted plant in the long run may be higher than that of budded plant. The rootstocks are raised in small pots or polythene bags. The scions are selected and the stocks are brought near the selected scion shoots. The scion shoot should be of medium texture, free from pests and diseases and 1-3 eyes in length. Larger

scions are not recommended. A strip of bark, about 3 cm long with a part of wood, is removed from the stock as well as from the scion, and the latter is attached properly on to the stock and wrapped. After union the scion shoot is cut below the graft and the rootstock above the graft union.

### 3. Layering

This type of vegetative propagation is usually practiced in climbing and rambling roses during the monsoon or early spring season. Layered plants thrive and bloom quite well as budded or grafted plants. This method has two types, ground layering and air layering.

#### a. Ground layering

It is performed by bending shoots to the ground and covering it with soil, leaving the terminal end exposed. A wooden peg or stone and a bamboo stick can be used to hold the bent shoot and exposed shoot in their position. Rooting at nodes usually takes place in a month or so and the layered shoot is detached 15-20 days after root formation.

#### b. Air layering

It consists of removing a ring of bark, about 2.5 cm long, from around the shoot to be rooted and covering it with a rooting medium. The use of damp sphagnum moss around the ringed portion and covering with polythene film have been found beneficial. Application of some root promoting substances may further improve the root formation in air layers.

### 4. Cutting

Propagation of roses by cuttings is normally done to raise stocks for grafting or budding. Climber, Rambler, Polyantha and Miniature roses respond quite well to this method. Although cuttings are almost always prepared from shoots, root cuttings have also been found to form shoots and ultimately a new plant.

#### a. Root-cutting

Some rose species like *Rosa blanda*, *R. nitida* and *R. virginiana* can be propagated by root-cuttings. The cuttings should be taken from young and healthy plants and it is important to maintain polarity when planting. The proximal end (nearest to the crown of the plant) of root piece should always be up. The cuttings should be inserted vertically with the uppermost level of the rooting media.

#### b. Stem-cutting

Raising plants by stem-cuttings is one of the least expensive and easiest method of rose multiplication. Usually, stem cuttings give satisfactory results when rooted during the period from late June to November. Cuttings should normally be taken during the monsoon or spring. Each shoot should be cut clean just below the node and lower leaves removed.

Sand is the best rooting medium but vermiculite or perlite also gives satisfactory results. Addition of peat moss to the sand in proper proportions is useful as it increases the water-holding capacity of the medium. In case of Miniature roses, a mixture of perlite and peat moss in the ratio of 1 : 1 is good for rooting of cuttings. The cuttings are usually planted 3 cm apart in a row and 8 cm between rows and watered as per the need. Within a month or so, roots and shoots will develop from the cutting and in about a fortnight, the plants may be transplanted in another well prepared bed or in pots.

Regeneration of rose plants from cuttings is influenced by various factors such as type of cutting, treatment of cuttings, the age and physiological condition of the stock plant, type of wood selected for cuttings and environmental conditions during rooting. Hardwood cuttings are widely used in the propagation of rose rootstocks. Cultivars of Miniature roses are easily propagated by cuttings of soft-wood or semi- hardwood

under mist. Hardwood cuttings taken from basal and mid portion of the shoot shows much better rooting than those taken from apical cuttings.

### 5. Seed propagation

This method of propagation is generally adopted by breeders for developing new cultivars with desirable characters. When the fruits are fully ripe, they are harvested and thoroughly dried before the extraction of seeds. Most rose seeds when mature are in a resting condition requiring an after-ripening period before germination. Stratification of seeds at 1.6-4.4° C is required after harvest. Stratification for 6 weeks is sufficient for *Rosa multiflora*, *R. rugosa* and *R. hugonis* require 4-6 months, and *R. blanda* requires 10 months. Warm stratification followed by cold stratification has also been found beneficial in *Rosa canina* seeds which requires warm treatment at 26.6°C for 2 months followed by 3 months at 4.4°C for better germination. Hybrid rose seeds usually respond best to a stratification temperature of 1-4.4°C for 69-90 days.

Clean seeds are sown about 5 cm apart in pans or in small plots to raise the seedlings. Soil used for this purpose should be prepared adding a good quality of well rotten farm yard manure. Though the time of sowing mainly depends upon temperature, sowing in the months of October- November is ideal in most of the places. Seeds may take several weeks to germinate. Germination is probably pre-vented in rose seeds by inhibitors occurring in the seed coat, as well as by the mechanical restriction imposed by the massive pericarp. The stage of ripeness is an important factor effecting germination. Temperature is another very important factors influencing the germination. Treatment of seeds with sulphuric acid and for 1-2 hours before sowing was found to improves the germination.

Rose seedlings tend to flower even when they are very small and this exhaust themselves. Therefore, the flower buds should be pinched off as soon as they appear, until the plants are reasonably large and sturdy. It is important to keep the seedlings growing continuously without any check in development. A continuous moisture and nutrient supply, control of weeds and of diseases and pests contribute to successful seedling growth.

### VII. Root Stocks

For grafting or budding, proper selection of rootstock is of immense importance. Rootstocks are known to impart marked effects on the vigorous, precocity, productivity, quality of flowers, longevity of bushes, disease resistance, adaptability to soil climatic conditions etc, and therefore, it is necessary to choose the most suitable rootstocks for budding or grafting roses. The rootstock should have the following qualities.

- i. It should produce fibrous root system.
- ii. It can easily be propagated from cuttings.
- iii. It should have vigorous growth habit, be healthy and resistant to diseases and frost.
- iv. Plants should have uniform growth.
- v. It should have a bark, thick enough to hold the bud firmly and provide sap to the budded plant.
- vi. It should be reasonably free from suckers
- vii. It should support the budded plant for a long time.
- viii. It should withstand a wide range of soils and climatic conditions.
- ix. Some of the commonly used rootstocks are given here.



#### **a. *Rosa barboniana* (Edward rose)**

It is one of the most popular stock and used extensively in the northern plains of India. Plants are hardy, vigorous, propagated easily by cuttings, provide straight stems of suitable length and is found useful for budding standards.

#### **b. *Rosa canina* (Dog rose)**

It is usually propagated by seed since the cuttings do not root easily. However, the seeds are difficult to germinate. The prominent thorns make it difficult to handle. It also tends to produce sucker.

#### **c. *Rosa indica***

This is a large climbing shrub and is used extensively as rootstock for greenhouse forcing roses. It is easily propagated from cuttings and under suitable conditions produces a large symmetrical root system. It is well adapted to both excessively dry or wet soil conditions and can withstand high soil pH. Since it is not cold hardy, it should be used only in areas with mild winters. Plants raised on this rootstock are vigorous and produce flower with longer stems. The rootstock is also quite tolerant to powdery mildew and insect pests. In India, it has been recommended for northern plains.

#### **d. *Rosa laxa***

This is well adapted to rich heavy soils and plants budded on it have vigorous growth. It can be propagated both by seed and cutting and have a very good root system.

#### **e. *Rosa manetti***

This is a very old stock used for propagating dwarf roses and for planting in sandy soils. It is easily propagated from cuttings, produces plants of moderate vigour, and is resistant to some strains of verticillium wilt. This rootstock has, however, proved unsuitable for the production of cut flowers in greenhouse.

#### **f. *Rosa multiflora***

This is a widely used rootstock for outdoor roses. Several strains are available, some giving better bud unions and bud development than others. Cuttings of this species root easily, develop a vigorous, nematode resistant root system, and do not sucker excessively. It is adaptable to a wide range of soil and climatic conditions. In India, it does well in Bihar, Bengal and in the hills when used as rootstocks.

### **VIII. Preparation of Beds**

Preparation of soil is the key to success with roses. It should be rich, porous and well drained. The initial preparation of rose beds should preferably be started during summer season, so that soil gets exposed to sun and air and during the monsoon it gets a chance to settle down before planting. The area selected for rose growing should be cleaned of weeds. According to the plan, the borders of the proposed beds should be properly marked.

If the soil is light, sandy and stony, the top 30 cm of the soil in the bed should be dug up to make trench. The dug up soil is heaped on the ground. The next 30 cm of soil in trench should be dug as deep as possible, and properly pulverized and levelled in the trench itself. After that about half portion of the dug out soil, heaped on the ground surface, should be returned to the trench. This layer needs manuring with organic manure @ 50- 60 tonnes/ha or FYM or compost. The remaining portion of the dug out soil should be returned to the trench. Application of superphosphate @ 30 kg/ha, and Aldrin or BHC (5% dust) @ 100 kg/ha is done, and the beds are irrigated thoroughly.

On the other hand, if the soil is heavy it would be necessary to dig out the second 30 cm layer of the soil and heap on the ground

surface. The next layer of the soil should be deeply dug, pulverized and levelled. The second layer of soil after it is pulverized and sun-dried, should be returned to the trench and manured with organic manure. @ 50 tonnes/ha. The remaining operations will be similar as in the case of sandy soil.

## IX. Cultivation

Planting, pruning, application of manures and fertilizers, irrigation, weed control are some of the cultivation practices that are described here.

### A. Planting

Few important preliminaries for planting are given here.

1. Cut away all immature, dead or diseased shoots and snags. Also as far as possible, each shoot to the next outward growing bud should be cut.
2. Remove all suckers growing below the point of union.
3. Reduce the possibility of loss of moisture, leaves including dried and yellow ones should be removed.
4. If the roses are with shriveled bark, immersing of the plants in water for 24 hours is necessary to plump them.
5. Immerse each plant in a suspension of one gram blitox in one litre of water to lessen the risk of attack of fungi.

At the planting time beds should be thoroughly prepared. At the planting time the soil should neither be too wet nor too dry. At each marked spot, a hole measuring 20-30 cm in diameter and 30 cm deep should be dug, and the plant with earth ball should be lowered into the hole. Then the soil around the plant should be pressed firm to avoid air pockets in the soil. The bed after planting should be thoroughly irrigated.

If the rose plants, are with bare roots, the roots along with stem up to the bud union should be dipped in water for about 6 hours before planting, to restore the loss of moisture during transit period.

Planting should be done with the bud union 2.5 -5.0 cm above the soil level. Roses can be planted any time except in very hot summer and during heavy rains when the soil is very wet. The suitable time for planting roses in most plains of India is during September-October and in the hills it is during October-November or February-March. In general a spacing of 60-75 cm between plants and rows is suggested.

### B. Pruning

Pruning refers to the removal of certain portion of plant. It is an important operation for maintenance of floriferousness and flower quality along with vigour of rose plants. The practice of rose pruning consists of two operations.

- i. Thinning out, i.e. removal of old, weak, dry, twigs and diseased stem and branches from the point of start, and
- ii. Shortening of stems, which aims at cutting down of last years growth to a desirable height.

#### 1. Pruning time

The best time of pruning is the period plant is at dormant or near dormant stage. Pruning time will depend entirely on the climatic conditions of the region. The most usual time for pruning is during October-November after the rains are well over and the cold season is approaching. In Bangalore and around the coastal towns of Madras and Bombay pruning is practised twice in the months of November and June for winter season and monsoon season blooms. Pruning in the hills by the end of March or April.

## 2. Where and how to prune

While pruning a plant a cut has been made at about half- a-centimeter above a vigorous bud and the cut should be slightly slanting, sharp and clean.

All wounds are dressed with cane scaler to protect against attack of fungus and cane boring insects. The cut surface may be painted with fungicide or chaubattia paint( prepared by mixing 4 parts of red lead, 4 parts of copper carbonate, 5 parts of linseed oil, and a small quantity of BHC). Spraying of insecticides like rogor or malathion immediately after pruning.

## 3. Types of pruning

Depending upon the extent and level of shortening, there are 3 types of pruning light, moderate and hard. In light pruning, the healthy shoots, left after thinning of diseased and unwanted portion, are cut. Moderate pruning is done by cutting back the ripe 'main and lateral shoots of the previous years growth at about half the length of the growth. Hard pruning consists of keeping only 3 or 4 shoots of the last year and heading back at about 3 or 4 eyes from the base.

As preliminary to the main pruning operation, all weak, diseased, dead and slender growing and overlapping branches are to be completely removed. In the remaining healthy growing shoots, the amount of pruning largely depends upon cultivar and class of rose, the health and vigour of the plant, space provided for each plant, fertility of soil and the desired flower quality etc. Generally, strong and sturdy plants are pruned lightly moderate growers moderately and weak plants relatively hard. If the soil is sandy, and the nutrient level in the soil is not high, pruning should be light. In case of heavy and fertile soils, pruning may be a little harder. Hard pruning is also advisable to obtain blooms with longer stems.

## 4. Pruning of one-year old plants

Rose plants should never be pruned until they are properly established and adapted to the new environment. In the first year of planting the pruning is done of weak, dead and crowded branches to give a definite shape to the plants. The real pruning starts in the second year of the growth of plants. viz. Hybrid Tea and Floribunda groups.

Climbing and rambling do not require any pruning except the removal of weak, unhealthy, dead and interlaced twigs. The polyanthas are pruned lightly whereas the miniatures are not pruned.

## 5. Pruning of established rose plants

### i. Hybrid teas

The established Hybrid Teas should have all dead, weak, damaged and crossing shoots removed from their point of origin, leaving only 4 or 5 healthy basal shoots. It has been observed that hard pruning, reduces the number of flowers per bush but increases the flower size and the length of stem.

### ii. Floribundas

The main object of pruning roses of this class is the production of abundant flowers with mass effect in the bed. It is necessary to remove the mass of twiggy growth at the ends of the main stems and extra growths should be trimmed. Thus light or moderate pruning is the general recommendation for floribundas.

### iii. Polyanthas

The primary objects of pruning roses of this group are to obtain large number of flowers and to give a good shape to the plant. Thinning of dead, weak and overcrowded shoots and tripping of the end of branches that have already flowered are all that is really necessary.

#### iv. Miniatures

Miniatures roses are generally not pruned except the removal of dead, diseased and overcrowding branches. Some of the older stems may also be pruned to make a well balanced compact bush which is the most desirable character of this class.

#### v. Climbers and ramblers

The hybrid tea climbers hardly need any pruning because it is desirable to promote the growth of the lateral and side branches to bear flowers. The best flowers are produced on the short branches that emerge from older canes. So they require only removal of tips. The climbing Floribunda, Polyanthers and some shrubs of the Hybrid Musk group only bloom in the new wood.

#### vi. Standard

Standards which are generally hybrid teas or floribundas do not need drastic pruning. Growth which comes in the way of its main stem, should be removed to give symmetry to the plant.

#### vii. Shrubs

In general, the majority will not need any pruning but they may be cut back to keep them in shape. The weak and dead shoots should also be removed.

#### viii. Species of roses

Rose species and their allies also need no pruning. Once established and growing strongly, the dead and weak growth of the plants should be removed entirely from the base in the first year itself.

### C. Manuring and fertilization

Rose is a nutrient loving plant and both major and micro nutrients play an Important role for its proper growth.

#### 1. Manures

Organic manures like FYM, oil cakes, bone meal etc. are very essential which supply

plant nutrients and maintains a good soil structure. Green manuring with sunnhemp and dhaincha can also practised. For the light soils, cattle manure and for the heavy soils horse or pig manure are best suited.

##### a. Rate of application

Sandy soils need heavier and more frequent application of organic manure than heavier soils. Application of well decomposed cowdung or FYM @ 8-10 kg/plant (4.5 tonnes/ ha) has been found useful for the growth and flowering of roses.

##### b. Time and method of application

The bulky organic manures in order of preference may be FYM, compost, cow dung slurry from biogas plants, cattle dung and activated sludge. Oil cakes and droppings of poultry, sheep or goat (@ 1 litre/plant) may be used for supplemental manuring. The quantity of these manures is smaller than in the basic manuring. Basic manuring in case of new planting should be done at the time of preparation of rose beds.

Supplementary manuring should be done after the first flush of blooming is over and there is pause for the next flush. The manure should be spread in a band around each rose plant, at least 20-30 cm away from the stem or between the rows of plants.

##### c. Liquid manures

Manures are decomposed in water so that plant nutrients from complex organic forms are converted to simple soluble forms. The liquid when applied to the soil reaches the plant roots directly and provides them with nutrient elements in readily utilizable forms. Excreta of animals and oil cakes after rotting are also used as liquid manure. The diluted liquid becomes lighter than that of tea liquor. The liquid (about 1 litre) is put around each plant, about 20-25 cm away from the stem. The soil should be moist at the time of liquid manuring. The application may be repeated at an interval of 5- 7 days till the flower buds start opening.



## 2. Inorganic fertilizers

For sustained production a plant health it is essential to apply fertilizer to roses. Urea, single superphosphate and both potassium sulphate and muriate of potash are the widely used fertilizers. The most common practice is to apply these fertilizers mixed to the soil in certain proportions, known as fertilizer mixtures. Micronutrients are usually supplied through foliar sprays.

### a. Fertilizer rates

For improving the growth and flowering of roses, some formulae of the mixtures are given here. (by weight)

i)	Groundnut cake	-5kg
	Bonemeal	-6kg
	Ammoniumphosphate	-2 kg
	Ammoniumsulphate	-1 kg
	Single superphosphate	-2 kg
	Potassium sulphate	-1 kg
ii)	Nitrate of potash	-6 parts
	Ammonium sulphate	2
	Superphosphate	-16"
	Sulphate of potash	-8"
	Magnesium sulphate	-2
	Iron phosphate	-1/2

This mixture is applied @ 50-100 g/plant.

### b. Time and method of application

Fertilizers are applied in three split doses and application should be made when there is sufficient moisture in the soil. Normally, the first application of the mixture is given about 15 days after pruning when the new growth has started. After the first flush is over the second does of fertilizer mixture is applied.

The method of application varies according to plant density and size of the plants. If the plant density is low, the requisite quantity of fertilizers mixture can be applied in a continuous band around the plant, 20 -25 cm away from the stem. If the plant population is fairly large, the fertilizer dose should be fixed according to smaller units and placed in continuous band in between the rows of plants, also between the plants and edges of the borders. The applied fertilizers incorporated into the soil but should not be deep.

### c. Liquid fertilizers

A solution prepared by dissolving 0.680 gm KNO<sub>3</sub>, 340 gm ammonium sulphate and 170 gm potassium phosphate in 432 litres of water and applied at the rate of half gallon per plant three times a week for a month and thereafter once a week before slow, produced outstanding blooms suitable for exhibition. Another solution prepared by dissolving ammonium sulphate, 56.6 gm superphosphate and 28.3 gm sulphate in 36 litres of water and applied at 9 litres per plant is also found very useful to improve the quality of flowers.

The advantage of this method is that the nutrients in solution reach the plant roots immediately for utilization. The disadvantages are the extra cost of application, the risk of toxicity and fixation of phosphates to soil, rendering it unavailable to plants. As a regular feeding of rose plants this practice seems unnecessary.

### d. Foliar feeding

This is an excellent supplement to root feeding because the leaves can directly absorb the nutrients. At minimizes the amounts of fertilizer mixture used. The concentration of solution should not be very high (not more than 0.3%) it damages the leaves.

For supply of macronutrients, the composition of the spray solution should be 7 gm of potassium sulphate, 14 gm ammonium sulphate, 28.3 gm potassium nitrate in 36 litres of water and is applied @ 1.36 g/litre. Good results can also be obtained by using ammonium phosphate and potassium nitrate in equal proportions by weight, and applying the mixture @ 2.5 g/litre of water.

In case of micronutrient deficiency foliar application of a solution prepared from the mixture containing 15g manganese sulphate, 20 g magnesium sulphate, 109 chelated iron I and 5g borax @ 2g/litre has been found very effective for obtaining brighter colour in flowers and foliage.

e. Combination of organic and inorganic manures

A pot mixture of 14 kg castor-cake, 9.5 kg finely powdered charcoal, 226 gm super phosphate, 113.2 gm carbonate of potash, 113.2 gm nitrate of soda, 283 gm leaf mould and 45.5 kg loamy soil is helpful for obtaining increased yield of flowers.

### D. Irrigation

Adequate soil moisture at all stages of vegetative growth and flowering is essential for the rose plants to meet the water loss through transplantation and evaporation from soil. Water requirement also depends upon the size of the plant and the growth period.

In lighter soil more frequent irrigation is required than that in heavy soil. Rose beds can be watered once a week or 10 days in winter and twice a week during summer season.

### E. Mulching

Mulching conserve soil moisture, supply humus making material and suppress weeds resulting in improved growth and flowering. Mulches also keep the soil some what cooler in summer.

Among the substances used for mulching, well rotten garden compost, FYM, Peat, straw sawdust, ground or whole corn cobs and other similar materials make satisfactory mulches. Mulches can be applied soon after the newly benched plants are established and growing satisfactorily.

### F. Hoeing

Light hoeing is a very effective way to keep the soil porous so that light, air and water may reach the roots better to improve moisture retention capacity and to keep rose beds free from weeds. Roses are shallow rooted plants and roots of established plants tend to grow near the surface. Therefore, shallow hoeing is preferred.

### G. Weed control

Weeds pose a very serious problem in rose cultivation as they not only consume water and nutrients from the soil, but also act as hosts for a number of diseases and pests. Manual weed control is effective if done frequently. Chemical weed control is comparatively economical, convenient and efficient in eradicating weeds. Application of CMU and DCMU four to five weeks after planting in late December and early January controls all weeds, in a rose nursery.

## X. Diseases and Pests

Major diseases and pests on rose are given here.

### A. Diseases

Like any other crop, roses are also prone to many diseases, some of which have been found to be very destructive. The most important diseases and the measures for their control are described here.

#### 1. Die-back

The causal organism is a fungus namely *Diplodia rosarum*. The disease causes death of the plant from top to downwards.

When plants are pruned, sometimes, blackening of twigs starts below the pruned surface which extends further down, killing the whole plant. The older plants are more prone to the attack of the disease.

#### Control

- a. Cut the affected parts and burn it.
- b. The secateur should be disinfected with spirit and the cut ends immediately coated with a paste containing 4 parts of copper carbonate, 4 parts of red lead, and 5 parts of linseed oil.
- c. Add 0.1 % BHC to the paste to check the digger wasp attack.
- d. Grow resistant varieties like white Christmas, royal ascot, blue moon and crimson glory .

### 2. Black spot

This disease is caused by *Diplocarpon rosae* characterized by dark brown, circular spots with fringe borders, present on both sides of leaflets. At a later stage, the leaves becomes yellow and fall. If left uncontrolled, the whole stem is defoliated and the plant becomes weak. Leaf buds and the flower buds are also affected.

#### Control

Since the black spot fungus is located under the protecting cuticle, no fungicide can kill it without destroying the leaf. Hence, cure of this disease is difficult and prevention seems to be the only hope. The infected leaves, as soon as they are observed should be clipped off, taken out of field and burnt. Preventive sprays of fungicides like Zineb reduce the damage to a large extent. Martin Frobrisher, Belaya , John Cabot, and Carefree Beauty are also found to be resistant to black spot disease.

### 3. Rose wilt

It is a viral disease caused by *Marmor flaccumfascines*. The first symptom appears in the form of recurving of leaflets at the tip

of young shoots which are brittle. Defoliation may happen, with leaves turning yellow and falling off. The stem also gets infected and the whole plant dies. In epidemic form, one infected plant could ruin the whole garden within a couple of years.

#### Control

Control of aphids, which transmit the disease, helps to control the infection. The affected plants should be removed and burnt.

### 4. Rose mosaic virus

Chlorotic areas along the midribs of the leaflets and localized distortion are the principal symptoms. Sometimes one finds ring and watermark pattern. Another strain of this virus causes brighter and light yellow patterns.

#### Control

Diseased plants should be destroyed and never used for propagation.

## B. Pests

Roses attract a large number of pests which cause considerable damage. At almost every stage, be in the nursery or in beds, rose plants are prone to attack by various pests. Some of the commonly reported insects and other pests attacking roses are mentioned in detail here.

### 1. White ants

White ants also known as termites cause damage to rose plants even before they are established. Small colonies are formed inside the soil and the insects multiply very rapidly during the rainy season. The insects destroy the underground parts including the roots of the young as well as old plants. Sometimes rose plants wither.

#### Control

Apply .5% BHC or Aldrin in the pits before planting roses. Drenching of rose beds with Aldrin also controls the damage in established gardens.

## 2. Red scales

They infest roses in the green house and in the garden and the affected branches become dry. The insects can easily be detected by the reddish brown encrustations on the lower portion of old stem and at times the younger shoots also which sucks the plant sap.

### Control

The menace can be removed by rubbing the scurfy encrustations with a used tooth brush, or a cotton swab dipped in methylated spirit. Spraying the affected plants with insecticides like malathion or rogor will control the insect. Application of granular insecticides like carbofuron at 1.5 kg a.i./ha and Disulfoton and Phorate at 3.0 kg a.i. /ha also gives good control of rose scales.

## 3. Jassids (Leaf hopper)

These are very small, light grey or pale green insects which suck the cell sap from the leaves. It causes yellowing or whitening of the attacked surface, giving the plants a sickly appearance.

### Control

Jassids can easily be controlled by spraying with 0.03% parathion, 0.1% Metacid or 8% Thimet as soil application. The use of 0.05% Monocrotophos is also effective in controlling jassids.

## 4. Red spider mite

As result of their feeding, white specks appear on the leaves and these specks coalesce and appear as white patches. Ultimately, affected leaves become mottled, turn yellow and fall. Some polyantha and floribunda roses completely lose their leaves prematurely due to the attack of this pest. The damage is more pronounced during warm and dry season.

### Control

Frequent spray with sulphur helps to control this mite. Several mite-killers such as

kelthane morestan, dimite, Tedion have been reported to be very effective in controlling rose mites, 1 ml of kelthane is thoroughly mixed with 10 m of water with 10-15 drops of any sticker and application of this chemical every 5 or 6 days may be sufficient to control the mites. Spraying the affected plants with 0.05% parathion or 0.1 % Metasystox is also suggested.

## XI. Harvesting and Post-harvest Handling

Time and stage of harvesting, storing and transportation of the flowers are the important aspects to be considered.

### A. Harvesting

The stage at which flowers should be cut, either for decoration or for despatch, is the tight-bud stage when the buds show full colour but the petals have not yet started unfolding. If harvested at this stage, they last longer and retain colour and freshness during transportation. If a flower bud of red cultivar cut at a little earlier stage it fails to open later. Pink and red cultivars should be allowed to develop to a stage where one or two of the outer petals begin to unfurl. Loose flowers, used for making garlands, preparing perfumes etc. are harvested only when they are fully open and collected in large open baskets.

The flowers should be cut in the early morning before sunrise or late in the afternoon when the sun is about to set as to avoid damage of buds due to high temperature during the day. Late harvest results in short vase life of cut flowers and low oil content in loose flowers used for preparing perfumes. For cut flowers, stem with two, five leaflet leaves should be cut and immediately dipped into clean water up to the base of the flower buds. The delay in keeping the flowers in a bucket of water will cause air entry and result in vascular blockage. The stems should be cut in water



about 2 cm above the previous cut end. If they are not required for immediate use, the cut-flowers along with stems dipped in water in the bucket should be stored at a cool air temperature of 4.4 -7.2 C for about 6-12 hours to harden the buds and thus enhances their keeping quality. During winter (December-January) a shorter treatment for 6-8 hours is sufficient while a longer duration of 8-12 hours is required in March-April.

### **B. Packaging**

The cut blooms are graded according to the length of stem and then packed in corrugated card-board boxes. The size of box varies with the quality and quantity of roses to be packed. The inside area of the box will be cushioned with polythene or soft materials. The blooms are generally packed in bundles. The upper half of each bundle having flower buds is wrapped in a corrugated paper which is fixed with an adhesive tape. Labeled flower bundles are placed opposite to another in such a way that their flower buds face the sides of the box and their stem ends towards the centre of the box. The inside of the box is finally covered with a sheet of tissue paper before putting on the cover of the box. Along the outer edges of the box, adhesive tapes can be fixed to close it.

### **C. Yield**

The yield of cut-flower depends on a number of factors such as type of cultivar, and cultural practices adopted from time to time. Gold strike and pink garnette, are high yielding cultivars which produces 24-28 flowers per plant. Sonora and Coral princess give low yields (15 flowers per plant per years) of 60% grade. Plant density has much influence on the yield of quality blooms per unit area. About 1,20, 000 cut flowers of exportable quality from an area of one hectare is obtained by close planting and providing plastic cover over the plants during November-February. In an essential oil-bearing rose, a yield of 6977

kg petals per hectare was recorded when planting was done at 2.5 x 0.5 cm apart. One of the best methods for maximization in yield and quality of flower is through balanced application of fertilizers.

## **XII. Importance and Uses**

The rose, because of its utility, occupies a pre-eminent, place amongst the flower crops and is one of the oldest of fragrant flowers to be cultivated by man. Its different types having beautiful flowers of exquisite shape, different sizes, bewitching colours and most delightful fragrance has made it an important flower or its varied uses. The various ways in which rose can be used are mentioned in detail here.

### **A. Exhibition and decorative purposes**

Varieties of roses which are most suitable to a particular type of decoration are given here.

#### **1. Shrub or bush**

Shrub or bush roses are planted in small groups at a height of 5-10cm from the ground level to create excellent mass effect in a rose or flower garden. They may also be mixed with other plants in a shrubbery, e.g. christian, midele double delight, first prize, gladiator, kiss of fire, midle meilland, montezuma, paradise, peace and super star.

#### **2. Standard Rose**

Standard rose or tree rose, is a very important feature in the rose garden. They are allowed to form buds only at the top leaving the entire stem clear of any vegetative growth. According to their height of budding they may be full standard (1.0 -1.5 metres high), half standards (45-60 cm high) or weeping standard (1.6 5m or higher above the ground). Hybrid Teas and few grandiflora are suitable for making the frill standard roses. Floribunda and Polyantha roses are excellent for growing as half standards. For weeping

standards, climbing and rambling roses are used as the long branches of the crown may be allowed to hang down.

### 3. Climbers

The climbing and rambling roses can be used to cover the walls of houses or fencing or pergolas, arbours and arches. Ramblers produce flowers only once in a year and flowers are in clusters lasting for several weeks. The beautiful climbers and Ramblers like America pillar, Blaze, Delhi Pink Pearl, Don Juan, Golden showers, Lamargue, Mardan white, Mardan Pink, Marechal Neil, royal gold add to the beauty of the garden.

### 4. Hedges and edges

A rose can also be used for making hedge or edge. Rose hedges except when pruned, remain full of life and colour and give protection due to the presence of thorns. Vigorous Floribundas are suitable for hedge and if necessary the plants can be planted in two rows. Some suitable cultivars are Border coral, Circus, Frensham and Runiba, Climbing or rambling roses may also be used for making tall hedges. Rose cultivars like coral in, Lady Reading, Magic, white Button etc. may be used for making edges.

### 5. Rockery

Roses may also be grown in rockeries and for this purpose hardy miniature and pompon cultivars such as Fairy Queen and Magic may be selected.

### 6. Pot plants

Roses can be easily grown as pot plants in suitable containers kept both indoors as well as outdoors. For balconies and terraces which receive limited sunlight miniatures and dwarf polyanthas should be selected. The cultivars like Baby Darling, Cinderella, Starina etc. are quite suitable for this purpose. Bush roses may also be grown in pots for beautifying the compounds around the building and for display in rose shows.

## 7. Hangers

Miniatures can also be grown in hanging baskets and cultivars suitable for making rose hangers are climbing Miniatures-Red cascade and Yellow Doll.

### B. Cut-flowers

Apart from making garlands, bouquets, button-holes their use for worship in temples, rose makes one of the best cutflowers and as such is in great demand in the internal as well as foreign markets. Germany is the biggest consumer and importer of cut-flowers. Rose cut-flowers are being exported from Maharashtra (India) to the Middle East countries.

Rose cut-flowers arranged in flower vases look extremely beautiful and they have a rightful place in the scheme of interior decoration. In general, cultivars with more petalage and opening slowly with long lasting quality are chosen as cut flowers. Some of the cultivars suitable for this purpose are Christian Dior, Happiness, Montezuma, Queen Elizabeth, Sea pearl and Super star. Presently cvs. Belinda, Golden Times, Illona, Laminette, Montreal, Mercedes, Red Success, Sonia Meiland are in great demand as cut-flower in foreign markets. Two Indian or Arjuna and Raktagandha producing flowers with long stems are also suitable for cut-flowers.

### C. Perfume and allied products

Oils, perfumes and other products made from rose petals are of superior quality.

#### I. Rose oil (Rose perfume)

Rose oil is an important commercial product obtained from rose petals. Apart from sweet fragrance it has medicinal value and is often used in Ayurveda. Bulgarian rose is largely used in perfuming soaps and cosmetics. Limited quantities of the oil are used in flavouring soft drinks and alcoholic liquors.

Rose oil has antibacterial property. The commonly grown rose species for rose oil are *Rosa damascena*, *R. borbonians*, *R. centifolia*, *R. alba* and *R. Gallica*. In India, *R. damascena* and *R. borborniane* are cultivated for rose oil.

Though France, Cyprus, Greece, India, Iran, Italy, Morocco and the USA are important countries producing roseoil, Bulgaria is a major producer and exporter of the roses and the rose perfumery .The oil is extracted by steam distillation and its quality depends much and cultivars and stage of picking. Generally 1 Kg oil is obtained from 3,000-4,000 kg petals. Among the different species, *R. Damascena* gives the maximum oil yield. *R. borboniana* and *R. teptiz* are also good. The principal constitutents of normal rose oil are l-citronellol (40-65%), Geraniol, neroll-linalool, phenyl ethyl alcohol, small quantities of esters, nonyl aldehyde, citral, engenol sesquiter penes and the vaxy constituent stearoptene.

To obtain good quality rose oil, the flowers are to be harvested early in the morning, as the percentage of volatile oil decreases with the advancing day.

## 2. Rose water

Rose water is also an important commercial product obtained from rose petals. It is used as a perfume and in medicines and confectionary. It has the property of cooling the body and is often used in eye lotion and eye drops for its soothing qualities. It is also used in drinking water and social occasions. The roses used for preparing oil are also used for making rose water.

## 3. Gulkand

Rose petals are also preserved for direct consumption by making gulkand which is prepared by pounding equal proportions of

petals and white sugar. It is considered both a tonic and laxative. *Rose damascena*, *R. chinem's.*, *R. Gallica*, *R. ponifera* and some other scented roses. e.g. Edouard are used for preparing gulkand.

## 4. Pankhuri

Dried rose petals are known as 'pankhuri' which is occasionally used for preparing sweetened cold drinks.

## 5. Gul-roghan

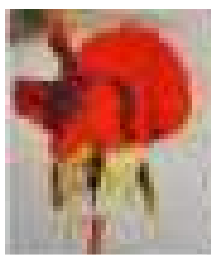
It is a rose hair oil prepared from rose petals by enflurage with wet sesamum seeds.

## D. Source of vitamins

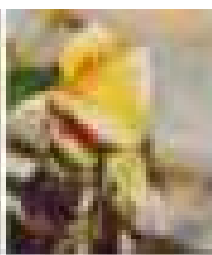
Rose hips are a very good source of ascorbic acid, i.e. vitamin C. Every 100g of rose hips syrup contains 150 mg of ascorbic acid as compared with only 50 mg present in fresh orange juice, 20 mg in tomatoes and 5 mg in apples. The ascorbic acid content, however, varies with species and some of the promising vitamin C bearing species are *R. rugosa*, *R. ambhyotis*, *R. aciculari*, *R. davaricas*, *R. pendulina*, *R. glauca* and *R. canina*. Apart from Vitamin C, the hips of *R. roxburghil*, *R. acicularis*, *R. rugosa*, *R. davurica* and some of the species are found to contain vitamins, A<sub>i</sub>, B<sub>2</sub>, K and E.

## E. Other Uses

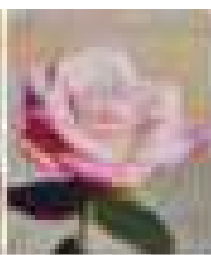
In Europe, roses are used for making pot-pouri, conserves, rose vinegar and rose petal wine. Jams, jellies and syrups have been made for centuries in Bulgaria and exported. Rose aids in digestion and has certain curative properties. In Czechoslovakia, fruits of wild roses are used for preparing a hot drink like tea and a popular wine. In America, bushes of *R. multiflora* are utilized as shock absorber or crash barrier.



Hybrid tea Black tea Brownish red



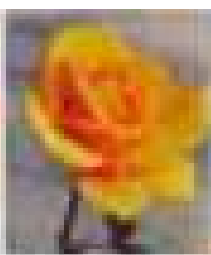
HT rose Hotel calofornia Yellow



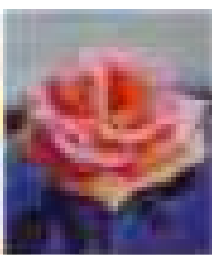
HT rose scandia Mauveblend



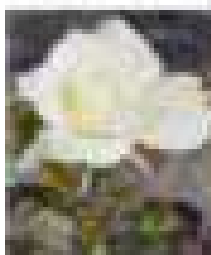
HT rose sweet water Salmon orange



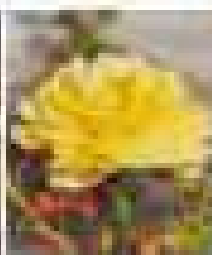
HT rose sungodess Golden



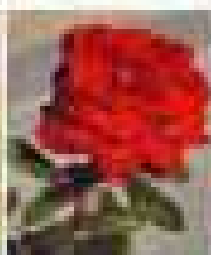
HT rose scentsation Peach blend



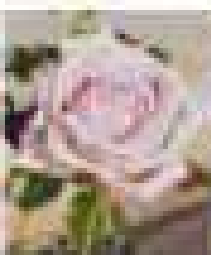
Hybrid tea White arrow White



Hybrid tea Kanchan Yellow



Hybrid tea Norma Red



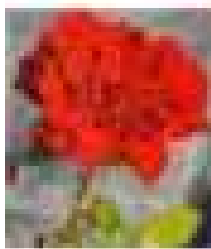
Hybrid tea Majestic Pink



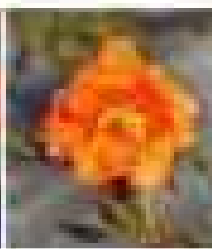
Hybrid tea Maria shriver White



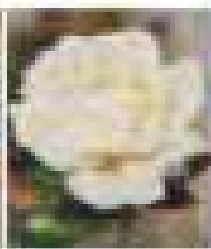
HT Rose Mother of pearl Pink with apricot



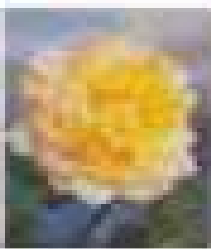
HT Rose Marcel pagnol Red



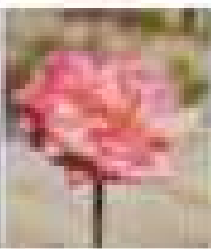
HT Rose Hot romance Orange blend



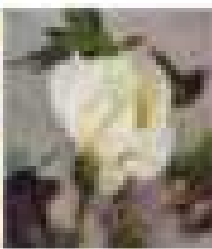
HT Rose Elvis White



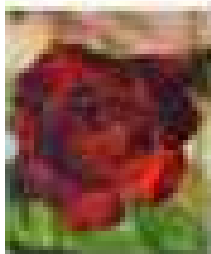
HT rose Shanghai autumn Yellow blend



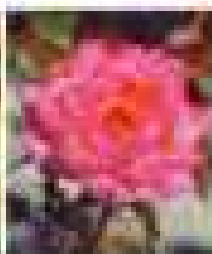
HT rose Sweet promise salmon orange



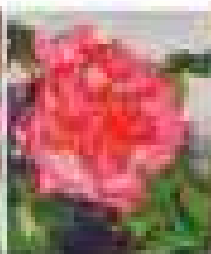
HT rose Delicate beauty White



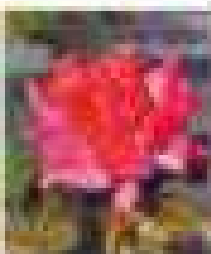
HT Rose Ashwini Blackish crimson



HT rose dream come true Bicolour



HT Rose Celebration day Pink blend



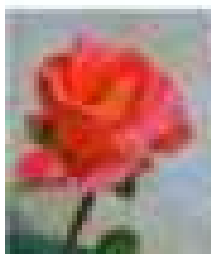
HT Rose Espresso Chocolate vermilio



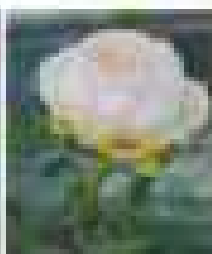
HT Rose lco delight sport White



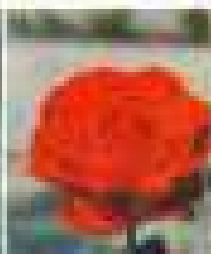
HT Rose Rose osaca Deep red



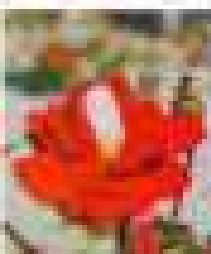
HT Rose Ksg manas Salmon yellow blend



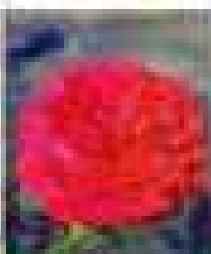
HT Rose Lily the pink Pink



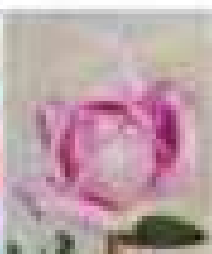
HT Rose Reba mcintire Deep Orange



HT Rose Fire and ice Bicolour

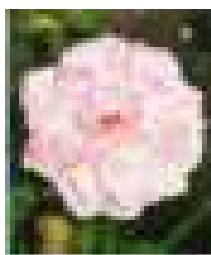


HT Rose Janice Kellog Red

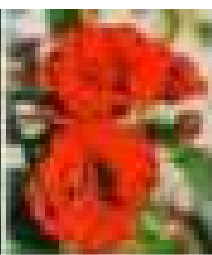


HT Rose Blue time Mouve

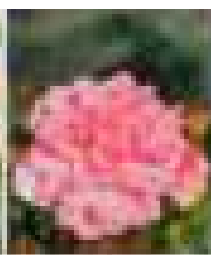




Floribunda cream abundance Creamy pink



Floribunda Lavaglut Blackish red



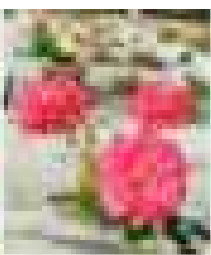
Floribunda bewitched Fuchsia pink



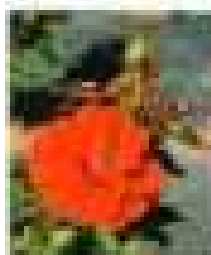
Floribunda living fire Bicolour



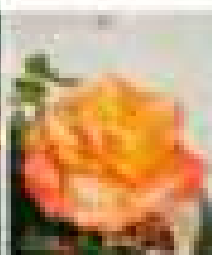
Floribunda raven Red



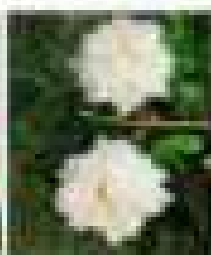
Floribunda deep purple Deep lavender



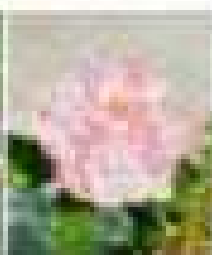
Floribunda remembrance Scarlet



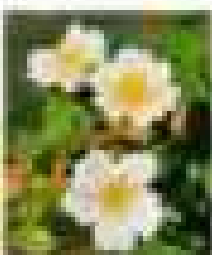
Floribunda Harkness marigold Peach blend



Floribunda Clara Silvery white



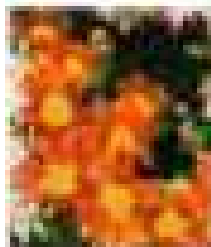
Floribund Home & Garden Pink



Floribunda Gebruder grimm Bicolour



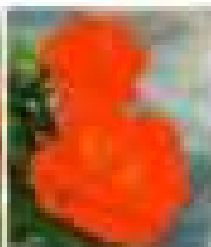
Floribunda Irene Apricot blend



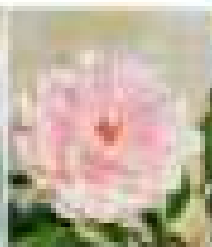
Floribunda Embrsement Scarlet crimson



Floribunda Autumn spray multi colour



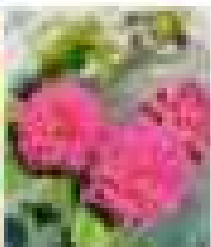
Floribunda For your with love Orange vermilion



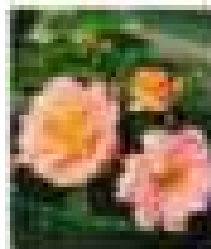
Floribunda Roserarses de chatlet Pink



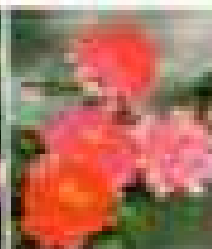
Floribunda Red hot Red



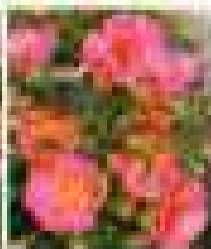
Floribunda Ebbtide Purple



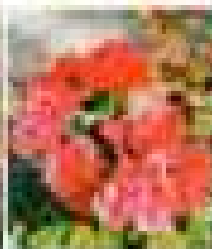
Floribunda Cubana Brilliant apricot



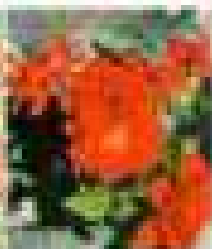
Floribunda Love struck Pink



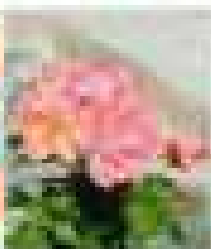
Floribunda Neon Multi colour



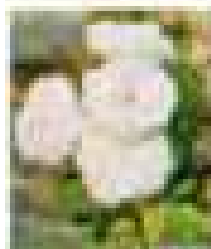
Floribunda Red Finess Red



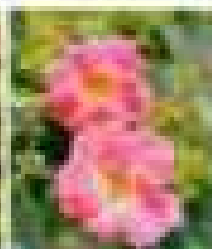
Floribunda Profumo Rosso Red



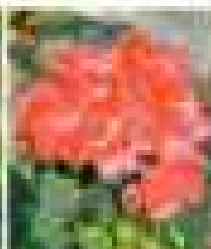
Floribunda Gisella Coral pink



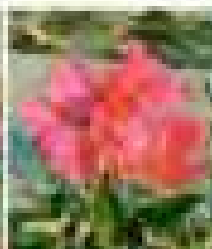
Floribunda Fairy White White



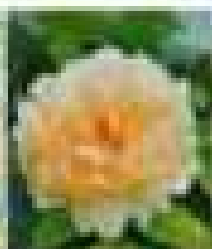
Floribunda Bad Worishofen Rosepink



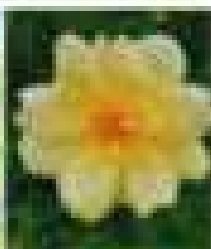
Floribunda Bad brambach Pink



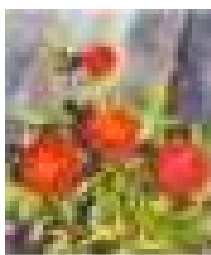
Floribunda Careless Beauty Pink



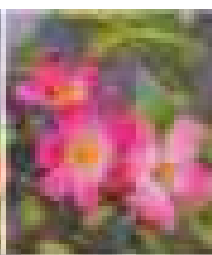
Floribunda Silvina Donvito Yellow blend



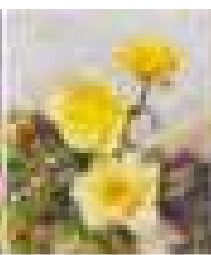
Floribunda Golden memories Yellow



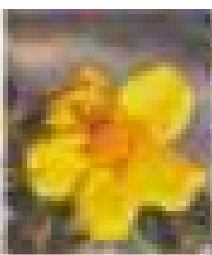
Miniature Phoenix  
Bright red



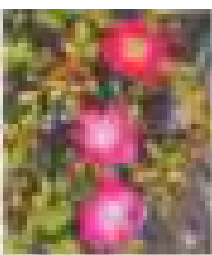
Miniature Candy  
free Pink



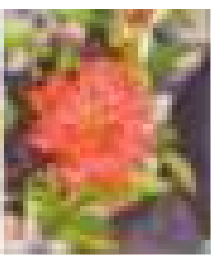
Miniature yellow  
fairy Yellow



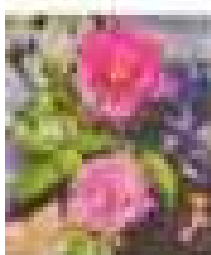
Miniature Baby  
love Yellow



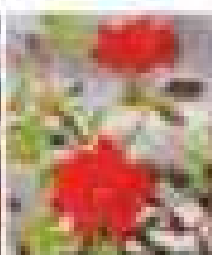
Miniature Lupo  
Bright pink



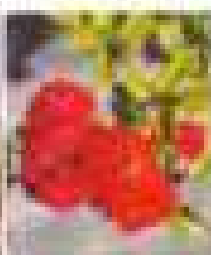
Miniature  
Petitefolie  
Vermillion Orange



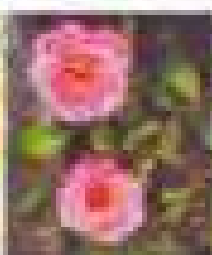
Miniature Incognito  
Lavender gold



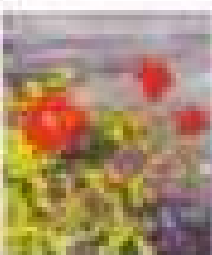
Miniature Red  
beauty Dark red



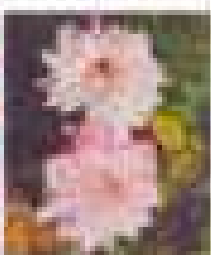
Miniature Red fairy  
Scarlet red



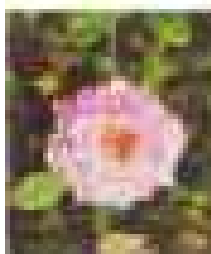
Miniature Magic  
carrousal White &  
pink



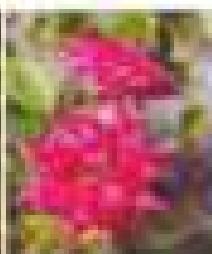
Miniature Spray  
delight Scarlet



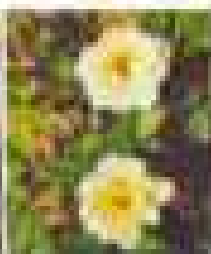
Miniature Choo  
Choo Soft pink



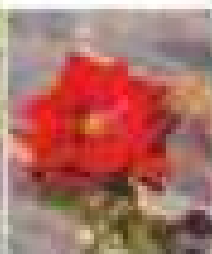
Miniature Libby  
White & pink



Miniature Wild  
plum Lavender



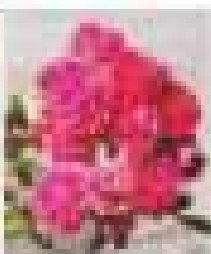
Miniature Flower  
power gold Yellow



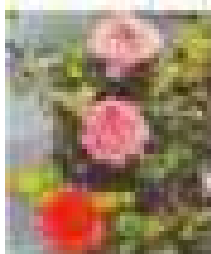
Miniature George  
best Red



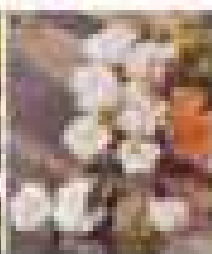
Miniature Janna  
sport Bright pink



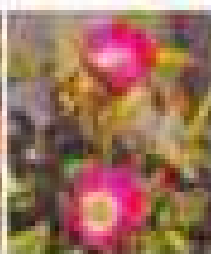
Miniature Pink puff  
Pink



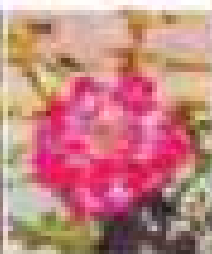
Miniature Cindy  
Carmine pink



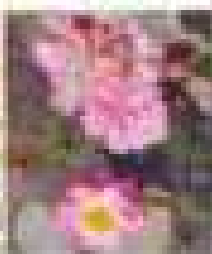
Miniature Ice fairy  
Ice white



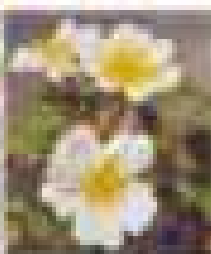
Miniature Sanjit  
Pink



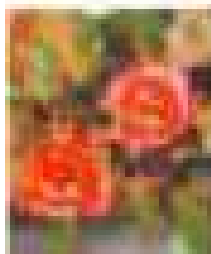
Miniature Hot &  
howler



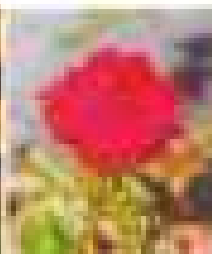
Miniature Happy  
trail Bright pink



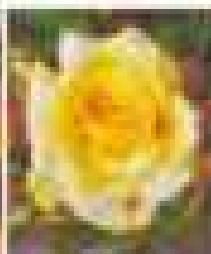
Miniature Tear  
drops White



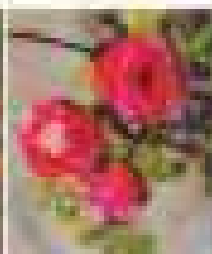
Miniature Hula girl  
Orange



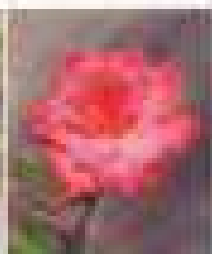
Miniature Don don  
Red



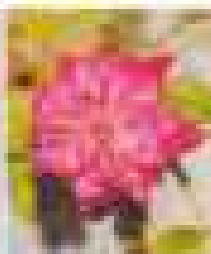
Miniature Careless  
moment Bicolour



Miniature Blue  
blood Red



Miniature Orange  
flame Orange



Miniature Over the  
rainbow Pink blend

# CHAPTER - 15

## LAWNS

### Some facts about Lawns:

Lawns and yards transform strangers into neighbors, neighbors into neighborhoods, and neighborhoods into communities.

Rainfall, Erosion and Recharge:

- Lawns are ten times better at soaking up rainfall than crop farms, they serve as rainwater harvesting pits.
- Grass is exceptionally good at preventing erosion. Rain will remove up to 2200% more top soil from bare earth than from a lawn. Properties of Grass:
- Grass is the only plant which responds to severe cutting with increased growth.

### Cleaning up pollutants:

- The microorganisms in a turf grass/soil ecosystem can clean up petroleum products, metals such as lead, copper, zinc, and cadmium, and a variety of organic chemicals, including pesticides.
- An acre of grass will absorb hundreds of pounds of sulfur dioxide every year.
- Lawn grass can be used as the last step for treating domestic wastewater.

### The Lawn Ecosystem:

- A turf grass ecosystem the size of a football field can support up to 13 lakhs earthworms.
- Grass enriches the soil by adding over 2600 kgs of organic matter each year to an area the size of a football field.

### Watering:

- Lawns require less water than shrubs or trees.

- Excessive usage rates for watering are a people problem, not a plant problem.
- Restrictions on watering and irrigation during local drought conditions can save potentially significant amounts of municipal water with no lasting harm to lawns that are allowed to go dormant. But the restrictions have to be done right.

### Lawns & the Environment:

- A 50' x 50' square of healthy lawn supplies enough oxygen for a family of four.
- More and more homeowners are leaving grass clippings on the lawn where they belong and where microorganisms can recycle the nutrients.
- Lawn pesticides are not harming the environment. Lawn fertilizers properly applied at the right times will stay in the lawn. They will not be washed away by rain or leached down into the subsoil.
- They stay where they are applied, and they are broken down into benign components in short periods of time. They do not accumulate. Where traces are found, they are in harmlessly low concentrations of a few parts per billion.

### Lawns & Health:

- Regularly mowed lawns will produce a minimum of pollen and look green all around the year.
- Nothing beats turf for safety and comfort on play areas of children and recreational areas.
- Majority of the gardeners who do all or part of their own yard work; consider it a healthy physical and mental exercise.

- A well-tended lawn and garden will harbor fewer snakes, rodents, mosquitoes, ticks etc. than untended areas.
- 60% of the garden lovers say that the primary benefit of their avocation is peacefulness and tranquility.
- Horticultural therapy is a recognized therapeutic tool.

### The Economics of Lawns:

- Homeowners say a well-maintained lawn can add 15% to the selling price of a home. Appraisers estimate that attractive landscap-ing adds at least 7% to the appraised value of residential property.

### Grass & Lawns:

S. No.	Name	Common Name
1.	Cynadon dactylon.Sp	Bermuda Grass
2.	Cynodon dactylon.Sp	Calcutta Doob Grass
3.	Festuca.Sp	Fescue Grass
4.	Paspalum notatum	Buffalo Grass
5.	Poa prapensis	Kentucky Blue Grass
6.	Stenotaphrum secundatum	St. Augustine Grass
7.	Stenotaphrum secundatum Ver	St. Augustine Variegated
8.	Zoysia japonica	Jade Velvet Grass
9.	Zoyasia matarella	Korean Carpet Grass
10.	Zoysia teunifolia	Mexican Grass

### Lawns:

1. Turfed lawns give instant garden effect. Even the dibbled lawns take good shape within 2-3 months time.

2. Lawns prevent dust rising and avoids slushiness during rains, and provide good pavement effect.
3. Walking bare footed on lawns gives best satisfaction and health.
4. Will act as backdrop for other garden features like flower beds, edges, shrub, ground covers.
5. Lawns are the best permanent ground covers.
6. Lawns provide excellent sit out place for the family and small gatherings.
7. It is cool and refreshing in summer. It is pleasant and relaxing in winter.
8. For children lawns provide an excellent space for playing.
9. Any home garden is incomplete without a lawn, smaller or bigger.

### Tips for Lawn Laying:

1. Dig out the soil for 16" depth.
2. Pick out weeds, stones, Bricks etc.,
3. Give required shape as gentle slope, terraces, mounds etc.,
4. Spread 4"-6" thickness of weed free red soil, break clods.
5. Wet the land and if there are any shrinkages cover with extra red soil.
6. Turfing or dibbling of selected lawn species such as Calcutta doob, Fescue, Burmuda varieties like Sun bird, transcontinenta I, Mexican or Korean Carpet etc.,
7. Immediately after dibbling sprinkle water, followed by regular daily watering.
8. Rolling of lawn may be done for better set.
9. Application of neem cake, urea, vermi-compost and water whenever lawn become pale green or sickly.
10. Periodic lawn mowing and spraying. (Mow Fescue or Burmuda grasses every 15 days and carpet grass every 60 days).



## Turf Varieties



### **Hybrid Bermuda Selection 1 (Cynodon Dactylon)**

Fast growing soft variety, suitable for well drained areas with moderate rainfall. Fast to root, suitable for very large areas. Repairs itself quickly from damage caused by sports fields, party lawns and public parks. Requires frequent mowing to be kept in top condition.



### **Korara (Zoysia Matrella)**

Slow growing dense grass, slightly shade tolerant, requiring infrequent mowing at a level of 5". Useful for small areas, semi-shaded, slightly saline and a little prickly. Mowing this variety is comparatively difficult.



### **Paspalum (Paspalum Notatum)**

Suitable for all areas including very heavy rainfall and large lawns. Tolerant to shade. A company subvariety. Grows aggressively and mowing needs.

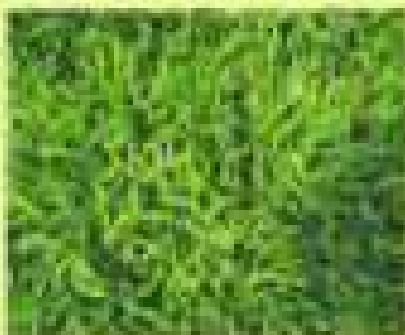


### **St. Augustine Grass (Stenotaphrum Secundatum)**

Dark green dense grass, broad flat blades, commonly known as "mammee". Grows best in protected areas, underneath trees. Tolerates heavy rainfall, most suitable to create a difficult situation where grass cannot be put in shade.



## Turf Varieties



### Centipede (Eremophila Opuntia)

Warm-season, dense, grass seedling to coarse textured grass that requires low fertilization & maintenance. Excellent growth in humid climates, withstands major submergence. Ideal for large to small with heavy traffic and humid climate such as the Southeast.



## Turf Selection Guide

Variety	Color	Texture	Shade Tolerance	Maintenance	Ideal For
Tifton Bermuda Selection 1	Dark Green 	Very fine and soft	II	Moderate to High	Sports Fields, Public Parks, sunny areas of heavy usage
Korean (Zoysia Matrella)	Leaf Green 	Medium coarse, little archy	II	Moderate	Small areas, light use, semi-shade
Paspalum Notatum	Emerald Green 	Medium coarse	II	Low	Landscape, ground cover and conservation, shaded areas
St. Augustine Green	Dark Green 	Semi-coarse	II	Moderate	Landscape, ground cover and conservation, shaded areas
Centipede	Medium Green 	Medium coarse	I	Lowest	Heavy use, Public Parks, coastal areas

\*The color reflected during a full sun. The actual green color will vary depending on soil fertility & climate conditions.

# CHAPTER - 16

## CHRYSANTHEMUM

Chrysanthemum is next only to rose in importance among the flowers in the world. it is versatile, can be planted in the bed, cultured in the pot, used for garland - making and also as cut flower for flower arrangement.

### Chrysanthemum Blooms are Two Types

- a. Disc-floret situated, in the center, tubular with five united petals. They are usually shorter and contain both male and female reproductive parts; they are called perfect flowers
- b. Ray-floret which surround the disc-florets and are comparatively longer, vary in shape, colour and direction of growth. The ray-florets are called imperfect flowers as they contain only the female reproductive parts.

### Growing Requirements of Chrysanthemum

Chrysanthemum plants are easiest of all perennials to grow

1. Produce large number of flowers if they are planted / placed in full sunshine. They respond to plenty of food and moisture
2. There are hundreds of varieties of Chrysanthemums, Giving you a multitude of options for height, colour, flower size and time of bloom. You can pick and choose to fit your wants and needs when you visit the Nursery.
3. They should be planted into well prepared, fertile, sandy media, they resent 'WET FOOT'.

### Cultivation

1. Chrysanthemum plants have a fibrous root system which is sensitive to waterlogging. prone to attack by diseases and pests, but, fairly tolerant to drought.
2. Ideal soil mixture pH to be 6.2-6.7 is required.
3. Light. Chrysanthemum plants continue to grow vegetatively till the nights are shorter than critical level (9 1/2 hr for most traditium 'l varieties.)
4. Temperature : The growth rate in chrysanthemum remains at low level at or below 100C. As the temperature is raised to 150 C the growth rate increases rapidly.

### Cultural Practices

1. Propagation Age-old method of propagation from suckers, it is easy to establish and almost no mortality and easy take-off due to already persistent roots. However cuttings also root well
2. Feeding : In early stages supply nitrogen using only organic manures. Phosphorus is best applied as basal dressing since it is released slowly. Proportion of Potassium should be increased as the flower buds appear.
3. Water management : The frequency of watering depends on the stage of growth, soil and weather conditions. Avoid water logging during the rainy season. Potted plants are either provided temporary shelter or kept in horizontal position during the constant downpour.

4. Nipping of growing tips encourages multiple branching and results better plant shape and more flowers.

## Plant Protection

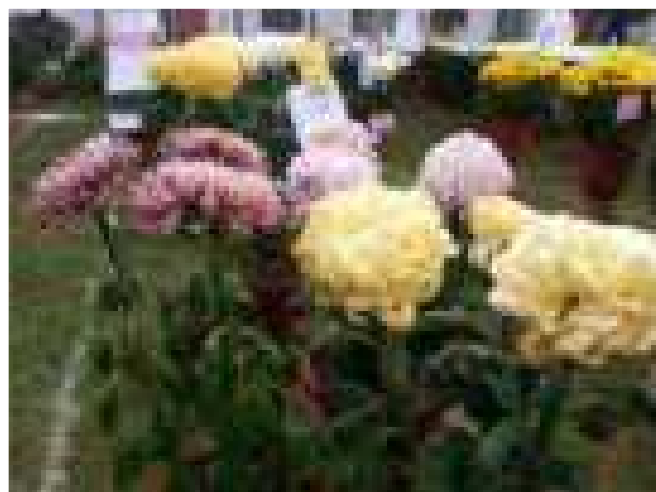
### Pests

1. Aphids and Thrips (Sucking pests) : Spraying of mild insecticides like tobacco leaf decoction or malathion 2ml / liter of water is effective against them.
2. Red spider mite : Spraying with Metasystox or Kelthane 2ml/liter of water controls the pest
3. Hairy caterpillar (*Diacrsia obliqua*) : Manual collection in mild attacks and spray of Ekalux 2ml/litre of water at weekly intervals in heavy infestation.
4. Grub (*Holotrichia*) : Soil application of Carbofuran 3G 10gms/cubic feet of soil in the pot.

### Diseases

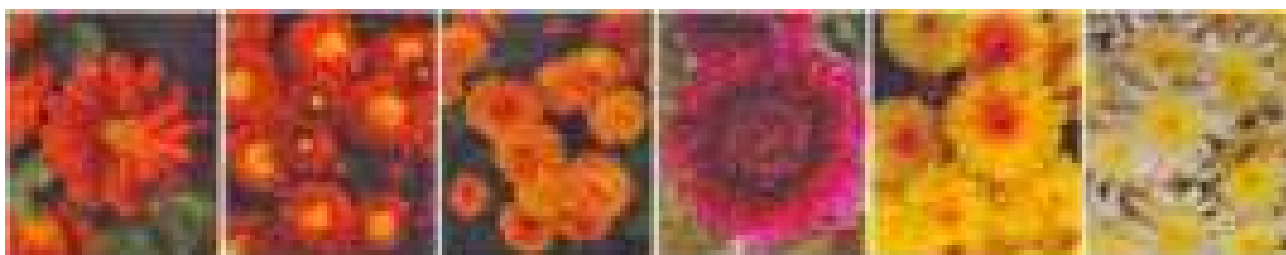
1. Root rot (caused by *Pythium* spp. or *Rhizoctonia* sp.) : Use sterilized medium, and treatment of cuttings and the medium with Thiram and Captan effectively control it

2. Leaf spot (caused by *Septoria Chrysanthemella*) : Greyish brown spots appear on leaves which turn yellow and ultimately die. The disease spreads from below upwards. It can be controlled by Bavistin 1gms or Dithane M-45 3gms/litre of water
3. Wilt (caused by *Verticillium*) : The leaves turn yellow to grey and the branch or whole plant gradually. The use of disease-free planting material and planting in sterilized medium prevent the infection.
4. Stunt (caused by stunt virus) : Spreads by mechanical means through cutting knife or secateur resulting in the overall dwarfing, paleness in leaf colour and the appearance of small yellow green dots in summer in some varieties.
5. A spermy (caused by aspermy virus) : This virus is transmitted by aphids and results in distortion of flower and reduction in flower size with florets becoming wavy. Heat therapy considerably reduces the incidence and consists of keeping the plant at 40°C for 2 hours and also control of sucking pests









Aloha

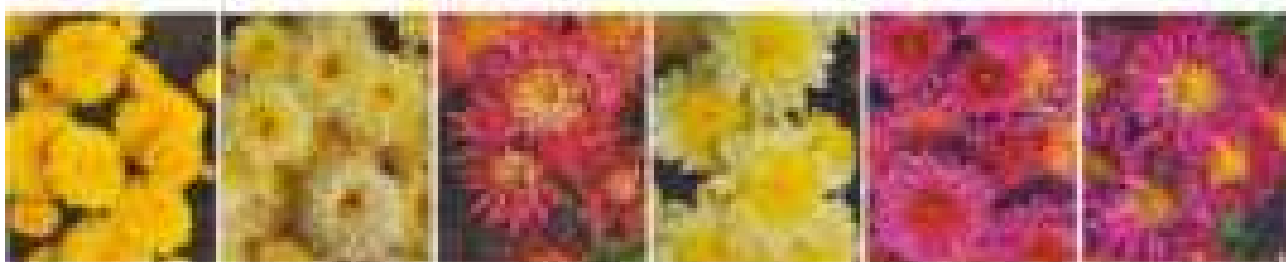
Aztec gold

Candy stripe

Cancun

Courtade

Dean conklin



DWF deciduous

Elena

Fngle wood

Mother theresa

Neelima

Pink cloud



Purnima

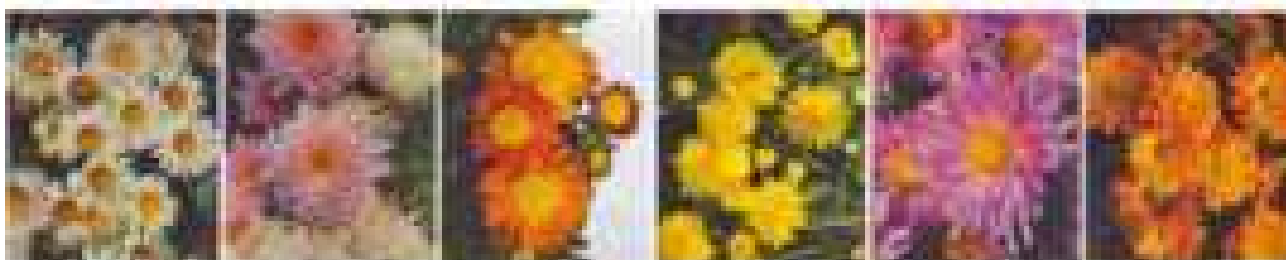
Purnima white

Pusa anmol

Shanti

Shanti

Shukla



Swetasagar

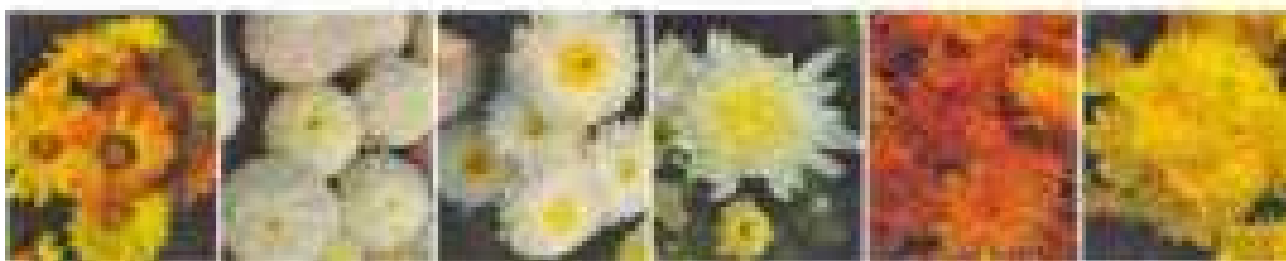
Tata century

Texas gold

Vasastica

Vasilika-B

Vijay



Vijay karan

White bouquet

White prolific

White star

Yellow gold

Yellow reflex

## CHAPTER - 17

### RARE TREES IN CPWD LOCATIONS



Maha Bodhi Tree at Budha  
Jayanti Park

#### 1. Maha Bodhi Tree (*Ficus religiosa*)

A Bal – Boudh Tree was planted in the Budha Jayanti Park by then Prime Minister Shri. Lal Bahadur Shastri on 25.10.1964, which was presented by Her Highness Sri Mao Bhandar Nayake the then Prime Minister of Sri Lanka. A sapling was planted in this park which was taken from the Holy Bodhi Tree in Sri Lanka. It was during the 3<sup>rd</sup> century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love

and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

A small temple beneath the Bodhi tree, Bodh Gaya, built in 7<sup>th</sup> century, after the original built by King Ashoka in 3<sup>rd</sup> century BCE, c. 1810 The spot was used as a shrine even in the lifetime of the Buddha. King Asoka was most diligent in paying homage to the Bodhi tree, and held a festival every year in its honour in the month of Kattika. His queen, Tissarakkhā was jealous of the Tree, and three years after she became queen (i.e., in the nineteenth year of Asoka's reign), she caused the tree to be killed by means of mandu thorns. The tree, however, grew again, and a great

monastery was attached to the Bodhimanda called the Bodhimanda Vihara. Among those present at the foundation of the Mahā Thūpa

are mentioned thirty thousand monks from the Bodhimanda Vihara, led by Cittagutta.



## 2. Makhan Katori (*Ficus kishnae*)

A small tree with folded leaves joined at the base which appear like containers of ice-cream (kulphis). The legend is that Krishna used to store butter in the leaves.

Propagated from seed, as a curiosity, it should be grown in all public parks and gardens. *Ficus Krishnae* Tree, or Krishna Fig Tree, is known as Makhan Katori or Krishna Badh in local languages. The leaf of the tree is in the shape of a cup – Krishna's Butter Cup. There is an interesting story which narrates how the leaves of the tree got the

shape of a leaf. It is said that in the beginning, the leaves of Krishna Fig tree were straight and it did not have the cup shape. A naughty episode of Krishna was responsible for the leaves taking cup shape. The "Sacred fig tree" probably a form of *benghalensis*, small tree sacred to the Hindu god Krishna, said to have folded its leaves into cups to leathery, irregularly cupped, deep green leaves with raised ivory ribs, finely pubescent inside, on grayish branches. Very interesting collection plant because of its curious leaves.





Kalapvriksha at  
Budha Jayanti Park

### 3. Kalapvriksh (*Adansonia digitata*)

A genus of eight species of tree, six native to Madagascar, one native to mainland Africa and the Arabian Peninsula and one to Australia. The mainland African species also occurs on Madagascar, but it is not a native of that island, and was introduced in ancient times to south Asia and during the colonial era to the Caribbean. A ninth species was identified in 2012, incorporating upland populations of southern and eastern Africa. A typical common name is baobab. Other common names include boob, boaboa, tabaldi, bottle tree, upside-down tree, and monkey bread tree. The generic name honours Michel Adanson, the French naturalist and explorer who described *Adansonia digitata*. *Adansonia*s reach heights of 5 to 30 m (16 to 98 ft) and have trunk diameters of 7 to 11 m (23 to 36 ft). Glencoe baobab – an African baobab specimen in Limpopo



Kalapvriksha at Raj Ghat

Province, South Africa, often considered the largest example alive – up to recent times had a circumference of 47 m (154 ft). Its diameter is estimated at about 15.9 m (52 ft). Recently the tree split up into two parts and it is possible that the stoutest tree now is Sunland baobab, also in South Africa. The diameter of this tree is 10.64 m (34.9 ft), with an approximate circumference of 33.4 m (110 ft). Some baobabs are reputed to be many thousands of years old, which is difficult to verify, as the wood does not produce annual growth rings, though radiocarbon dating may be able to provide age data.



Terminalia Bellirica at Budha Jayanti Park

#### 4. Baheda (*Terminalia bellirica*)

Baheda is a large deciduous tree found throughout India, in areas up to an altitude of 1,000 meters. The tree takes a height of 30 meters, while the bark is brownish grey in color. The alternate, broadly elliptic leaves are clustered towards the end of the branches. They are 10 to 12 cm in length and 7 to 14 cm in breadth. The simple, solitary flowers are in auxiliary spikes, with offensive odor. They blossom in the month of May. The fruits are ovoid grey drupes and the kernels are sweet, but narcotic. The tree is found in abundance in Madhya Pradesh, Uttar Pradesh, Punjab and Maharashtra. It is known as vibhitaki, karshaphala and kalidruma in Sanskrit and bahera in Hindi.

##### Uses & Benefits of Baheda

- Beleric is a rejuvenative and laxative. It proves beneficial for hair, throat and eyes.
- Beleric seed oil or fruit paste is applied on swollen and painful parts.
- The seed oil gives excellent results in skin diseases and premature graying of hair.
- Fruit pieces are baked and chewed for cough, cold, hoarseness of voice and asthma.
- Beleric fruit is powdered and used to dress wounds to arrest the bleeding.
- Beleric fruits and kernels are used in making medicated hair oil, used to alleviate pain and burning sensation, boost hair growth and impart black color to the hair.
- The paste of the fruit is applied on eyelids, in case of conjunctivitis.
- The herb is used in various eye ailments, such as myopia, corneal opacity, pterigium, immature cataract, chronic and acute infective conditions.
- Beleric helps in loss of appetite, flatulence, thirst, piles and worms.
- The ripened fruit acts as an astringent and anti-diarrheal.
- The decoction of the kernels is used in case of excessive thirst and vomiting.
- Beleric plant alleviates cough, relieves blocked phlegm, controls bleeding in the sputum and eases bronchospasms.
- It prevents ageing, imparts longevity, boosts immunity, improves mental faculties and enhances the body resistance against diseases.
- It helps in lowering cholesterol and blood pressure.



Lagerstroemia Lancasterai at Rajpath

## 5. Lagerstroemia (Lagerstroemia lancasterai)

Lagerstroemia, commonly known as Crepe Myrtle, is a genus of about 50 species of flowering shrubs and trees. Native to the Indian subcontinent, South Asia and Oceania, most species of Lagerstroemia are found in Pakistan, India, Bangladesh, China, Australia and parts of Central America.

Lagerstroemia Lancasterai bears beautiful flowers of white colors in summer. In full bloom,

bright green leaves and clusters of flowers make it an excellent choice as ornamental tree for homes and gardens. Lagerstroemia sheds its leaves in a gradual process so you would hardly find it completely bare. Flowers contain six or seven crumpled and wrinkled petals, that is why, Lagerstroemia is also called Crepe Flowers tree.

**Ficus Macdonald at Rajghat**



## **6. Ficus (Ficus macdonald)**

It is a gynodioecious (functionally dioecious), deciduous tree or large shrub, growing to a height of 6.9–10 metres (23–33 ft), with smooth white bark. Its fragrant leaves are 12–25 centimetres (4.7–9.8 in) long and 10–

18 centimetres (3.9–7.1 in) across, and deeply lobed with three or five lobes. The complex inflorescence consists of a hollow fleshy structure called the syconium, which is lined with numerous unisexual flowers.



*Olea Europea* (Zaitoon) at Rajghat



## 7. Zaitoon (*Olea europea*)

Zaitoon tree is also known as olive tree and produces the gray green flowers in winter season. The plant of olive reaches the height of 3 meters, leaves are bright green and very attractive and the fruits are of bright bluish or violet color, possesses a metallic taste. It is known from old ages. During

the excavation of ancient Egyptian graves, vessels full of olive oil were found with other articles. According to the scholars of Hadith, on subsidence of Toofan-E-Nooh (The Great Flood of Noah), when water level came down, the first thing on the earth that was seen was the olive plant.

Bombax ceiba tree  
at 1 Moti Lal Nehru Marg



## 8. Cotton tree (*Bombax ceiba*)

Like other trees of the genus *Bombax*, is commonly known as **cotton tree**. This tropical tree has a straight tall trunk and its leaves are deciduous in winter. Red flowers with 5 petals appear in the spring before the new foliage. It produces a capsule which, when ripe, contains white fibres like cotton. Although its stout trunk suggests that it is useful for timber, its wood is too soft to be very useful. *Bombax ceiba* grows to an average of 20 meters, with old trees up to 60 meters in wet tropical weather. The leaves are palmate with about 6 leaflets radiating from a central point, an average of 7~10 centimeters wide, 13~15 centimeters in length. The leaf's long flexible petiole is up to 20 cm longer. Seeds are numerous, long, ovoid, black or gray in colour and packed in white cotton. The fruit, which reaches an average of 13 centimeters in length, is light-

green in color in immature fruits, brown in mature fruits. This tree is widely planted in parks and on roadsides there because of its beautiful red flowers which bloom in March/April. This tree is quite common in New Delhi. The cotton fibers of this tree can be seen floating in the wind around the time of early May. This tree shows two marked growth sprints in India- in spring and during the monsoon months. This tree is commonly known as *Semal* (*Hindi*: सेमल). This tree is also found in the eastern parts of Pakistan, especially in the eastern city of Lahore. The local Urdu and Punjabi name for the tree is 'Sumbal'. Plant pacifies vitiated pitta, wounds, ulcers, skin diseases, hemorrhoids, urinary calculus, cystitis, inflammations, cough, bronchitis and dark discolorations on face.



Swietenia Senegalensis Tree at Govt. Sunder Nursery

## 9. Swietenia (Swietenia senegalensis)

Swietenia senegalensis (Khaya, African Mahogany) :- It is tree with shining leaves upto 100ft tall. Leaves are compound drying pale glaucous green. Flowers normally have

four parts. Sepals are pale green, petals and stamina tube are cream colored, fruit is normally very much valuable.



*Celtis Tetrandra* at Govt. Sunder Nursery

## 10. Khirk (*Celtis terandra*)

A medium sized tree up to 30m height. Leaves simple, alternate, obliquely ovate. Margin, serrate from apex to below. Flowers polygamous, yellow born on leafless shoots.

Fruit is hard when dry, edible bitter to taste. Flowering from January to March. Fruiting from Feb. to April a medium sized tree.





Guazuma Ulmifloia Tree at Govt Sunder Nursery

### 11. Guazuma (*Guazuma ulmifolia*)

It is small to medium size tree upto 30m height and 30 to 40 cm in diameter. Leaves are in alternates pattern, ovate, finely saw toothed margin with darker green upper surface and pale green below. The flowers

come in panicles and are short stalked, have brown yellow color and are lightly fragrant. The fruits, which are capsules, have many seeds.



Agathis Robusta Tree at Govt. Sunder Nursery

## 12. Kauri Pine (*Agathis robusta*)

it is a large evergreen trees growing straight. Height 30 to 50m with smooth scaly bark. The leaves are broad, tough and leathery in texture. The seed cones are globose and

mature in 18 – 20 months after pollination. They disintegrate at maturity to release the seeds. The male cones are cylindrical.



Swietenia Mahagoni Tree at Govt. Sunder Nursery

### 13. Swietenia (Swietenia mahagoni)

it is a tall tree 30 m height upto 1 m dia and large spherical crown, dense shade. The bark is reddish brown on large trees. Leaves are shiny dark green, lance shaped, flowers

greenish yellow. The light brown seeds capsule stands upright with 5 valves. Each valve releases about 20 flat brown winged seeds.



**Bolusanthus Speciosus Tree at Govt. Sunder Nursery**

#### **14. Bolusanthus (Bolusanthus speciosus)**

The tree is evergreen may drop leaves in winter. Leaves are lanceolate, shiny green above paler below. Fruit is flat thin light brown to grey, pod, Ofrom Sept. to January.

The dark fissured bark drooping foliage and attractive flower. Low maintenance garden tree.





Atalantia Monophylla Tree at Govt. Sunder Nursery

### 15. Jangli Nimbu (*Atalantia monophylla*)

Indian atalantia is a small much branched tree with single sharp spines. Leaves are bright green above paler and reticulate-veined

below, ovate or elliptical with margins slightly wavy. Flowers are long stalked in clusters. Fruit globose yellowish green when ripe.



Albizia Lucidor (Potka Siris) Tree at Govt. Sunder Nursery

## 16. Potka Siris (*Albizia lucidor*)

It is fast growing beautiful trees. The large compound leaves are unique. Flower are

clusters of small powder puff. Fruit pod is flat, dark brown. Flowering June to July.



Caesalpinia Ferrea (Khirk) Tree at Govt. Sunder Nursery

### 17. Khirk (*Caesalpinia ferrea*)

It is a beautiful tree with white and chocolate flaking bark thus called leopard tree. The tree is long, drooping branches with feathery

leave. The flower are yellow small fragrant. The wood is used for finger boards of electric basses, guitars, flooring, fancy furniture.



Mesua Ferrea Tree (Nag Keshar or Nag Champa at Govt. Sunder Nursery

### 18. Nag keshar or Nag Champa (*Mesua ferrea*)

A handsome Indian evergreen tree, of small to medium size upto 13m. Simple oblong green leaves, the emerging young leaves are red to yellowish pink. The flower are white with numerous yellow stamens. The

flower's are used for making incense and used to stuff pillows. The national tree is Sri Lanka. The oil from seeds is used for treating sores, scabies, wounds and rheumatism. The root is used as an antidote for snake poison.





**Bridelia Retusa Tree at Govt. Sunder Nursery**

### **19. Kasai (*Bridelia retusa*)**

Tree is identified by rigid leathery leaves, strong spines on the barks of young stems. Flowers are arranged on leafless branches appearing as spikes with small acute bract. Fruit is globose, fleshy, sweetish taste, size of

a pea, purple black. Flowering May- August. The bark is used for the removal of urinary concretions in Ayurveda. Root and bark are valuable astringents.



Dillenia Indica Tree at Govt. Sunder Nursery

## 20. Elephant Apple (*Dillenia indica*)

Elephant Apple (Chalta) is small to medium sized tree upto 15m tall. The leaves are long with corrugated surface. The flowers are large

with five white petals and yellow stamen's. The fruit having seeds with edible pulp. The pulp is used in curries, Jam & Jellies.



*Pterospermum Xylocarpum* (Tada) Tree at Govt. Sunder Nursery

## 21. Tada (*Pterospermum xylocarpum*)

Trees are small 5-8 m tall. Leaves ovate, elliptic base uniquely cordate white wooly beneath glabrous above. Flower's white

solitary, capsules pyriform seeds winged. Wood is used for furniture.



Largerstroemia Microcarpa (Benteak) Tree at Govt. Sunder Nursery

## 22. Benteak (*Largerstroemia microcarpa*)

It is a deciduous tree. Grow upto 10-15m height. The bark is of ash color oppositely arranged leaves. White flowers are borne in

large compound panicles. Seeds are winged. Flowers in May – June.





Markhania Lutea Tree at Govt. Sunder Nursery

### 23. Siala (*Markhania Lutea*)

The tree is 10-15m high having leaves 20-30cm in length. Bark light brown. Flowers are bright yellow trumpet shaped. Fruit is very

long thin brown capsules borne in clusters, release winged transparent seeds.



Bistendu (*Diospyros Cordifolia*) Tree at Vijay Chowk

## 24. Bistendu (*Diospyros montana*)

Bistendu is a small deciduous tree with spiny trunk and spiny older branches. Leaves are elliptic lanceshaped, somewhat heart-shaped at the base and sharp or blunt at the tip. They are smooth above and velvety on the underside. Male and female flowers grow on separate trees. Male flowers are

borne in 3-flowered clusters, and the female ones singly. Flowers are creamy white or greenish-white, tubular, with 4 petals which are curved back. Sepals are ovate, velvety. Stamens of male flowers are longer than the flower tube. Fruit is spherical, cherry sized, yellow when ripe. Flowering: March-April.



Branch of Rudraksha Tree

## 25. Rudraksha (*Elaeocarpus Ganitrus*)

Rudraksha grows in the area from the Gangetic Plain in foothills of the Himalayas to South-East Asia. Rudraksha seeds are covered by an outer shell of blue color when fully ripe, and for this reason are also known as blueberry beads. The blue colour is derived not from pigment but is structural. It is an evergreen tree that grows quickly. Rudraksha Tree starts bearing fruit in three to four years. As the tree matures, the roots buttress rising up narrowly near the trunk and radiating out along the surface of the ground.

The seeds show variation in the number of grooves on their surface, and are classified on the basis of the number of divisions that they have. Different qualities are attributed to the rudraksha based on the number of grooves, or 'faces' that it has. A common type has five divisions, and these are considered to be symbolic of the five faces of Shiva. It can only be worn with red string or a gold chain.

Rudraksha Tree at 6 Moti Lal Nehru Marg



According to the Ayurvedic medical system, wearing Rudraksha can have a positive effect on the heart and nerves, and relieve you from stress, anxiety, depression, palpitations and lack of concentration. It is also known for its anti ageing effect, and electromagnetic and inductive properties. People with high blood pressure have been found have benefited from the use of Rudraksha seeds.

## CHAPTER - 18

### MIRACLE FRUIT

Miracle fruit, (*Synsepalum dulcificum*), also called miracle berry, of the family Sapotaceae, grown for its mild fruits that make subsequently eaten sour foods taste sweet. The miracle fruit is native to tropical where it is used locally to sweeten palm wine and other beverages. The unrelated sweet prayer plant (*Thaumatococcus daniellii*) is also known as miracle fruit for its similar ability to make sour foods taste sweet.

The miracle fruit plant grows as a dense shrub or small tree, usually not more than 5.5 metres (18 feet) in height in the wild and generally smaller when cultivated. The simple leaves are oval and tapering at the

base with smooth margins and feature a waxy underside; they grow in spire like clusters at the ends of small branches. The small white flowers give rise to red drupe fruits that are about 2–3 cm (0.8–1.2 inches) in length. Plants typically begin producing fruit after three or four years and require acidic soil.

The flavour-altering mechanism of miracle fruit is due to a glycoprotein named miraculin, which was first isolated by Japanese researcher Kenzo Kurihara in 1968. Although miraculin itself is not sweet, it binds to receptors on the taste buds and causes acidic foods to be perceived as sweet. The effect typically lasts from a half hour



Miracle Fruit Leaves and unusual flowers of the Miracle Fruit plant (*Synsepalum Dulcificum*)



to two hours, with the intensity declining over time. The fruit has been proposed as a treatment for the taste changes experienced by some chemotherapy patients, though further studies are needed. In the United States an attempt was made in the 1970s to commercialize the fruit extract as a low-calorie or noncaloric sweetener for use by diabetics and dieters, but the U.S. Food and Drug Administration (FDA) classified the product as a food additive requiring further safety testing, and the venture was abandoned. Similarly, the European Union required a safety assessment before miracle fruit extracts could be used as a food additive, though miraculin has been approved in Japan. The purchase of powdered or whole fruits is legal in most places, and the fruit is commonly consumed as a novelty.

For people looking for a delicious and exotic berry to add to their diet, the miracle fruit is an excellent option. It has a plenty of benefits for your body which include its ability to aid in weight loss, improve vision health and boost immunity, among others. That being said, before adding any new food to your diet, it is critical to understand where it comes from, what it contains, and the possible health benefits it may hold.

Miracle fruit is one of the common names of *Synsepalum dulcificum*, a shrub that is native to western Africa, where it has been in use for centuries. Most notably, miracle fruit has the ability to make sour food taste sweet, thanks to a compound called miraculin. Miraculin is able to bind to the tongue's taste buds, which blocks the receptors when the pH level of the mouth is neutral. However, when we eat sour fruit, the pH of the mouth drops, and miraculin is able to activate the sweet receptors while blocking the sour ones.

Aside from the novel aspects of miracle fruit, also known as miracle berry, sweet berry, and

as this fruit has a number of unique nutrients that can positively affect health. These small berries are the size of cherry tomatoes and each contains a single seed, roughly the size of a coffee bean. The berries are typically consumed raw and are actually tasteless when eaten alone, but the fruit pulp can also be mixed into fruit smoothies or other sweet desserts. Some restaurants around the world use miracle fruit as a complement to their dishes, allowing diners to revel in the strangeness of eating sour food, but tasting a sweet treat instead!

Miracle fruit is not a great source of traditional nutrients, but there are notable amounts of vitamin C, vitamin K, vitamin A, vitamin E and various amino acids that the body requires for numerous functions. The fruit is incredibly low in calories, only 1/2 calorie per berry, and also boasts a number of polyphenolic compounds and antioxidants that make you healthy.

The most notable benefits of miracle fruit include its ability to manage diabetic symptoms, aid in weight loss efforts, improve the strength of the immune system, boost vision health and prevent chronic disease, among others.

By acting as a low-calorie, sugar-free additive in many meals, this fruit is an excellent aid in your weight loss efforts. It will not contribute to your overall calorie intake, nor is it packed with simple sugars and carbs that can lead to weight gain.

Although only trace amounts of vitamin C are present in this fruit, it can still give a small boost to your immune system. Vitamin C stimulates the production of white blood cells, which are the body's main line of defense against pathogens and infections.

There are also trace amounts of vitamin A found in this fruit, which has been directly

linked to improved vision health, specifically a lower risk of macular degeneration and cataract formation as you age.

Perhaps the most important health benefit of miracle fruit is enjoyed by diabetic patients, who can safely replace sugar in their diet with this berry. Apart from the flavor impact, some of the active ingredients in this fruit can naturally lower insulin sensitivity, which is good news for diabetic patients.

The number of polyphenolic compounds found in this fruit will give your body an antioxidant boost, which can lower levels of free radicals and reduce oxidative stress in organ systems.

Miracle fruit is used in various ways around the world, but its use is primarily linked to its flavor-altering properties. It is commonly added to desserts and other foods that may have a tart flavor, or it is used as a replacement for sugar in foods. For example, if you have a sweet tooth but are trying to cut down on your sugar intake, using miracle fruit in conjunction with sour food can give you the sweet burst you're looking for.

Miracle fruit is also used by some for medical purposes, such as changing the flavor of unpleasant medications or lessening the side effect of certain treatments. Miracle fruit is often found as a complementary item in a dish at restaurants that advertise unique flavor experiences.

Despite the potential health benefits and novel abilities of this fruit, miracle fruit does have some side effects that should be considered, such as high acidity and gastrointestinal problems.

**Acidity** – Using this fruit can enable you to eat more sour foods, but only taste them as being sweet. While this is a unique property, it can allow you to eat an excess of sour foods, which could result in elevated acidity levels in the body.

**Stomach Issues** – Similarly, this fruit could also allow you to eat spicy food without feeling the heat, which could lead to heartburn or gastrointestinal distress. Use this berry in moderation, and be aware of what types of food you are eating to avoid unnecessary problems.



Landscape Design

# CHAPTER - 19

## DETAILS OF CPWD PARKS

### 1. Buddha Jayanti Park

Pt. JawaharLal Nehru, pioneer of Modern India and a man of far sightedness had the idea to commemorate the 2500<sup>th</sup> birth anniversary of Lord Buddha by laying a park commiserative to his status and teachings of making the mankind free from sufferings. The Buddha Jayanti Park is seen with a large Statue of Lord Buddha in a sitting posture covered in Gold Coloured paint erected on a flat raised Platform supported by pavilions on all directions. The platform and Statue were established on October 1993 over an artificial Island created within the premises of this park as a respect and tribute to H.H. Dalai Lama the 14<sup>th</sup>. A sapling was planted in this park which was taken from the Holy Bodh Tree in Sri Lanka. It was during the 3<sup>rd</sup> century when Princess Sanghamitra who was King Ashoka's daughter took a sapling from the ancient original Bodh Tree situated in Bihar believed to be the tree under which lord Buddha spent days during his meditation period up till he attained Nirvana or Enlightenment and hence is considered very Holy and Sacred to all and carried it to Sri Lanka where she planted, nurtured and attended to it with love and care up till it grew very tall, thick and green. It was also known that she used to preach Buddhism under this very tree which exists even today.

The speech of 1<sup>st</sup> Prime Minister of India Pt. JawaharLal Nehru in UN General Assembly New York in Nov. 10<sup>th</sup> 1961 had also been displayed on a big stone in 1965 on international co-operation year in Hindi and English version. A Bal – Boudh Tree was planted in the park by then Prime Minister Shri. LalBahadurShastri on 24.10.1964, which

was presented by Her Highness Sri Mao BhandarNayake the then Prime Minister of Sri Lanka.

The approximately 70 acres of land for this park was allotted by the L&D.O. long back. A great care has been taken to keep the Buddha Jayanti Park free from all sorts of pollution after preserving the topography of land, rocks and hillocks and flora and fauna of the ridge in which it is located. This Park is being maintained by CPWD . The natural trees, shrubs and other flora and fauna had not been disturbed at all while making the park. Most of the trees planted there are of indigenous nature and ecological balance has been maintained in a nice way. In the last year Colour Garden, Canna Garden, Medicinal Garden, Rose Garden, Palm Garden, Cactus Garden, Bulbous Garden, Bamboo Garden, Rock Garden and Fragrance Garden have been created. The Buddha Jayanti Park is seen crowded with mostly with Youngsters, early morning joggers and Yoga enthusiast; however, most Family along with Friend's are seen here, especially during weekends, where they spend fun time after a good picnic lunch with each other. Young couples mostly visit this park during weekdays as it generally remains quit and free of the usual family crowd and hence gives them a quiet time and ample space to spend private time with each other.

Major part of the Garden is covered by different varieties of Bougainvilleas which gives a very good look during its flowering time and those can be seen in these pictures.



Buddha Statue at Buddha Jayanti Park









## Buddha Statue in the Buddha Jayanti Park

The installation of the statue of Lord Buddha at Buddha Jayanti Park in New Delhi is an historic event. This monument with a canopy is being dedicated as a symbol of the gratitude of His Holiness the Dalai Lama to the people and government of India for their sustained effort in promoting the cause of world peace and understanding. In 1983 His Holiness expressed a wish to erect a monument in Delhi under such a dedication. Following that, Tibet House, the Cultural Centre of His Holiness, approached the Government of India with a proposal to install a statue of the Buddha under a canopy in Buddha Jayanti Park. This would not only be an ornament to the park but also a befitting monument in honour of one of the greatest sons of India, who showed the Universal path to Freedom from suffering through personal example over 2,500 years ago.

Through the sympathetic consideration of the Ministry of Urban Development, the Delhi Urban Art Commission and other authorities, a plot of land was made available to Tibet House for the installation of the statue and canopy in Buddha Jayanti Park. In 1987, the then Prime Minister, Shri Rajiv Gandhi, approved a model of the proposed structure, the design and proportions of which were finalized in consultation with the appropriate authorities in 1988. The design as a whole symbolizes a harmonious union of diversities—racial, linguistic, communal etc. — a unit which has been the core of the message of His Holiness the Dalai Lama. The structure in its entirety may be viewed as a journey through stages to this goal, rising from the base to the topmost spire, of the complete realization of compassion and wisdom. It is a symbol of this process of manifestation, and a representation of non-duality.

Its name, natural topography and pattern of vegetation made Buddha Jayanti Park an appropriate setting for the statue of the Buddha. Placed on an island in the Park, this new monument faces east, exactly as the Kalacakra Mandala is oriented, and the direction in which the Buddha sat under the Bodhi tree at Bodh Gaya when He attained Enlightenment.

The entire structure embodies a cluster of Buddhist symbols and meanings. The base is set within an embankment with five concentric rings representing the five elements — earth, water, fire, wind and space. The design of the base is fashioned after the Kalacakra Mandala, the last system of mandalas introduced to Tibet from India. (Besides their deep spiritual message, the teachings of the Kalacakra were a historical response to the various threats, such as internal riots and external aggression, that endangered the unity of the diverse communities of the India of the time.)

The canopy has a three-tiered base on each of its four sides, which together signify the twelve channels (nadis). Its four pillars represent the four energy drops (bindus), apart from supporting the dome and upper parts of the canopy. The ten directions of the canopy represent the ten vitalities (pranas). The nadis, bindus and pranas are the vital constituents of the human body in the Kalacakra system of Tantra. The parapet and the upper reaches of the canopy are ornamented with intricate Tibetan designs, while the dome symbolizes the vital factors of enlightenment. Above the dome, a square and conical structure represent the constituents of the Noble Path, while thirteen rings on the core are symbols of the ten strengths and three mindfulnesses of an Enlightened being. The chatra represents the all pervasive compassion (mahakaruna) of the Buddha, and the topmost spire the nobility of his attainment.

Altogether, the six parts of the canopy – base, columns, dome, cone – chatra and spire, correspond to the six chakras which form the centres of subtle energy in this human body; but the design of the upper reaches of the canopy follows that of the historic Gyantse Stupa, Palkhor Choten – in Tibet.

The statue of the Buddha has been designed in traditional Tibetan style of Mr Pemba Dorje, a skilled Tibetan craftsman in Dharamsala. It is made from beaten copper glided with gold, and is eight feet high including the pedestal. The right hand of the Buddha is shown in the Bhumisparsa Mudra, and the positioning of the statue on a raised throne symbolizes His message that all beings have the potential to attain the highest goal of Buddhahood.

The statue is placed on a throne which contains an engraving of Bhumidevi, the Earth Goddess. When challenged by Mara to provide a witness to testify to the merits He had attained, the Buddha touched the

earth (bhumisparsa), invoking it to bear witness. Bhumidevi emerged from the earth to testify for Him. It is our responsibility now to care more deeply for Mother Earth, who is depicted in the engraving as pleading for the attention of her children.

The canopy is about forty feet at its highest point and is built in sandstone mined and transported from Bansi Paharpur in Sikar district, Rajasthan. The craftsmen who transformed the stone into a beautiful edifice are also from Rajasthan and belong to communities of traditional temple builders. An initial design of the canopy was done by Kazuhiro Nakahari of Thanka Architects and his team, but that assumed a larger structure and site than ultimately became feasible. The beautiful structure that has now been completed was designed and its construction and landscaping coordinated by M.N. Ashish Ganju Mark Warner Rajiv Narain Architects.

## 2. Bhagwan Mahavir Vanasthali Park

Bhagwan Mahavir Vanasthali Park is situated on the Ridge Road towards the southern ridge which lies close to Dhaula Kuwan or alternatively from Sardar Patel Marg and is easily reachable by local transport. It spreads over the area of 25 acres of land and is seen planted with ornamental and green trees, shrubs, flower beds and lawns that's creates natural effect to the environment. Gardens in Delhi are been constructed since the Mughal Emperor rule over Delhi. The park is seen crowded with mostly young couples, morning walkers and yoga enthusiasts, however most families along with friends are seen here especially during weekends. This park also attracts tourists and sacred for Jain religion.



MAHAVIR VANASTHALI PARK



MAHAVIR VANASTHALI PARK

### 3. Delhi Chalo Park

Delhi Chalo Park is situated behind the Red Fort along the Ring Road, it's approx area is 12.30 acres seen from this park is Musamman

Brij in the centre. Rang Mahal is the right and Deewan-E-Khas on the left. This beautiful park increase the beauty of the Red Fort.



DELHI CHALO PARK



#### 4. Jai Prakash Narayan Memorial Park

The Lok Nayak Jai Prakash Narayan Memorial Park is situated at Bahadur Shah Zafar Marg. This was offered to public in year 2004. This park was developed by CPWD and it has lush greenery. Having more than 4.50 acres of area, this park is having 127 Nos. of trees of 22 different varieties. A number of trees are planted in a circular manner around a circular lawn having a circular bed of Cannas in the centre. There is a huge statue of Lok

Nayak Jai Prakash Narayan fixed on a high rise mound. Garden light, fittings and fixtures are very beautiful at the night. This park was made open for use of public without any ceremonial/opening ceremony. The park has excellent boundary structure and gates etc. The park is having a huge statue of Dr. Shyama Prasad Mukherjee in a side surrounded by a cluster of good looking Thuja plants.



#### 5. Deen Dayal Upadhyay Park

Deen Dayal Upadhyay Park is located at Deen Dayal Upadhyay Marg, near CAG office, New Delhi. The park is designed and developed by Central Public Works Department in the year 2017. This park covered approximate 16.00 acres area and divided with 3 Pockets known as Pocket-7A, 3A and 6B. The park is developed with concept of Rashiphal, Nakshatra, Navgrah, Panchvati, Tirthankar, etc which is unique and probably first of its kind in Delhi.

Recently BJP Chief Shri Amit Shah inaugurated the Deen Dayal Upadhyay Park. Shri Amit Shah was accompanied by Urban Development Minister Shri Hardeep Puri and Party MP Smt. Meenakshi Lekhi.

The redeveloped park has a rich variety of plants and large expanses of grass lined by flower beds with colourful blooms well laid walking tracks and several plant and bushes with their full names put up alongside.



BJP Chief Shri Amit Shah inaugurating the Deen Dayal Park accompanied by Urban Minister Shri Hardeep Puri.

## Nakshatra Garden

One of the attractive areas of Deen Dayal Upadhyay Park is Nakshatra Garden. This garden is developed in Pocket-7A by planting 27 species of plants representing each Nakshatra. List of auspicious plant for nakshtra is:

Nakshtra	Common Name	Botanical Name
Ashvini	Poison nut	<i>Strychnos nux vomica</i>
Bharani	Amla	<i>Embilica officionalis</i>
Krittika	Fig	<i>Ficus racemosa</i>
Rohini	Jamun	<i>Syzygium jambolanum</i>
Mrigashirsha	Kadhira	<i>Acacia catechu</i>
Ardra	Agard wood	<i>Aquilaria agallocha</i>
Punarvasu	Bamboo	<i>Bambusa</i>
Pushya	Peepal	<i>Ficus religiosa</i>
Ashlesha	Naga kesar	<i>Mesua ferrea</i>
Megha	Banyan	<i>Ficus bengalensis</i>

Nakshtra	Common Name	Botanical Name
Purva phalguni	Flame of Forest	Butea monosperma
Uttara phalguni	Juvi	Ficus infectoria
Hasta	Retha	Sapindus mukorassi gaertn
Chitra	Bel	Aegle marmelos
Swati	Arjun	Terminalia arjuna
Vishakha	Wood apple (Kaith)	Limonium acidissimum
Anuradha	Bakul	Mimusops elengi
Jyeshtha	Chir	Pinus roxburghii
Mula	Black dammar	Canarium strictum
Purva ashadha	Jack fruit	Artocarpus heterophyllus
Shravana	Milk weed	Calotropis gigantia
Dhanishtha	Shami	Acacia ferruginea
Shatabhisha	Kadamba	Anthocephalus cadamba
Purva bhadrapada	Neem	Azadirachata indica
Uttara bhadrapada	Mango	Mangifera indica
Revati	Ippe	Madhuca indica

## Nav Garh Garden

This garden developed in Pocket-7A by planting 09 species of plants with every plant symbolically represents or attached with every Graha. It is beautifully designed and maintained. The list of auspicious plants for Nav Graha Garden is:

Garha	Common Name	Botanical Name
Surya (Sun)	Aak	Calotropis
Chandra (Moon)	Dhak, Palash	Butea monosperma
Mangal (Mars)	Kadhira	Acacia catechu
Buddha (Mercury)	Chirchirta	Achyranthes aspera
Brihaspati (Jupiter)	Peepal	Ficus religiosa
Sukra (Venus)	Gular, Udamber	Ficus glomerata
Shani (Saturn)	Shami	Acacia ferruginea
Rahu (Rahu)	Kush	Cynodon dactylon
Ketu (Ketu)	Dev kush	Imperata cylindrica

## Rashiphal Garden

This garden developed in Pocket-7A by planting 12 species of plants each plant represents different Rashiphal. The list of auspicious plants for rashi is:

Rashi	Common Name	Botanical Name
Mesha (Aries)	Red Sandal Wood	Petrocarpus santalinus
Vrishabh (Taurus)	Satwin	Alstonia scholaris
Mithun (Gemini)	Jack Fruit	Artocarpus heterophyllus
Karka (Cancer)	Flame of Forest	Butea monosperma
Singh (Leo)	Wid ber	Ziziphus mauritiana
Kanya (Virgo)	Mango	Mangifera indica
Tula (Libra)	Bakul	Mimusops elengi
Vrischik (Scorpio)	Kadhira	Acacia catechu
Dhanu (Sagittarius)	Peepal	Ficus religiosa
Makar (Capricorn)	Shisham	Dalbergia latifolia
Kumbh (Aquarius)	Khejri Tree/ Shami	Prosopis cineraria
Meen (Pisces)	Bargad	Ficus benghalensis

## Tirthankar Garden

This garden designed and developed with the concept of Tirthankar Van in which 24 species of identical plants of Tirthankar are planted. The list of plants planted in Tirthankar van is:

Tirthankar	Common Name	Botanical name
Shri Rishabhdeva Swami	Banyan	Ficus benghalensis
Shri Ajitnath Swami	Kalpavriksha	Adansonia digitata
Shri Sambhavnath Swami	Sal	Shorea robusta
Shri Abhinandan Swami	Chir	Pinus roxburghii
Shri Sumatinath Swami	Priyangu	Callicarpa macrophylla
Shri Padmaprabha Swami	Banyan	Ficus benghalensis
Shri Suparsvanath Swami	Siris	Albizia lebbek
Shri Chandraprabh Swami	Sultan champa	Calophyllum inophyllum
Shri Suvidhinath Swami	Bel	Aegle marmelos
Shri Shitalnath Swami	Anjeer	Ficus lacor
Shri Sreyanshnath Swami	Ashok	Sara indica
Shri Vasupujya Swami	Lodh Tree	Symplocos racemosa
Shr Vimalnath Swami	Jamun	Syzygium cumini
Shri Anantnath Swami	Ashok	Sarica indica
Shri Dharamnath Swami	Palash	Butea monosperma
Shri Shantinath Swami	Deodar	Cedrus deodara

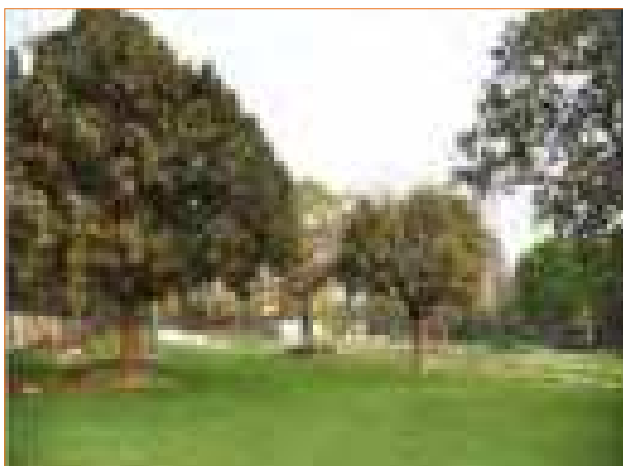
Tirthankar	Common Name	Botanical name
Shri Kanthunath Swami	Lodh Tree	Symplocos racemosa
Shri Arnath Swami	Mango	Mangifera indica
Shri Mallinath Swami	Ashok	Saraca indica
Shri Suvrat Swami	Golden Champa	Michelia champaca
Shri Naminath Swami	Maulshiri	Mimusops elengi
Shri Neminath Swami	Salix	Salix caprea
Shri Parsvanath Swami	Fire Flame Bush	Woodfordia fruticosa
Shri Mahavir Swami	Sal	Shorea Robesta

### Play Ground

The playground developed in Pocket-7A. It covered approximate 1.00 acre area. Play Ground is developed for children. The lush green lawn along with children playing equipment is developed in this garden.



DEVELOPMENT OF LAWN AT DDU PARK (POCKET-3A)  
DEVELOPMENT OF LAWN AT DDU PARK (POCKET-6B)



DEVELOPMENT OF LAWN AT DDU PARK (POCKET-7A) PARK 3A TRELLIS





PARK 7 A – OPEN AIR THEATRE

## 6. National Police Memorial Park

National Police memorial park is located in Chankyapuri. Its approximate area is 3.93 acre. This park was developed to commemorate the memory of Martyrdom of all the 9 or 10 Police Forces serving the nation. These forces are such as CRPF, ITBP, BSF etc. Its ownership belongs to the Ministry of Home

Affairs. In the beginning, a huge global structure was proposed to be established at a much higher location in the center of the park. But due to some objection raised by different organizations, this global structure was removed from here & shifted to some other park, probably in Noida.



## CHAPTER - 20

### COLLECTION OF SPECIMEN BONSAI PLANTS AT GOVERNMENT SUNDER NURSERY, CPWD, NIZAMUDDIN, NEW DELHI

#### “BONSAI”

Bonsai comprises a tree or shrub planted in a small container for developing as a miniature plant showing the general appearance of that plant species found in nature. It differs from a pot plant where the foliage and flowers are important, whereas for Bonsai the appearance of the plant in a miniature form is to be maintained for many years.

The Government Sunder Nursery is also making Bonsai plants by their trained staff by binding with wire, shaping them, cutting

them, training them, fixing moss grass, using small pebbles repotting, watering and selling to the public also. The Government Sunder Nursery is having specimen collection of bonsai, some of them donated by Shri Agnihotri. These bonsai are preserved in the nursery for imparting training to the scholars as well as to the public. The new bonsai house was also constructed at Government Sunder Nursery and inaugurated by DG, CPWD on 3<sup>rd</sup> March 2012. The specimen bonsai were displayed in various flower shows and won many prize in the flower show.



#### 1. Khirni (*Manilkara hexandra*)

It is a slow growing evergreen tree. The bark is grayish black and rough. The wood is used for big beams. Its fruits are edible.



#### 2. Saptaparni (*Alstonia scholaris*)

The name scholaris means children used the slated made from wood of tree for writing purpose. In October small green fragrant

flower appear. All parts of the trees is poisonous. The dark green leaves form whorls of 4-7 and regular branching gives tree a beautiful shape.



### 3. Pakur/Pilkhan (*Ficus infectoria*)

The trees can grow upto 10mtr. to 12 mtr. The leaves are glossy, green thick, copper new growth. The white flower appears in spring.



### 4. Pipal (*Ficus religiosa*)

It is a semi evergreen tree, normally grown on roadside, near temple. It is a religious tree of India. The leaves are broad cordate in shape. The fruit is a small fig green ripening to purple



### 5. Ficus (*Ficus long island*)

For making bonsai 3 to 5 year old plant is selected . The height of the bonsai can be maintained upto 30cm. The Bonsai plants require 3 to 4 hours sunlight. The leaves are leathery and thick and branches can be easily train.



### 6. Savani (*Largestromia indica*)

It is deciduous tree grows near rivers. The plants have separate male & female flowers appear in summer in white, pink or red color.

Height of bonsai can be kept upto 30cm to 45 cm. The pruning is done in late spring. Wiring is essential. Informal, cascade bonsai forms from medium to extra large size.



### 7. Putranjiva (*Putranjiva Roxburghii*)

Tree with drooping leaves having medicinal properties. Flower yellowish green leaves and fruits used for rheumatism.



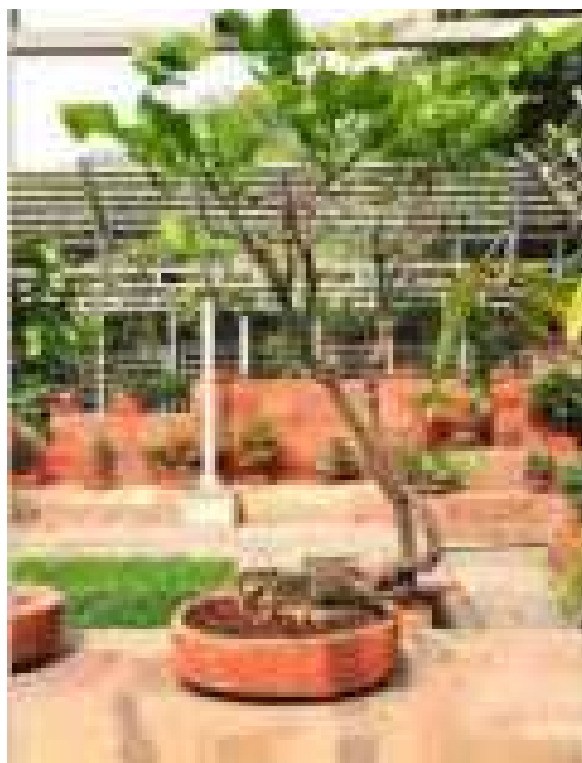
### 8. Bistendue (*Diospros Montana*)

It is a small deciduous tree. The stem is having thorns. The male and female flower grow on separate trees. The flower are creamy white. The fruit is cherry became yellow after ripening. Flowering



### 9 Ficus (*Ficus tsiela*)

The tree is large spreading tree without aerial roots. Leaves coriaceous. Fruits when ripe become purple during April to October. A good avenue tree.



### 10 Papri (*Pongamia glabra*)

It is also called pongam oil trees. The oil kept away the insects from the skin. The oil of the seeds beneficial in treating skin disease and antimicrobial.



### 11 Amrood (*Psidium guajava*)

The tree became tall upto 15 mtr. Height having leathery leaves small fruits but very sweet and white flowers in March & October.



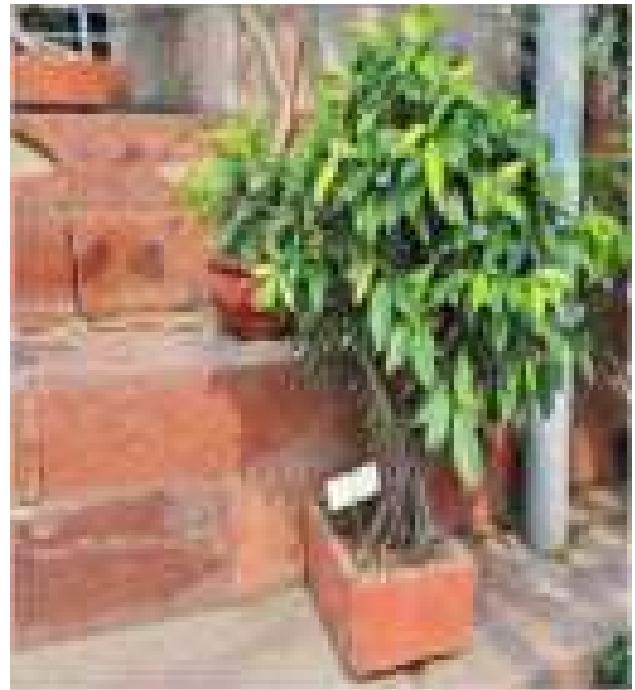
### 12 Schefflera (*Schefflera* sp.)

It is having more than one leaflet. Due to the wood and bark it is bit difficult to shape with wire. The cutting of branch a new apex grown on the cut.



### 13 Savani (*Largestromia indica*) dwarf

The plant is attractive to bees, butterflies and birds, due to violet/ lavender color flowers. The plant can be grown by soft wood cutting. Average water requirement bloom in April. The leaves are shiny/ Glossy.



### 14 Ficus (*Ficus panda*)

The Bonsai plant of this plant can be made in one month by using air layering. It is big tree having shining leaves.





#### 15 Maulsiri (*Mimusops elengi*)

The plant is having small shiny leaves. The flower are tiny cream colored fragrant star shaped. In the morning the flower spread scent in the air. The flower are offered in temples and shrines. Fruits are eaten fresh. It medicinal value is to prevent the bad breath and keep the gum healthy.



#### 16 Limonium (*Limonium* sp.)

It is a herbaceous perennial plant produce from a rhizome. The leaves are simple the flowers are of pink, violet or purple color. The fruits is small having single seed. These are grown "as everlasting flower.



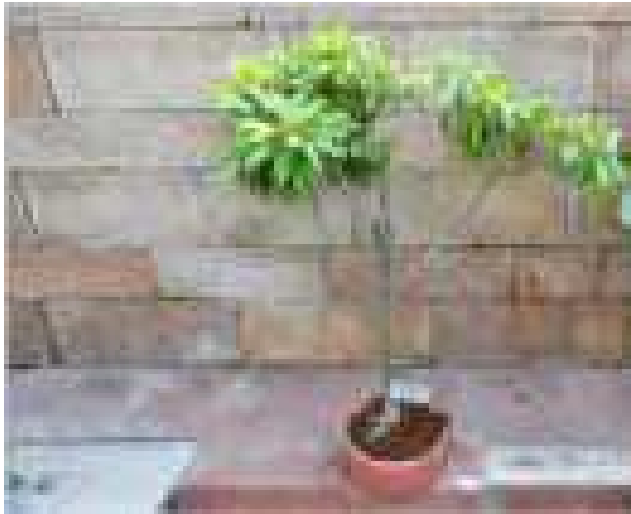
#### 17 Jatropha (*Jatropha* sp.)

It is small flowering plants. The plant is resistant to drought and pests and produce seeds. Seed is used for extracting future biodiesel. The flower appear from April to Sept.



#### 18 Malpighia (*Malpighia coccigera*)

The plant is having less height, toothed leaves, pinkish/ white flower throughout the year. It makes a beautiful bonsai. It has light fragrance. Height of the plant 15.



### 19 Chiku (*Achras zapota*)

It is much branched tree upto 8mtr. Height. Flower are hairy outside. Fruit are brown and fleshy, having 5 or more shiny blackish brown seeds. The fleshy part is sweet with flavor. Seeds are diuretic, and antipyretic. It contains sapotin (which is rich source of sugar, protein, vitamins C and mineral).



Landscape Design

## CHAPTER - 21

### DECORATION AT DIFFERENT SAMADHIES

#### 1. Flower Decoration at Shanti Van. Shanti Vana (Samadhi of Late Sh. Pt. Jawahar Lal Nehru, Former Prime Minister of India)

One of the most able sons of India who not only shaped India's destiny but also played an instrumental role in framing the future of the world, Pandit Jawaharlal Nehru was cremated here at the ShantiHYPERLINK "<http://www.sodelhi.com/memorials-modern-architecture/337-shanti-vana>" HYPERLINK "<http://www.sodelhi.com/memorials-modern-architecture/337-shanti-vana>" Vana. The Campus of Shanti Vana is around 60.00 acres area including forest and lawn area. It has 2776 Nos. of trees of 65 different species.

Shanti Vana or the Forest of Peace truly lives up to its name. Lush greenery, sprawling gardens, numerous trees & saplings keep the atmosphere cool & serene. The stretches of greenery run endlessly and in almost every nook & corner, a beautiful plant stands in humility to welcome you.

All the visiting dignitaries & the heads of the states include a visit to Shanti Vana as an integral part of their itineraries. As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 27<sup>th</sup> May of every year. On 14<sup>th</sup> November of



every year, which is his birth anniversary, he is remembered & honoured by the country's people; and for his ardent love for kids, 14th November has been recognized as National Children's Day.

Certain prayer sessions & cultural programmes are organised in Shanti Vana to celebrate the event. The place provides you with an absolute peace & calm and has a perfect atmosphere for meditation.

## 2. Flower Decoration at Vir Bhumi (Samadhi of Late Sh. Rajiv Gandhi, Former Prime Minister of India)

Vir Bhoomi stands near the memorials of Sh. Mahatma Gandhi (Father of Nation) & other prominent leaders of the country on the Mahatma Gandhi Marg (Main Ring Road) New Delhi. Sh. Rajiv Gandhi was India's youngest Prime Minister when he was sworn in as the Prime Minister of India in 1984. Unfortunately Sh. Rajiv Gandhi assassinated by an LTTE lady suicide bomber in 1991 and India lost one of its most dynamic and visionary Prime Minister. Vir Bhoomi (the land of the Brave) is a memorial dedicated to him, where he was cremated. The campus of Vir Bhoomi is around 22.30 acres. It has 950 Nos. of trees

of 54 different species. The lawns of this site is seen covered with well trimmed green grass and lined with trees, plants and shrubs that add on heavenly look to the entire area and its surroundings.

As a sign of respect, one has to take off his footwear to visit the sacred site and can also attend the special prayer sessions held every 20<sup>th</sup> of August (Birthday) and 21<sup>st</sup> of May (Death Anniversary) every year in order to remind us of the dreams and aspiration he had for his country and admire the fact that after his demise



### 3. Flower Decoration at Kissan Ghat. Kisan Ghat (Samadhi of Late Sh. Ch. Charan Singh, Former Prime Minister of India)

The literal meaning of Kisan Ghat is “Farmer’s Court”. Kisaan Ghat is the Memorial of Chaudhary Charan Singh, was the sixth Prime Minister of India. He was born on 23rd December 1902 and died on 29th May 1987. He was appointed as a prime minister of India for a very short period in 1979. The area of Kisan Ghat has a beautiful park surrounded with trees planted by visiting dignitaries and heads of state. The campus of Kisan Ghat is

around 8.84 acres area. It has 255 Nos. of trees of 19 different species.

As a sign of respect, one has to take off his footwear to visit the sacred site of his cremation on 29<sup>th</sup> May of every year. On 23<sup>rd</sup> December of every year, which is his birth anniversary, he is remembered & honoured by the country’s people.





#### 4. Sadaiv Atal Samadhi

1. Sadaiv Atal, the Samadhi of Atal Bihari Vajpayee was dedicated to the Nation on the birth Anniversary of the former Prime Minister Atal Bihari Vajpayee 25-12-2018.
2. The Bharat Ratna awardee was born on 25 December. The day is celebrated as 'Good Governance Day' by the BJP.
3. Prime Minister Modi, President Ram Nath Kovind and Home Minister Amit Shah, among other BJP bigwigs, were in the attendance to pay their respects. President Ram Nath Kovind pays his respects to Atal Bihari Vajpayee on his first death anniversary.
4. To emphasise on the unity in diversity, stones from various parts of the country have been used in the construction of Samadhi near Rajghat in New Delhi. The Samadhi has a central platform comprising of nine square blocks, capped with a Diya in the centre. The number nine represents the navarasas, navaratras and navagrahas. The placement of the nine square blocks is in a circular lotus shaped pattern.
5. "Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of," PM Modi said in his tweet.
6. Land was made available for the memorial at Rashtriya Smriti Sthal by the Union Housing and Urban Affairs Ministry.
7. It was constructed by the Centre Public Works Department (CPWD) at a cost of Rs 10.51 crore. The project was funded by the Atal Smriti Nyas Society.
8. The memorial is spread over approx. 10 acres of land at Rashtriya Smriti Sthal, where Vajpayee was cremated on August 17, 2018.
9. Not a single tree was cut down in developing 'Sadaiv Atal' at Rashtriya Smriti Sthal, which also houses samadhis (memorials) of former presidents, prime ministers among others.
10. Sadaiv (always) Atal memorial will be managed by a trust headed by Ex. Lok Sabha Speaker Sumitra Mahajan.

Former prime minister of India Atal Bihari Vajpayee passed away on 16 August 2018. Marking his first death anniversary, a 'Saidev Atal' memorial was organised in New Delhi on 16<sup>th</sup> August 2018.



President Ram Nath Kovind, Vice-President M Venkaiah Naidu and Prime Minister Narendra Modi were among the dignitaries who paid floral tributes to the former statesman at the memorial built near the Rashtriya Smriti Sthal, where his mortal remains were consigned to flames on 17<sup>th</sup> August 2018.



Namita Kaul, daughter of Atal Bihari Vajpayee with her family members and others pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary at his memorial, Sadaiv Atal, in New Delhi. “Tributes to Atal Ji on his Jayanti. We reiterate our commitment towards creating the India he dreamt of,” Modi.



Prime Minister Narendra Modi pays tributes to former prime minister AB Vajpayee on his 95th birth anniversary, in New Delhi.

A vacant piece of land was made available for the memorial at the Rashtriya Smriti Sthal here by the Union Housing and Urban Affairs Ministry. Spread over approx. 10 acres of land, the memorial was constructed by the Central Public Works Department in a very short period. The project was funded by the Atal Smriti Nyas Society.



President Ram Nath Kovind with Prime Minister Narendra Modi, Amit Shah, JP Nadda & other BJP leaders attend prayer meeting to pay tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.



President Ram Nath Kovind with Prime Minister Narendra Modi pays tributes to former prime minister Atal Bihari Vajpayee at his memorial, Sadaiv Atal, on his first death anniversary, in New Delhi.



Prime Minister Narendra Modi and BJP President Amit Shah arrive to pay tribute to BJP veteran late Atal Bihari Vajpayee at Sadaiv Atal Samadhi, ahead of former's swearing-in ceremony as prime minister for the second consecutive term, in New Delhi.

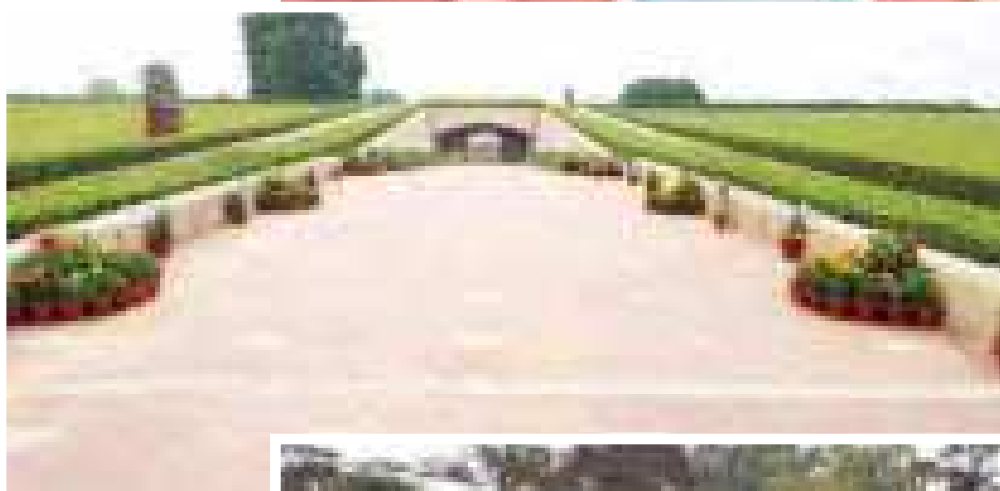
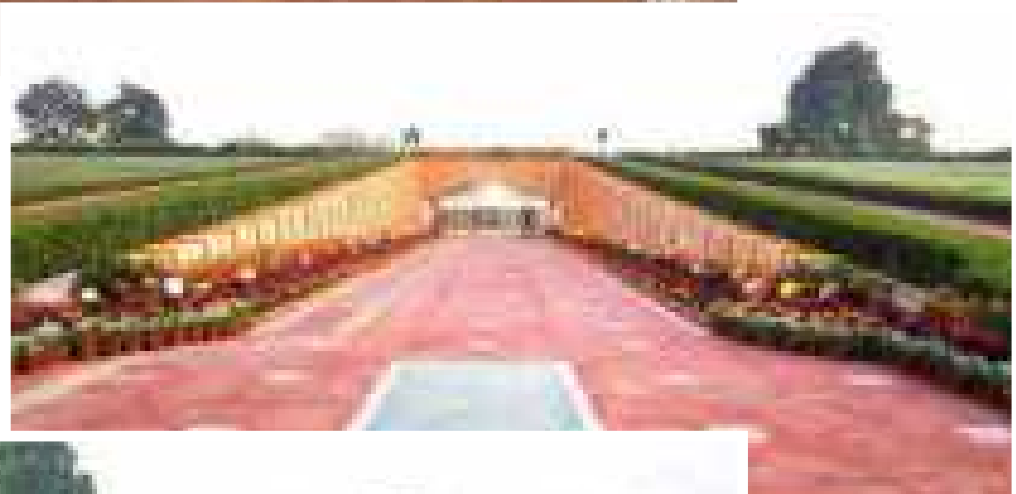
## 5. Rajghat

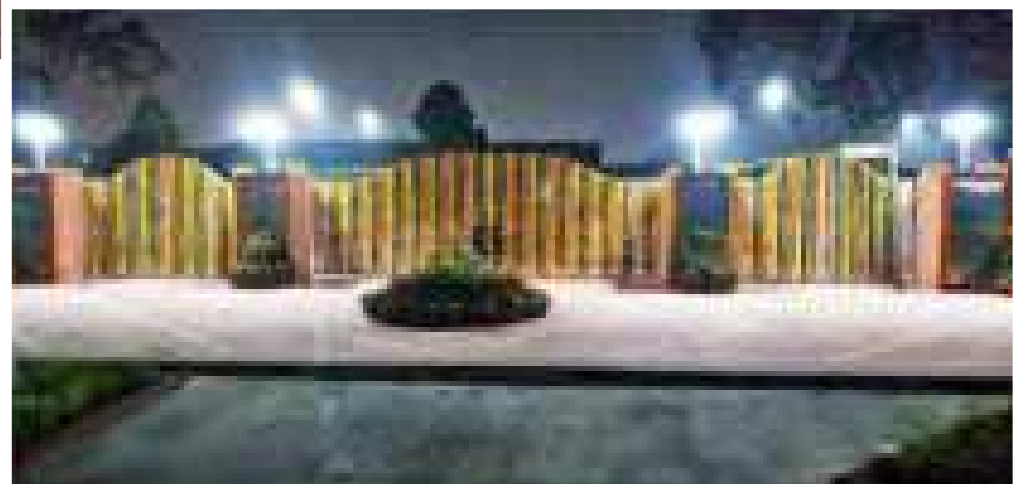
1. Raj Ghat is the memorial of Mahatma Gandhi, the Father of the Nation.
2. Black stone platform in an open air complex marks the spot where Gandhi was cremated.
3. A flame constantly burns at one end of the platform and visitors are required to remove their footwear before they enter Raj Ghat.
4. This memorial is located between Ring Road and the banks of the Yamuna River, towards the southeast of Red Fort.
5. His last words, 'Hey Ram,' are inscribed on the marble which is always adorned with flowers.
6. Foreign dignitaries visiting India pay respect to Gandhi by laying flowers on the platform.
7. United State Ex-President Barack H. Obama visited the Rajghat on 25, January, 2015.
8. United State President Donald Trump visited the Rajghat on 25 February, 2020.
9. Horticulture Activity in the Rajghat Complex:-
  - a. Samadhi of Mahatma Gandhi is the well-known place in the world.
  - b. Specially landscaped beautiful and lush green lawn (35.47 Acres).
  - c. It has 1056 numbers of trees of 42 different species
  - d. Large number of tourists and school children visiting every day.
  - e. All the heads of Nations visit this place during their stay in India.
  - f. Flower decoration of Rajghat Samadhi on the occasion of birth and death anniversaries.
  - g. There is also a Gandhi Memorial Museum where a film is shown – between 9:30 am and 5:30 pm except on Thursday – about his life and philosophy. It is also presented on Sunday in Hindi at 4 pm, and at 5 pm, it is shown in English.

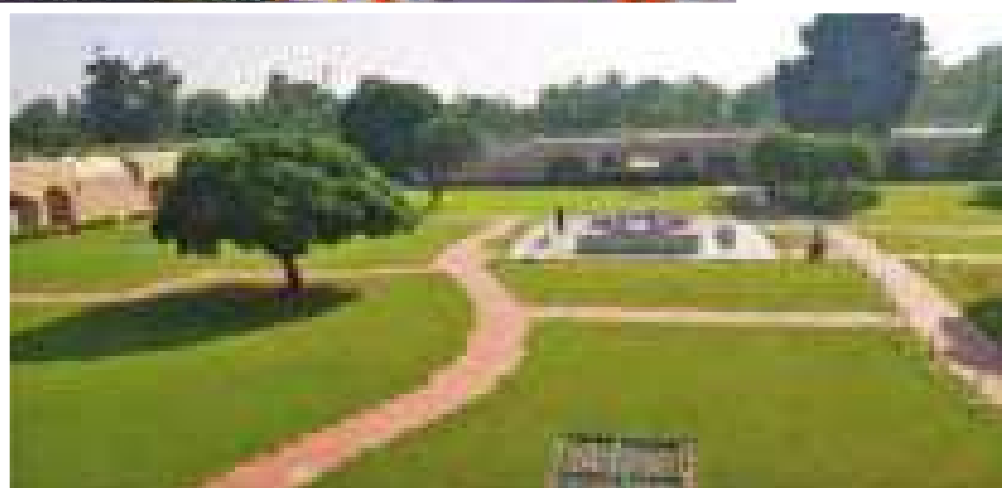
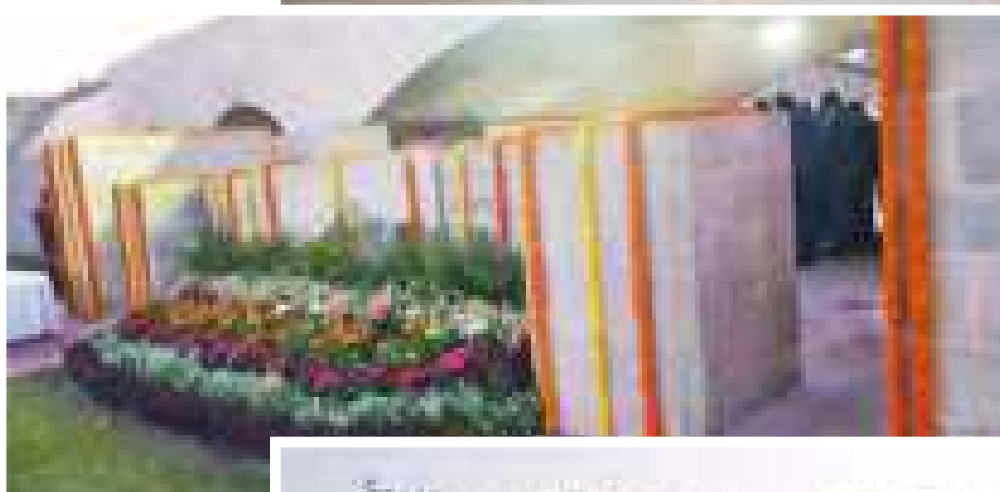
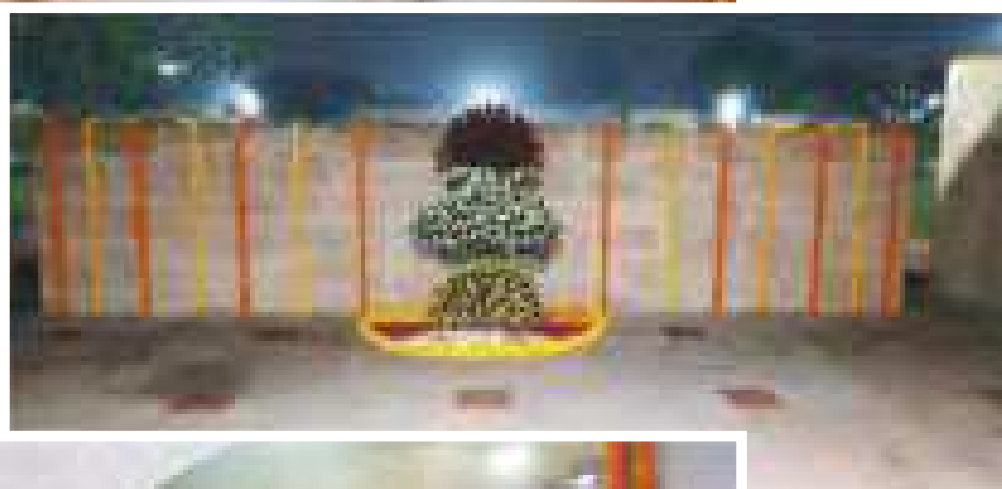
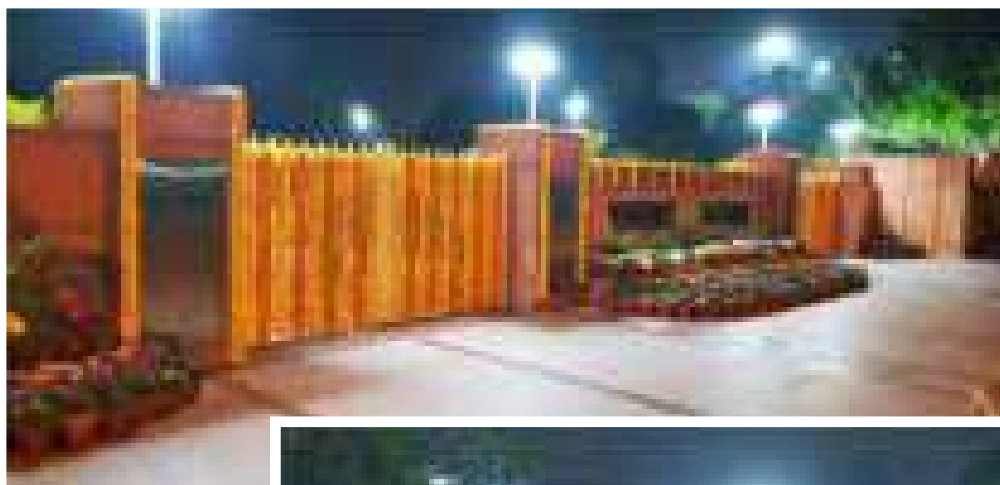


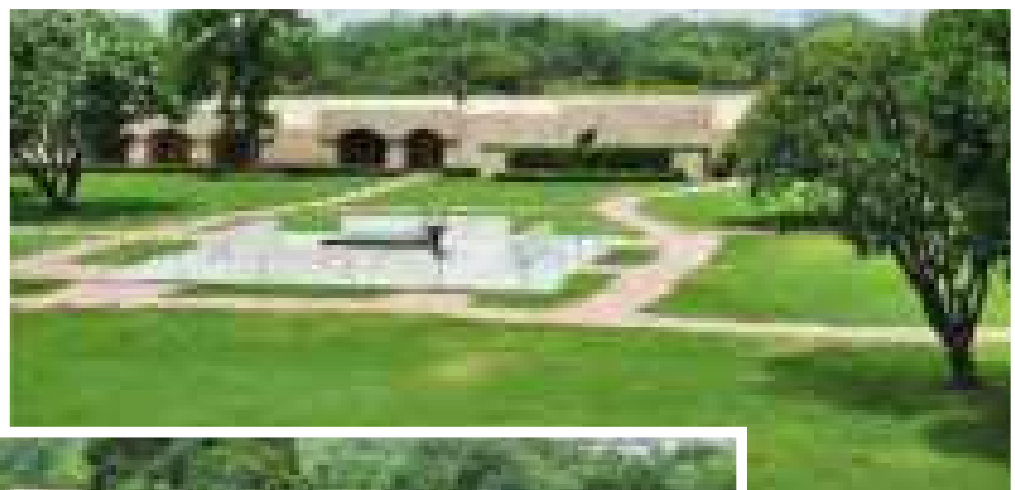




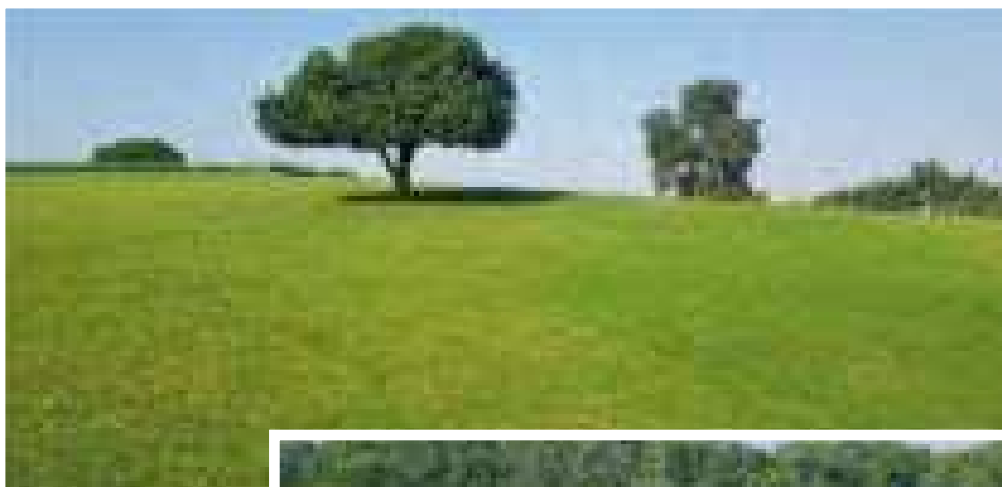
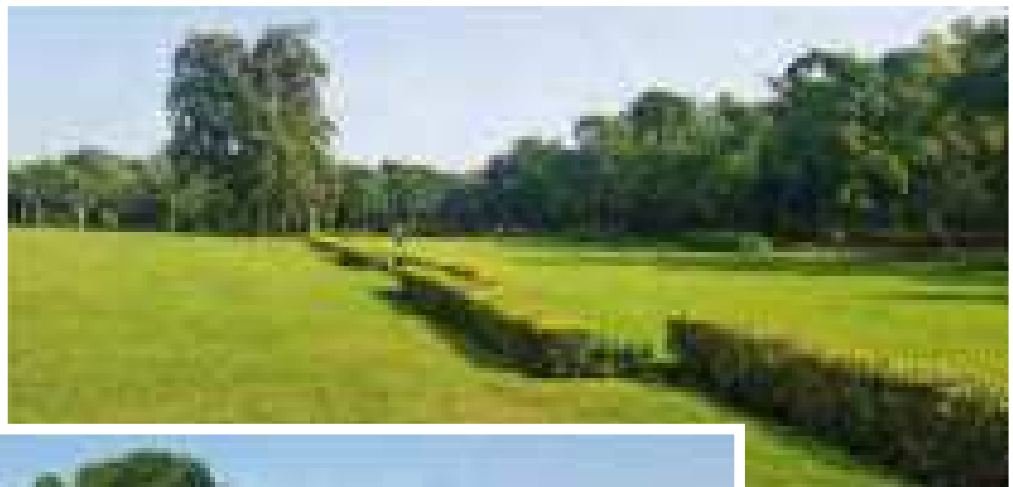
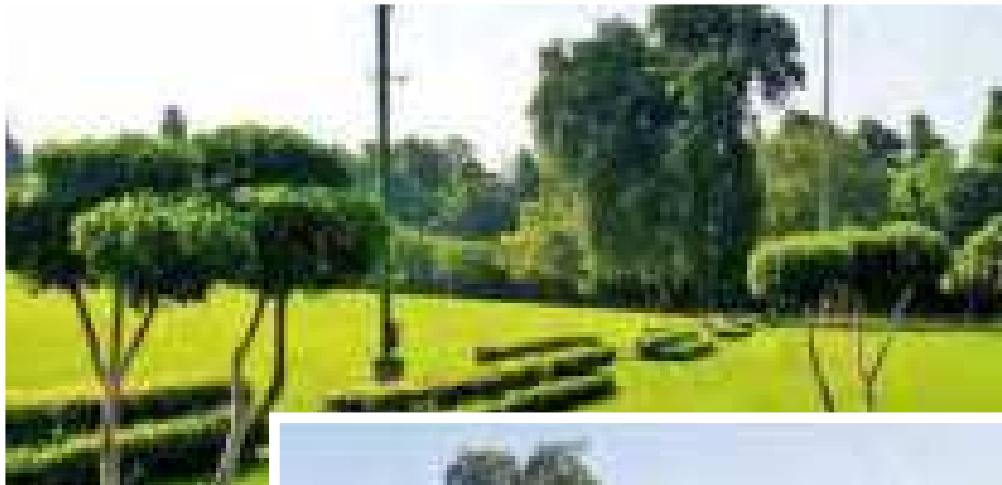












No. 5- DDR/VIP/2000-DDVI  
Ministry of Urban Development and Poverty Alleviation  
(Delhi Division)

\*\*\*\*\*

Nirman Bhawan, New Delhi

Dated 21<sup>st</sup> July 2000

OFFICE MEMORANDUM

Sub: Environmental damage use to unnecessary and wasteful building exercises undertaken by Municipal agencies – Issuing of guidelines.

The undersigned is directed to state that after considering the view of experts Government agencies local bodies and NGO's the Guidelines for Greening of Urban Areas and landscape have been formulated. These guidelines are issued to all concerned for taking follow up action.

(MAHENDRA KUMAR)

Under Secretary to the Govt. of India

To

8. Principal Secretary (UD) GNCTD, Vikas Bhawan, I.P. Estates, New Delhi.
9. Commissioner, MCD, Town Hall, New Delhi.
10. Chairperson, Palika Bhawan, New Delhi.
11. Vice Chairman, DDA, Vikas Sadan, New Delhi.
12. CEO, Delhi Jal Board, Jhandewalan, New Delhi.
13. Chairman, DVB, Shakti Sadan, New Delhi.
14. DG (W), CPWD, Nirman Bhawan, New Delhi.
15. Engineer –In-Chief PWD(Delhi Admin), GNCTD, K.G. Marg New Delhi.
16. Director of Horticulture, CPWD, I.P. Bhawan, New Delhi.
17. Director of Horticulture, MCD, Under School Lane Fly over. Deen Dayal Upadhyay Marg, Rouse Avenue, New Delhi.
18. Director of Horticulture, NDMC, Palika Kendra, New Delhi.
19. Director of Horticulture, DDA, Vikas Minar, New Delhi.
20. Conservator of Forest, GNCTD, Kamla Nehru Ridge Delhi 110007.
21. Head of Department Floriculture IARI Pusa Road, New Delhi.

Copy to

1. APS to UDM/PS to MOS (UD)
2. SPPS to Secretary (UD)/ PS to JS (UD)/PS to JS(DL)/PS to DS(DD)

## Guidelines for greening of urban areas and landscaping

3. **To avoid use of excessive tiling of payments : porous materials to be used :-** Unnecessary and excessive tiling of the road side pavement should be avoided. The area around trees lined along the road should not be covered with tiling as it hampers the basic necessary function and needs of the trees i.e. root aeration and availability of water get drastically reduced. Whenever tiling is done, porous tiles preserved while taking up civic works Indiscriminate tiling of road dividers and footpaths should be avoided.
4. **Tiling should be done only on pavements with heavy pedestrian traffic:** - Tiling should be only done don't on the roadside which have heavy pedestrian movements. In case of bridges and such areas where there are no pedestrian movement, tiling may be avoided and in case tiling is to be done, preference is to be given to porous tiles as porous materials allows seepage of ground water. The species of trees may be chosen for their pollution reduction abilities including dust trapping to avoid reliance of a single species, a combination of trees, shrubs, grasses should be grown.
5. **Growth of grasses to be encouraged :** - The necessary of grasses playing a vital role in making soil suitable for vegetation should be realized and unnecessary digging of soil should be stopped forthwith.
6. **Excessive pruning to be avoided:** - Practice of excessive pruning of crops should be avoided. Pruning of plants in a well nurtured garden and pruning of roadside plants should be differentiated Excessive pruning may lead to upsetting

the root shoot ratio. Leaf pruning should not be resorted to.

7. **Compost to be made of leaves:** - Leaf is an excellent material for making of compost and burning of leaves causes pollution. A system of composting of leaves in nearby parks should be adopted which will provide water retentive manure to civic agencies. Some fallen leaves may be left near the base as water retentive mulch.
8. **Adequate space to be left around trees:** - An area of 6"x6" around the trees should be left un-cemented. Widening of roads, upto the trunk of trees is to be avoided as roots come under the asphalted roads and will gradually die. In case of storm, these trees can topple down. Activities which adversely affect the roots are to be kept at a minimum.
9. **Digging near trees to be avoided:** - Digging near the trees by allowing telephone, electricity, sewage lines should be avoided to avoid root injury, sufficient space should be left along the ground for the trees. In no case should roots be exposed. Washing avenue trees foliage may be done on a tri-monthly basis to get rid of particulate matter from the foliage.
10. **Use of Organic Compost:** - The dead trees may be replaced by young plants after providing sufficient compost in the pits. Organic manure added with compost FYM mix with nitrogen fixing bacteria culture and neem cake should be spread on the green and poured into the soil before either irrigating the tree basin or before rains.
11. **Planting of second line trees to be encouraged:** - New trees which may be called as second generation trees must be planted preferably 2-3 meters behind

12. the existing road trees in an alternate position or inside the bungalow compounds. A mix of foliage and fruit trees should be planted. Planting of fairly well established large trees should be undertaken as chances of their survival will be more. Cues of species to be adopted may be taken from the old trees lining Delhi's roads.
13. **Initiation of EEC Activities:** - Horticulture department may initiate education/awareness campaign with school students and elders and users of the park where the difficult species of trees are present in the particular park and importance about preservation of eco-systems is explained. School Student may be taken for nature walks in a major garden to get them associated with the flora and fauna around them. Also the citizens of an area residing near a park can be involved for this awareness campaign.
14. **Compactness of soil near trees to be avoided:** - Compactness of soil should be avoided within at least one meter around the tree. Perforated metallic frame can be used for this purpose. Soil surveys around the trees should be done by removing stones.
15. **Setting up a Central Resource Centre :** - A Central Resource Centre should be set up to aid and **advise** the State Government, Municipal Corporations and other development agencies dealing with matters pertaining to Horticulture and landscaping. A manual on the subject should also be prepared.
16. **Stress on shelter beds of thick trees :-** Around the cities vulnerable to desert winds, shelter-beds of special design of thick trees should be planted.
17. **Updating technology of transplantation of trees:** - Technology of transplantation of trees should be updated to ensure at least 80 percent of the success rate of planted trees. As far as possible, trees grown in the nursery with a height of four to six meters should be planted. Presently, survival rate of trees is less due to animal menace and non-caring of trees. The public participation in caring of trees planted around their houses may be ensured.
18. **Setting up of a tree disease surgery unit in Horticulture Department:** - A small tree disease/surgery unit should be created in all Horticulture departments to cure tree maladies.
19. **Earmarking of some cost of projects for landscaping:** - In any layout plan of land and housing development, at least two and a half percent of the cost of the project should be earmarked for landscaping and green development.
20. **Use of kitchen and garden waste for compost:** - Technology to use kitchen waste to fabricate building and landscaping material should be perfected and made available to all the urban development agencies.
21. **Proper care of water fronts :-** Underground water does not get recharged sufficiently because of use concrete around them. Efforts should be made to get the water fronts recharged and these fronts kept clean.
22. **Heritage building to be landscaped:** - Areas around heritage buildings should be suitable landscaping and beautified.
23. **Greening of void areas not required for minimum construction:-** Urban void areas should not be allowed to exist and the area not required for immediate

development or construction, should be made green and fenced with suitable landscaping. Similarly road berm/right of way required for future road widening should be landscaped and maintained as green.-

24. **Encouragement for water harvesting technologies:-** Information regarding water harvesting has to be disseminated in public and its use encouraged. It should be ensured that quality of water does not get deteriorated for which required measures are to be taken.

25. **For maintenance of greens internally :-** Criss-cross paths should be provided for in the gardens and lawns. There should

be connecting gated at all corners so that people do not walk on the grass.

26. **Public participation to be ensured :-** Public participation at present is poor in maintenance of green. This has to be activated and Residents Welfare Association and to be involved in planting of new trees and in their survival. User groups need to be activated, NGO's can play a catalytic role in this. Each NGO may earmark a selected area for its activities thereby dividing the entire net area. Committee with officials from MCD, NDMC, DDA, GNCTD etc. will act as a nodal agency and will review every month or as necessary.



Landscape Design



**DEPARTMENT OF FORESTS & WILDLIFE  
GOVT. OF NATIONAL CAPITAL TERRITORY OF DELHI  
A-BLOCK, 3<sup>RD</sup> FLOOR, VIKAS BHAWAN, I.P. CHATTE, NEW DELHI-110002**

ENR/0000/CP/TA/07-18/Part 06/18-20/04/27-9-0

Dated: 14/10/19

**GUIDELINES  
FOR PRUNING OF TREES  
UNDER DELHI PRESERVATION OF TREES ACT, 1994**

1. The Delhi Preservation of Trees Act, 1994 was enacted to safeguard the forest area in and around NCT of Delhi and to provide for preservation of trees. The Department of Forests & Wildlife, DNCTD has regulatory control for implementation of DPTA, 1994 which prohibits felling or pruning/ head backing of trees.
2. The Sec.2 (4) of DPTA, 1994 states that "to fell a tree" with its cognate expression, means severing the trunk from the roots, uprooting the tree and includes bulldozing, cutting, girdling, lopping, pollarding, applying herbicides, burning or damaging a tree in any other manner as factors causing the death of a tree. Thus it would be apparent that its implied meaning does not appear to carry any implicit connotation that pruning of trees which do not cause damage or death of a tree could be termed as a Tree Offence.
3. In the light of above, general guidelines for pruning of trees are prescribed for adherence by all concerned, so that the trees grown with great care and precision over a period of several years are not abused recklessly leading to their untimely death (which is an offence under Section 8 of DPTA, 1994) or result in reduction of green cover of Delhi which is an essential strategy to combat pollution.
4. Pruning means cutting off or removing dead or living parts or branches of a tree to improve shape or growth. It is a horticultural and silvicultural practice involving selective removal of parts of a plant, such as branches, buds, or roots. Reasons to prune plants include deadwood removal, shaping by controlling or directing growth, improving or maintaining health, reducing risk from falling branches, preparing nursery specimens for transplanting, etc. However, the pruning cut should not be too large so as to damage the tree.
5. For the purpose of clarity and transparency in the meaning of light and heavy pruning, following would constitute as above:

Term	Branches of girth size	Permission required or not	Remarks
Regular Pruning/ General Tending	Upto 15.7 cm.	No	May be got done by Civil Agriecet at regular intervals
Light Pruning	Greater than 15.7 cm but less than and equal to 40 cm.	Required	From concerned Tree Officer on submission of prescribed Form B and other documents as prescribed in DPTA, 1994.
Heavy Pruning	Greater than 40 cm	Required	

6. The forest department does not get the trees felled or pruned/ head backed directly but only accords permission for the same to the owner of land on which the concerned tree is standing after due inspection/ investigation.
7. The actual pruning of the concerned tree/ trees is got done by Deputy Director (Hort.) of the MCDs/ NDMC/DDA/ FWD/CPWD (whichever is the local owning agency) of the concerned area or by the property owner himself/ herself.
8. For obtaining permission for felling or pruning/ head backing of trees, guidelines are in place for information to all and ease of Public/ Govt. agencies towards achieving their desired objective which are available on the department website "[www.forest.dehpunjab.in](http://www.forest.dehpunjab.in)".
9. If Individuals/ General Public/ Society /RWAs is desirous that any tree inside his house/premises is posing problems to him or the public and needs to be felled or pruned/ head backed, then he may apply for the same in Form B' along with photographs and number of trees/ beds in situation to the DCF/ Tree Officer of his area for the permission. After inspection, the permission or otherwise is communicated to him/ her within 60 days as per merit of the case.
10. If the tree/trees for which felling or pruning/ head backing is required is standing on Govt. land/ roads/ Parks/ govt. property in front of the houses/ shops/ private property of an individual and is posing problem to him, he has to apply for felling or pruning/ head backing of such tree on a simple piece of paper to the Deputy Director (Hort.) of the MCDs/ NDMC/ DDA/ FWD/ CPWD (whichever is the local owning agency) with photographs of such tree/ trees.
11. It should neither be applied directly to concerned DCF nor Form B submitted directly which has to be filled and signed by the concerned Dy. Director (Hort.) of the land owning agency. After inspection, the permission or otherwise is communicated within 60 days of receipt of such completed applications/ form B to the concerned Dy. Director (Hort.) as per merit of the case.
12. If a tree is standing on govt. land but leaning on private land/ building and is considered dangerous and likely to cause damage to life and property, it should be informed immediately with photograph to the concerned aggrieved person. Permission is granted for its felling or pruning/ head backing within 48 hours of inspection, as per merit of the case. In case permission/ any intimation to the contrary is not received within this time, the person can go ahead and fell or prune/head back the dangerous/ leaning tree and intimate the concerned Tree Officer (DCF) within 24 hours of such felling or pruning/ head backing.
13. There are three (3) Deputy Conservator of Forests (DCFs) who are designated as Tree Officers to look after the cases of tree felling or pruning/ head backing and accord permissions for the same, after inspections, as per merit of the case. Their respective jurisdictions in Delhi are shown in table below.

S.N.	Name of the Division	Name of the Revenue District	Name of the Subdivision
1.	North Forest Division	North	Mota Town, Kanda & Adpur
		North West	Bafra, Kachanoli & Sarwan Vihar
		West	Puneri Baga, Pori Nagar & Karam Dargah
		North East	Sarwan, Yama Vihar & Karam Nagar
		East	Gandhi Nagar, Pori Vihar & Yama Vihar
		Shahdara	Shahdara, Sarwan & Yama Vihar
		Control	Civil lines
2.	West Forest Division	South West	Dwarka, Noida part & Kapashra
		South Delhi	Chandigarh, Delhi East & Yama Vihar
3.	South Forest Division	South	Safai, Huda Chow, Mayapuri
		South East	Indira Colony, Kirti & Noida Vihar
		Control	Kirti & Kirti Baga

14 Pruning/ pollarding/ burning/ topping/ applying arboricides or damaging a tree in any other manner would be considered as tree offence when, as per ocular estimation of such damage, the Tree Officer, in all his wisdom, holds that such act is likely to lead to the death of the tree, in near future.

15 If a tree standing on any govt. land/ road side/ private land/ building is considered dangerous and likely to cause damage to life or property, or hindrance to traffic signal, it should be pruned immediately by the concerned Civil Agency and referred to concerned Tree Officer within 24 hours and for which no permission is required from Tree Officer.

  
Deputy Conservator of Forests (HQ)  
Member Secretary (Tree Authority)

F.No.8(133)/CF/TA/CP-18/Pat No/18-VN/5473-10

Date: 27/10/19

Copy to:

1. All DOPs for information.
2. All DBOs/ Forest Guards for information.
3. The Director (Hort) of All Civil Agencies viz. MCD/ NDMC/ DDJ/ FWD/ CPWD etc.
4. Action Board
5. Programmer, Environment Department, GNCTD with a request to upload on the official web site of the Department.

Distribution:

1. Secretary to Hon'ble Minister (S&P), GNCTD for information.
2. PS to Principal Secretary (S&P), GNCTD for information.
3. PCIT/ MOD, GNCTD for information.

  
Deputy Conservator of Forests (HQ)  
Member Secretary (Tree Authority)

Page 3 of 3



## CHAPTER - 22

# DISPLAY OF FLORAL TABLEAU DURING REPUBLIC DAY CELEBRATIONS PREPARATION OF FLORAL TABLEAU

Republic day celebration is the responsibility of the Ministry of Defence, Government of India. Ministry of Defence circulates its letter for the preparation of different tableau to the various states and some of the Ministries for the Republic day celebrations in each year. Our Ministry receives this letter in the month of May then this work is assigned to CPWD, and till the month of June, it comes to the Directorate of Horticulture. Director of Horticulture assigns the duty of a particular division for the fabrication of the floral tableau. Normally, six sketches of themes are being submitted to the Ministry of Defence by the month of July as per their guidelines. Then discussion regarding the theme of the floral tableau being discussed before the tableau expert committee. Expert committee suggests their view points regarding the theme, colour scheme and its suitability to the occasion. Then department has to make rectification in the theme, colour scheme, etc. as desired by the tableau expert committee. After they get satisfied with our proposal then we are being asked for the preparation of the model. Then again meeting takes place regarding the selection of model and expert committee suggests their view points regarding the model. After the model being selected by the tableau expert committee then the department is asked to submit music with relevant to the theme and model. Then again meeting takes place regarding the selection of music, if any suggestion comes then music is also modified as per the view points of expert committee. After the theme, model, music and colour scheme being cleared by the tableau expert committee then the department gets ready for the

preparation of floral tableau for the Republic day celebrations.

Director of Horticulture selects the site for the preparation of floral tableau by taking concern of all the sensitivity and security angles of the Republic day celebrations. In the last week of December the department gets a new tractor along with a trailer from the Ministry of Defence (OSD, RR Camp), duly received by the Assistant Director Horticulture and Section Officer Horticulture in-charge of the floral tableau. The whole arena of the fabrication site is being taken by DCP (PM security), Delhi Police and the site is being monitored by CCTV round the clock as per the security norms. Director of Horticulture convenes a meeting of whole department and takes the view points of everyone regarding the availability of flowers and other suggestions regarding fabrication of floral tableau. Thereafter duties are being assigned to all the Horticulture Divisions situated at Delhi. In the first week of January skeleton work starts thereafter wire mesh and mossing works starts. Mossing is done and it is being watered regularly for the conservation of moisture so that longevity of the flowers may be ensured. On 23<sup>rd</sup> onwards collection of flowers starts and the pinning of the flowers starts on 25<sup>th</sup> morning and entire Horticulture department works during this occasion as per the duties already assigned to them and it completes around 11:00 PM in the night. A dinner is also being hosted by the Director of Horticulture for all those who are involved in the fabrication work during this occasion, all the senior officers of the CPWD including Director General and Secretary, Ministry of



Urban Development also grace the occasion with their presence. CPWD floral tableau is continuously winning special prize since year 2007 and in the year 2007 this floral tableau won four prizes i.e. Special prize, Best theme,

Best colour scheme and Best presentation. Probably this floral tableau is one of the longest floral fabrication work where this much infrastructure, floral craftsmanship and skilled man power is involved.

## CPWD TABLEAU- 2000

### Theme : Basant

The theme of the Floral Tableau of the year 2000 is 'Basant' depicting Ideas of rejuvenation, renewal, regrowth. Basant festival is celebrated to mark the preliminary preparations for the arrival of spring. The beautiful Tableau shows the colour yellow represents good fortune, spirituality, the ripening of the spring crops and the recent harvest. Yellow flowers are used in abundance to decorate the places of worship. In the Tableau Garden adornments like Fountain

and patio adding the beauty. This design and concept re beautiful depicted in this tableau.

The Tableau describes plants and animals compliment and supplement with each other and truly depict the quotes i.e. spending time in nature is energizing.

Chrysanthemum, Carnation, Rose, Gladiolus and Marigold are blended on the Tableau in a way that perceives a natural landscape.



**2000 (BASANT)**

## CPWD TABLEAU- 2001

### Theme : Shanti Sandesh

The theme of the Floral Tableau of the year 2001 was “Shanti Sandesh” showing three monkeys of Mahatma Gandhi depicting moral gestures-see no evil, speak no evil, and hear no evil.

The rear part of tableau shows the portrait of mahatma Gandhi decorated with beautiful white colour chrysanthemum flowers gives the message of peace and purity. The front portion of Tableau shows the Teen Bander of Mahatma Gandhi. These monkeys have

come to resemble our actions or observation, listening, and speaking which depicts don't see flaws in every one, don't listen irrelevant things don't speak any things that hurt others. Always look for the good in people and believe in truth.

The beautiful flowers of different varieties of Lily and Asparagus are used in the Tableau which gives message of renewal, growth, and hope.



**2001 (SHANTI SANDESH)**

## CPWD TABLEAU- 2002

### Theme : Ghar

The theme of the Floral Tableau of the year 2002 was 'Ghar' depicting Home, a place of happiness, peace and harmony happiness lies within individual but home environment also plays very crucial role this tableau depicts that happy home is one which is surrounded by aesthetic view. Money is not the secret of happiness.

Floral Tableau decorated with beautiful colours of Gerbera flowers. Yellow marigold usage on the Tableau representing passion and creativity. The trees all around the houses keeps the macro environment cool and brings happiness and positively.



2002 (GHAR)

## CPWD TABLEAU- 2003

### Theme : Chatur Khargosh

The theme of the Floral Tableau of the year 2003 was 'Chatur Khargosh' indicates popular story about clever Rabbit and foolish Lion. In this story a greedy lion started killing animals in the forest indiscriminately and to bring an end to this animals decided to sacrifice themselves by volunteering one animals every day. The wise rabbit let the lion towards the deep well and showed his reflection in water as claimed as his competitor. Foolish lion in the well to attack

his competitor and lost his life. Thus the wise rabbit saved the inhabitant of the forest. The story gives the moral 'Wit is superior to brute force'. The front part and the rear part of Tableau shows the Lion stands on the deep well waiting the animals.

On the Tableau the diversity of animals made from the flowers of various colours giving the look of forest whereas other things are given natural colour. All the decorations are made with fresh flowers.



2003 (CHATUR KHARGOSH)

## CPWD TABLEAU- 2004

### Theme : Teej

The theme of the floral tableau of the year 2004 is “Indian Festival Teej”, which showcases Indian Culture and Happiness. The very colourful festival of Teej is presented through tableau by CPWD. The Teej festival welcome monsoon season and monsoon and primarily dedicated to Goddess Parvati and her union with Lord Shiva. It is celebrated throughout the country.

The front trailer has a depiction of an elephant howdah, the throne where king ( Maharaja) used to sit. Two peacocks placed at side of this trailer, representing monsoon season

festival teej. The attached trailer shows a group of womens in traditional costumes, dancing on the folk music and welcoming monsoon.

Blemish- free flowers are selected to create the display, of the theme with floral rangoli two elephants on the sides of the trailer posing in welcome manner. Chrysanthemums, marigolds, gladioli, anthuriums, different varieties and many types of foliage plants are used to bring out this showcase of indian culture and happiness.



2004 (TEEJ)



## CPWD TABLEAU- 2005

### Theme : Chatur Bandar .

The theme of the floral tableau of the year 2005 is “Chatur Bandar”, Intellectual mind of monkey. It depicts the story of clever monkey and foolish crocodile which is believed to be featured in the Panchatantra, folk tales written by an Indian scholar Vishnu Sharma. The crocodile and monkey become friends after the later offers berries to the former. The crocodile’s wife gets jealous of this friendship and demands her husband to bring her the heart of monkey. Being persuaded by her, the crocodile tricks the monkey to come with him for dinner at his place. Once they reach the middle of river, the crocodile spills his plan.

At this point, the monkey stays calm and thinks wisely. He devises a plan, and tells the crocodile that he keeps his heart safe on tree. The crocodile falls for this scheme and takes the monkey back to his tree, for retrieving the heart. Once home, the monkey flees to the top of the tree and bids farewell to crocodile and his friendship.

Different scenes of this story are depicted on the tableau, Blemish- free flowers are selected to create the whole scenery, also shown floral rangoli. Chrysanthemums, marigolds, gladioli, ferns and berry trees are used to bring out the story of ancient wisdom.



**2005 (CHATUR BANDAR)**

## CPWD TABLEAU- 2006

### Theme : Sagar Sampada

The theme of the floral tableau of the year 2006 is “Sagar Sampada”. The Indian Ocean is the largest which surrounds India from three sides. These ocean has conserved many natural including shall resources coral reefs, fungi, and mineral resources. Ocean provides marine life to abundant aquatic organisms and supports livelihood to millions of people. But due to climate change and global warming , ecosystem of marine life is in danger. Lots of marine species are being extinct due to water. This tableau giving

the message to save the wealth of marine ecosystem.

The front part of tableau showed octopus crafted with flowers. The mid, rear and side portion of trailer showed different types of marine fishes, sharks, coral reef, turtles, marine mammals and many more benthos and planktons. Ocean is depicted by using blue coloured flowers and other marine organisms are beautifully crafted with different types of flowers and foliages.



**2006 (SAGAR SAMPADA)**

## CPWD TABLEAU- 2007

### Theme : Nanhi Duniya

The Tableau depicts children in moods and is intended to get them identified with the Republic Day Celebration.

Placed on the tractor are a happy boy and a girl with a pet rabbit in the background. A number of slides, swings and children in playful moods have been shown scattered all over the trailer.

On the both side panels of the trolley has been fascinated by showing the famous

Panchtantro story. The story is based of the theme “Slow and Study win the race” In which a rabbit following a tortoise which is leading the race. Other than rest of the animals watching the race.

Natural flowers will be lavishly used to create an eye pleasing experience. Children and Parents characters are live, while the cartoon characters and other things are created out of floral designs.



2007 (NANHI DUNIYA)

## CPWD TABLEAU- 2008

### Theme : 60th years of Independences

This Floral Tableau is depicting patriotism unique cultural heritage made up to colourful and fresh flowers. This Floral Tableau also won special prize among the Tableau which

paraded in the Republic Day Celebration 2008. Natural flowers had been lavishly used to create and eye caching experience.



**2008 (60<sup>th</sup> YEARS OF INDEPENDENCES)**

## CPWD TABLEAU- 2009

### Theme : Toy and Games

This year CPWD Floral Tableau is depicting Toys and games.

The Tableau leads with first Indus valley Toys. Indus Valley people seem to have loved toys.

They made many toys, such as toy Bird, toy monkeys that could slide down ropes.

On the trailer part has been shown different type of toys like wooden toy, terracotta toys,

and chess, modern Bat and ball kite. Middle part of the trailer shows the children's playing and enjoy with toys.

The tableau would be crafted in flowers in their natural colours.



2009 (TOY AND GAMES)



## CPWD TABLEAU- 2010

### Theme : Global Warming

This year CPWD Floral Tableau is depicting effect and solutions of Global Warming. These days hardly a day goes by without a news story reporting an aspect of global warming. The Tableau leads the reasons of global warming. Hence burning earth has been shown on the front part of the Tableau. Deforestation, industrial and traffic pollution, the land pollution by throwing garbage is shown on the side part of the tractor. On the trailer part has been shown plant new trees and preserves existing trees. Middle part of the trailer shows the activities, a teacher

educating children to grow more trees to keep the environment clean. We educate children to be eco- friendly and to protect our environment. Back part of the trailer show the lovely glaciers where young children are enjoying the nature's beauty. On the side panel it has been shown that animals are moving freely around the protected environment. The tableau would be crafted in flowers in their natural colours.

**WHEN WE HEAL THE EARTH, WE HEAL OURSELVES.**



**2010 (GLOBAL WARMING)**

## CPWD TABLEAU- 2011

### Theme : Save The Tiger, Save Earth

These days hardly a day goes by without a news story reporting an aspect of save tigers. India has been home to Tigers for a very long time. Tigers were found all over India and still as many as 16 States of India are home to the Tigers. The latest census report released on 12th. February, 2008 by the Government of India reports that there are **only 1411 tigers left**.

The population of the Tiger has been reduced by nearly 50% and that too in a period of 6 to 7 years. It is time that emergency and drastic steps are taken to save the pride of jungle and pride of India from becoming extinct. Agriculture, industrialization and degradation and fragmentation of natural habitats, forests and natural grasslands are one of the main reasons for the decrease of Tiger population and for that matter all wildlife in India. The immediate effect of this is lack of natural food and habitat causes the wild animals to come out of the forest area.

If we make sure tigers live, we will have to make sure that deer, antelope and all other

animals that the tiger eats or its prey base live. To make sure that these herbivores live, we must make sure that all the trees, grass and other plants that these prey animals need for food are protected. In short, in this way the whole forest gets saved! Saving the tiger means indirectly saving the forests and in turn saving the environment that is reeling under global warming due to massive deforestation. Not only is tiger a beautiful animal but it is also the indicator of the forest's health. Saving the tiger means we save the forest since tiger cannot live in places where trees have vanished and in turn secure food and water for all. This year CPWD Floral Tableau is depicting the save tigers. The Tableau leads tiger kids playing and enjoying the natural habitats, forest and natural grassland. Shown at the front part of the trailer. The rear part of the trailer the pear of tiger setting on rock in its full wild majesty its natural beauty. The tableau would be crafted in flowers in their natural colour.



**2011 (SAVE THE TIGER, SAVE EARTH)**

## CPWD TABLEAU- 2012

### Theme : Snow Valley

This year CPWD Floral Tableau is depicting SNOW VALLEY a beautiful landscape of north India. These days hardly a day goes by without a news story reporting an aspect of global warming. There is no doubt that global warming is felt in many ways now and this will worsen. Effects are, and will, be increasingly noticeable in these areas.

We educate children and tourist to be eco-friendly and to protect our environment. All the activities show the people are having fun

and enjoying in fresh nature. On an average snowfall patterns have changed across the glaciers are melting rapidly. To stop deforestation and to protect our environment.

The trailer shows the lovely glaciers where young children are enjoying the nature's beauty. The tableau would be crafted in flowers in their natural colours. The tableau is intended to make an extremely eye pleasing experience by using natural flowers lavishly.



**2012 (SNOW VALLEY)**

## CPWD TABLEAU- 2013

### Theme : Seasons (Ritus)

C.P.W.D. Floral Tableau is depicting the cycle of seasons (Ritus). Front portion of the Tableau displays “Vasant Ritu” (Spring season), Shown by dancing boy and girl. The front part of the trailer is showing “Grishma Ritu” (Summer season). Middle part of the trailer is showing “Varsaha Ritu” (Monsoon season) depicted as dancing peacock

and water fall, after that deciduous tree is shown in “Sharad Ritu” (Autumn season), followed by bonfire by the live characters under “Hemant Ritu” (Pre-winter) and snowy mountain under “Sisir Ritu” (Winter season). The whole Tableau is crafted by beautiful and vibrant colorful fresh flowers.



2013 (SEASONS - RITU)

## CPWD FLORAL TABLEAU -2014

### Theme : Rajpath

The theme of the floral tableau of the year 2014 is “Rajpath” illustrating the landscape beauty of Rajpath. Rajpath which means the Royal Path. It is a ceremonial venue located in the heart of New Delhi, the capital of India. Rajpath runs from the Rashtrapati Bhawan on Raisina Hills on one end to the National Stadium on the other end and passes through Vijay Chowk and Inda Gate. Rajpath is also popularly referred as “The Rajpath”. Rajpath is surrounded by beautiful and lush green lawns, rows of trees and canals on the both sides.

The Front part of the tableau illustrating the India Gate made up of different flowers

and leaves. The flower which is used in front tableau are: orange and yellow (marigold), white and pink (anthurium), pink (carnation), orange (French marigold) and green asparagus. Middle tableau shows the running water in the form of fountain covered with blend of flowers in all around. Boy, girl, man, women, couples are shown in middle of tableau close to fountain to make a picturesque image of Rajpath. On the background the parliament is designed with the use of orange and yellow colour marigold flowers and ferns and green plants on its side. The whole picture of the floral Tableau is a masterpiece.



**2014 (RAJPATH)**



## CPWD FLORAL TABLEAU -2015

### Theme : Maa Ganga

The theme of the floral tableau of the year 2015 was of “Maa Ganga”. The Ganga is the most sacred and longest and river of India. This river originate from Gangotri, and passes through across country and falls into Bay of Bengal. It is lifeline of millions people who live along its course. Govt has launched Namami Ganga programme to clean the Holy Ganga.

The front part of tableau symbolizes kalash decorated with beautiful flowers depicts the Holy Ganga Jal. Middle of trailer showing the peoples enjoying on the bank of river. The rear part of tableau is designed like beautiful Gangotri glacier of Himalayas from which holy river emerges and also Kedarnath temples. The whole tableau were crafted with green foliage and flowers to give picturesque view.



**2015 (MAA GANGA)**

## CPWD FLORAL TABLEAU -2017

### Theme : Clean India Green India

The theme of the floral tableau of the year 2017 was of “Clean India Green India”. During 2014, Hon’ble Prime Minister launched the Swachh Bharat campaign which is the largest cleanliness drive in the history of India aims to achieve the vision of a ‘Clean India ‘ by 2<sup>nd</sup> October 2019. As a part of Swachha Bharat Abhiyan, Clean India , green India, initiated. cleanliness is a clean habit which is very necessary for all of us. This is also habit of keeping ourselves physically and mentally

clean including our home, pets, surroundings, environment, office, school etc.

The rear part of tableau showed a hermit was doing meditation near mountains area that promotes healthy minds are developed in clean environment. The whole tableau were crafted with green foliage symbolizes to promote the greenery that leads to cleaner and pure air.



**2017 (CLEAN INDIA GREEN INDIA)**

## CPWD FLORAL TABLEAU -2018

### Theme : Diwali

The theme of the floral tableau of the year 2018 is of “Festival of Diwali portraying lighting festivity” depicting the message of Peace and Happiness. Diwali is the festival of victory of light over darkness, good over evil, joy and happiness. It has been celebrated for welcoming Lord Rama return to his kingdom Ayodhya after staying in exile for fourteen years. To mark the occasion, people lighted lamps and decorated whole Ayodhya with diyas. The ideas behind lighting diyas and fireworks on the day of Diwali is to spread

the light of positivity in the world, despite the darkness of negativity.

The trailer part of tableau symbolizes temple decorated with beautiful flowers lightened with diyas. The middle part symbolizes people were greeting each other with happiness, joy and sweets. The back part of tableau represents Kingdom Ayodhya, decorated with flowers and lightened with diya. Whole tableau beautifully represents peace and happiness. Side of tableau were decorated with blends of different colours of flowers.



2018 (DIWALI)

## CPWD FLORAL TABLEAU -2019

### Theme : Dandi March

The year 2019 is being celebrated as 150<sup>th</sup> birth anniversary of Father of Nation. Therefore the theme of the Floral Tableau of year the 2019 is “Dandi March” movement started by Mahatma Gandhi and Title is **“VANDE MATARAM”**. In this floral tableau different varieties of flowers, foliage and ground covers have been used. Different flowers like chrysanthemum, marigold, liliun, gerbera, china aster and many more have been fixed up by the skilled men to make JHANKI a perfect masterpiece.

Marigold and Chrysanthemum are used to frame the Gandhi Ji figurine which spread the message of “Unity in Diversity” and “Non-violence” during Dandi March (1930). The middle part of tableau is our national flag “Pride of Nation” beautifully decorated with flowers and foligae. The Back Part of tableau is symbolized by Pigeon decorated with white chrysanthemum over the globe, spread the message of peace across the world. The “charkha” was beautifully decorated by marigold represents the Gandhi jis ideology.



2019 (DANDI MARCH)

## CPWD FLORAL TABLEAU -2020

### Theme : KASHMIR SE KANYAKUMARI

Sare jahan se accha, Hindostan hamara hum bulbulen hain is ki , yeh gulsitan hamara.

Indian has different religion, different language, different culture but known for unity  $\frac{1}{4}$  vusdrk esa , drk  $\frac{1}{2}$  - This year the CPWD Horticulture tableau is depicting the nation "KASHMIR SE KANYAKUMARI" and different parts of country are shown at floral decorated tractor and trolley.

On the trailer it represent natural landscape of Kashmir valley, dull lake where tourists are enjoying on "Shikara" which is part of tourist attraction.

On the front part of the trailer represents **Sanchi Stupa**, which is one of the oldest stone structures in Sanchi at Madhya

Pradesh. Spreading the message of peace and love.

The tractor enhances the southernmost point i.e. Kanyakumari surrounded by the sea, a memorial of Swami Vivekananda.

Besides their other part of country lake Rajasthan represents the western part of the subcontinent holds up the side panel of the tractor and binding all these elements with Jahaj of desert.

Apart from this the ground artists will showcase different religion representing unity and integrity.

The tableau crafted with their identical places in flowers in their natural colours.



2020 (KASHMIR SE KANYAKUMARI)



## CHAPTER - 23

### WINTER SEASONAL FLOWERS

The winter season in India starts from the month of October and continue till the month of March. This is the season when the flowering plants bloom and fill the dull landscape with their vibrant and eye soothing colours. It is up to the choice of the gardener, what variety he wants to grow. Definitely he should be aware that the variety that he chooses should be suitable with his land conditions for a perfect bloom. The conditions required for a great bloom may involve different light requirement depending on their variety, i.e. full, semi shaded or shade, most winter annual flowers require full sun and water throughout.

The characteristic feature of every winter flowering plant would be their striking appearances and a colourful display of flowers. Annual flowers and plants live their complete lifecycle in one season and once they start to flowering they continue blooming, some just until they have produced seed other until the weather is incompatible for their growth/ survival. You should intend filling the colourless places in the garden with colourful flowering plants. Winter can be dull if we have not prepared for it with the grey skies and so many plants dormant. Winter annual flowers can be a fantastic way of filling gap in the time between dormancy and spring with sparky colours. Fortunately, North India offers a very rich variety of winter annuals to choose and to arrange them in order to create a colourful display in the garden. There are two ways to grow them, firstly from seedlings which grow in seed pans secondly by directly sowing seeds in beds or pots.

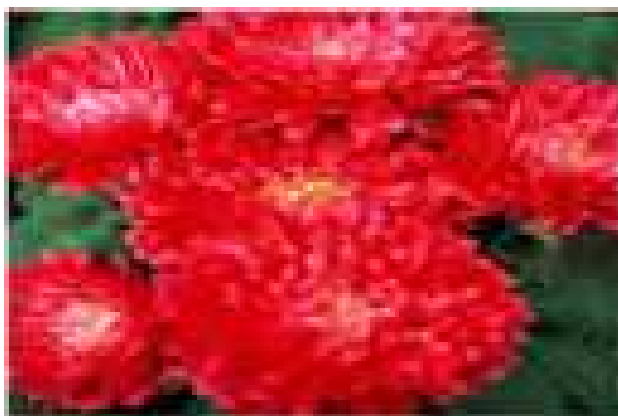
No joy in this world would match the level of joy to gaze upon the seedling sown by you, break first into a bud and then blossom into a riot of colours, an unsurpassed beauty that only Mother Nature can bestow on mankind. Sheer aesthetics apart, growing plants would take care of your contribution towards conserving our environment. This in turn would help save the fast depleting green cover on earth. So go out and plant now. Happy gardening!

Herewith are a few examples of winter annuals which are easy to grow in Indian conditions, easy to maintain and bloom into absolutely stunning flowers.

#### 1. Aster (*Callistephus chinensis*)

Asters get their name from the Latin word for “star,” and their flowers are indeed the superstars of the garden. Some the height of the plants varies from 30 cm to 75 cm according to varieties. Aster has most cheerful different colours. It requires full sun for growth. The flowers attract butterflies and drought tolerance plant and very easy to grow during winter in India.





## 2. Sweet William (*Dianthus barbatus*)

The quintessential cottage flower, pinks are treasured for their grass like green foliage and abundant starry flowers, which are often spicily fragrant. Depending on the varieties of pink, red and other colours flowers appear in late winter and continue till spring. This is used as cut flower in flower vases . Plants height varies from 10 cm to 75 cm approx. The flowers attract the humming bird, butterflies.



## 3. Petunia (*Petunia hybrida*)

Petunias are fail proof favourites for gardeners everywhere. They are vigorous growers and prolific bloomers from mid spring through late fall. Colour choices are nearly limitless, with some sporting beautiful veining and intriguing colours. Many varieties

are sweetly fragrant (sniff blooms in the garden centre to be sure.) Some also tout themselves as “weatherproof,” which means that the flowers don’t close up when water is splashed on them. Height of the plant varies from 15 cm to 45 cm according to varieties . It is more useful in pots and border of the lawn.



## 4. African marigold (*Tagetes erecta*)

There’s nothing subtle about an African marigold, and thank goodness for that! It’s a big, flamboyant, colourful punch of colour for the sunny bed, border, or pots. Mostly it finds in orange, yellow, cream and white. Plants height varies from 30 cm to 90 cm according to different varieties The foliage of the plants dark green fresh and tidy. It require full sun and a common man flower in India.



## 5. Marigold French (*Tagetes patula*)

Shorter and not as upright as African Marigolds, French Marigolds form mounds that are often wider than they are tall. These aromatic annuals are easy to grow and brighten the garden with their cheerful shades of yellow, orange and red. They grow roughly 8-12 inches high with a chic, neat, little growth habit and elegant dark green foliage. They do best in full sun with moist, well-drained soil and will flower all summer long. They may reseed, coming back year after year, in spots where they're happy.



## 6. Phlox (*Phlox drummondii*)

Annual phlox is good choice for gardeners in India because it's easy to grow and puts on such a great display for beginning gardeners who have to tackle a hot, dry spot. Remove the flower clusters as they fade to encourage more blooms and pinch the plants back in summer if they start to get leggy. Plant is grown easily in beds, pots and border etc. Height of the plants varies from 10 cm to 45 cm and has the wider choice of colour white, pink, red, blue, violet, lavender etc.



## 7. Statice (*Limonium sinuatum*)

Old-fashioned annual statice is found more often dried in crafts stores than growing in gardens. But this easy-to-grow plant is a great pick for containers or the middle of a border, especially if you want to harvest it for everlasting bouquets indoors.

The plant is also very drought-tolerant, so you can enjoy its blooms even if you forget to water it from time to time. In fact, statice thrives in hot, sunny spots with well-drained soil. The plants to be planted middle of the border and height goes to 30 cm to 60 cm. This is a wider choice of floweriest because the flowers to be used for cut flowers and dry flower.



## 8. Begonia (*Begonia valvata*)

Annual begonia is about as easy as it gets. It does well in a variety of conditions, but to keep it its most luxuriant best, give it light shade; rich, well-drained soil; and ample water. It also loves plenty of fertilizer, so be generous. The plant can be grown in semi shade or shaded area. The plant height varies from 15 cm to 45 cm according to the varieties It is specially use in container, border as well as hillock also.



## 9. Black-eyed Susan (*Rudbeckia occidentalis*)

Add a pool of sunshine to the garden with a massed planting of black-eyed Susan. From midsummer, these tough native plants bloom their golden heads off in sun or light shade and mix well with other perennials, annuals, and shrubs. Tall varieties look especially appropriate among shrubs, which in turn provide support. Add black-eyed Susans to wildflower meadows or native plant gardens for a naturalized look. Average soil is sufficient for black-eyed Susans, but it should be able to hold moisture fairly well. The Plant ht. 60-300 cm tall, 3-11 plants, Width: 1-1/2 to 3 feet, Depending on variety flower color: Yellow or Orange Flower, Depending on variety Bloom, Time: Bloom midsummer into fall.



## 10. Calendula (*Calendula officinalis*)

The Calendula is a most common winter annuals after the African Marigold in India. Sometimes grown as an herb, cheerful calendulas look good in every garden. The cream, yellow, apricot, or orange flowers are edible, adding bright colour and tang to soups and salads. And they're great cut flowers, adding a burst of sunshine to bouquets. Cool-season annuals, these plants do best in early flowering.

They like a variety of soils but need good drainage and moderate water. Deadhead them regularly to prolong bloom. Calendula will reseed in ideal conditions. The plant requires full sun it can be easy to grow and uses for cut flowers, border plant and pot plants. Height of the plant varies from 20 cm to 75 cm according to different varieties.





### 11. California poppy (*Eschscholzia californica*)

California poppy, a native wildflower, adds an easy going dose of color hot, dry sites. Beautiful, satiny flowers in sunset colors wave above ferny, blue-green foliage. They like poor soils, especially sandy soils. If soil is too rich and moist, they won't bloom well. California poppies are a cool-season annual, which means they offer great color early in the growing season but fade once the heat of summer hits. The Plant ht. 30 cm tall , width: 1 foot wideLandscape, Easy to Grow. California poppies will reseed easily; for more plants next year, allow some flowers to ripen to seed on the plant and scatter when you tear up those plants. Replant in fall if you like, especially in warmer-climate areas.



### 12. Hollyhock (*Alcea rosea*)

The ultimate cottage garden choice, hollyhock sends up tall spires that cover themselves in flowers in beautiful colors. They're easy to grow from seed -- in fact, that's usually the only way they are found in garden centers. Most hollyhocks are biennials, that is, they grow only foliage the first year, flower the second, and die that fall. However, if you establish a stand of hollyhocks, they'll reseed each year so there will always be plenty blooming. Interestingly, the flowers open from the bottom to the top of the spike throughout the summer. These tall (up to 8 feet) beauties are ideal against fences or buildings where they can get natural support. Red forms are especially attractive to hummingbirds and butterflies. The plant ht. 90-240 cm, width. 30-90 cm, colour available. Red, Pink, apricot, yellow, levender, purple amd near black, Easy to Grow.





### 13. Cosmos (*Cosmos bipinnatus*)

The simple, daisy like flowers appear in cheery shades on tall stems that are great for cutting. The lacy foliage makes a great backdrop for shorter plants, as well. Cosmos often self-seeds in the garden, so you may only have to plant it once, though the colors can appear muddy or odd in the reseeds. The plant ht. 60-150 cm tall, 2-11 plants, width: 30-60 cm wide landscape, Easy to Grow Plant cosmos from seed directly in the ground in spring. Or start from established seedlings. This flower doesn't like fertilizing or conditions that are too rich, which causes the foliage to be large and lush but with fewer blooms.



### 14. Flowering kale (*Brassica oleracea*)

Thank goodness for kale. It's one of the few plants available to add a fresh burst of color and life to the fall landscape! Its leaves come with beautiful variegations in pinks, purples, and reds that blend beautifully with changing autumn foliage. Plant it in spring or in the fall after you tear out tired or frost-damaged annuals such as marigolds and impatiens. It likes rich, well-drained but moist soil. The

flower ht. 12-18 inches tall, width: 12-18 inches wide landscape, Easy to Grow.



### 15. Gazania (*Gazania linearis*)

This tough plant endures poor soil, baked conditions, and drought beautifully and still produces bold-color, daisy like flowers from summer to frost. A perennial in Zones 9-11 -- the hottest parts of the country -- gazania is grown as an annual elsewhere and blooms from mid-summer to frost. A summer plant often grown as an annual, gazania bears boldly colored daisy-shaped flowers from



summer to frost. The flowers appear over toothed dark green or silver leaves between varieties). Plant established seedlings outdoors after all danger of frost has passed. Do not fertilize, and keep soil on the dry side. The plant ht. 30 cm, width: 30 cm, 8-10 plant, Easy to Grow.

## 16. Geranium (Geranium oreganum)

Geraniums have been a gardener's favorite for well over a century. The old-fashioned standard for beds, borders, and containers, geranium is still one of the most popular plants today. Traditional bedding types love hot weather and hold up well to dry conditions; many offer colorful foliage. Regal, also called Martha Washington, geraniums are more delicate-looking and do better in the cool conditions of spring and fall. Though most geraniums are grown as annuals, they are perennials in Zones 10-11. Bring them indoors to overwinter, if you like, then replant outdoors in spring. Or they can bloom indoors all year long if they get enough light. The plant ht. 60 cm & width. 60 cm, Easy to Grow.



## 17. Gerbera (Gerbera jamesonii)

Gerbera daisies are so perfect they hardly look real. They bloom in nearly every color (except true blues and purples) and produce fantastically large flowers on long, thick, sturdy stems. They last for a week or more in the vase, making them a favorite of flower arrangers. This tender perennial will last the winter in only the warmest parts of the country, Zones 9-11. In the rest of the country, it is grown as an annual. It does well in average soil; it likes soil kept evenly moist but not overly wet. Fertilize lightly. The plant ht. 30 cm, width. 60 cm, 10-11 plants, Easy to Grow.



## 18. Brachycome (Brachycome iberidifolia)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking. The plant ht. 60-150 cm tall, width. 30-60 cm wide landscape, 5-8 plants, Easy to Grow.



### 19. Godetia (*Clarkia amoena*)

This under-appreciated annual bears the most beautiful, satiny pink or white flowers for weeks in summer. It also goes by the charming name farewell-to-spring, perhaps because it blooms just as spring temperatures are rising. Plant it once and you won't want to go a growing season without it.

Native to areas of North America, this plant does best in areas with cool summers and in moist, well-drained soil. It's a great cut flower, too. Although you can sometimes find it as established seedlings, most gardeners will need to start it from seed. Plant directly



in the ground in early spring; it dislikes transplanting. Don't fertilize. If it has too many nutrients, it will have lots of foliage and few flowers. The plant ht. 30-150 cm tall, width 30 cm wide landscape



### 20. Larkspur (*Delphinium ajacis*)

Larkspur is basically an annual version of delphinium, an all-time favorite perennial. Larkspur produces lovely spikes of blue, purple, pink, or white flowers in spring and summer. They look best clustered in small patches.

Like many cool-season annuals, it's a good winter-blooming plant for the Deep South.



Larkspur is so easy to grow that it often self seeds in the garden, coming back year after year. Plant larkspur from seed directly in the garden in early spring. Larkspur doesn't like to be transplanted. It prefers rich, well-drained soil and ample water. The plant ht. 60-120 cm, width. 6-12 inches, Easy to Grow.

## 21. Shirley Poppy (*Papaver rhoeas*)

The Shirley poppy was created from 1880 onwards by the Reverend William Wilks, vicar of the parish of Shirley in England. Wilks found in a corner of his garden where it adjoined arable fields, a variant of the field poppy that had a narrow white border around the petals. By careful selection and hybridization over many years he obtained a strain of poppies ranging in colour from white and pale lilac to pink and red, and unlike the wild poppies these had no dark blotches at the base of the petals. Further selection has given rise to semi-double and double forms, as well as flowers with a ring of contrasting colour around the edge: the picotee form.



## 22. Nasturtium (*Tropaeolum majus*)

Nasturtiums are so versatile. They grow easily from seed sown directly in your garden's poorest soil and blooms all season until frost and are never greedy about food or fertilizer. Nasturtiums are available in either spreading

or climbing types. Plant spreading types in large containers to spill over the sides. Plant them alongside wide paths to soften the sides for a romantic look. Use nasturtium to brighten a rock garden or between paving stones. Plant them at the edges of beds and borders to fill in between other plants and add soft, flowing color. Train climbing types up trellises or alongside fences. The leaves and flowers are edible; use them as a showy plate garnish or to jazz up salads. The plant ht. Mounding varieties from 9-16 inches, width. 12-18 inches depending on type landscape, Easy to Grow.



## 23. Mesembryanthemum (*Mesembryanthemum crystallinum*)

*Mesembryanthemum* is a member of the family Aizoaceae; like many members of this family, it is characterized by long-lasting flower heads. Flowers of *Mesembryanthemum* protect their gametes from night-time dews or frosts but open in sunlight. There is an obvious evolutionary advantage to doing this; where sun, dew, frost, wind or predators are likely to damage exposed reproductive organs, closing may be advantageous during times when flowers are unlikely to attract pollinators.



#### 24. Paper Flower (*Helichrysum petiolare*)

This plant is attractive to bees, butterflies and/or birds, Average Water Needs; Water regularly; do not overwater Self-sows freely; deadhead if you do not want volunteer seedlings next season. This plant is resistant to deer Flowers are good for drying and preserving Suitable for growing in containers Height: 6-12 in. (15-30 cm) Width: 12-18 in. (30-45 cm)



#### 25. Corn Flower (*Centaurea cyanus*)

The annual blue cornflower is a slender plant of great charm. Its rich shades of blue are much sought after, both for garden

decoration and for flower arrangements. Garden varieties have added red, pink, lilac and white to the colour range, and even bright yellow is available in the closely related sweet sultan *Amberboa moschatus*. The wiry plants may need some discreet support, and deadheading helps to prolong the flowering season, as does autumn sowing, an option that will produce larger, earlier-flowering plants. This fully hardy plant requires a sunny site, growing in most well-drained soil types, even poor soil. The plant Height: 90cm, Spread: 30cm, Time to plant seeds: March to May.



#### 26. Salvia (*Salvia splendens*)

“Annual” salvia is a tender tropical perennial that is typically grown as a warm weather annual bedding plant. It has long been a garden standard, reliably blooming over an extended period. Ever more varieties are being developed, giving a wide range of colors, including white, salmon and purple, as well as the traditional bright red, and heights from about 8 in (20 cm) to nearly 3 ft (0.9 m).



Leaves are bright to dark green, elliptical and toothed. Flowers grow on spikes and are two-lipped, with a flat lower lip and helmet-shaped upper lip.



### 27. Cineraria (*Cineraria longipes*)

These are herbaceous perennials that are often grown as annuals. There are three basic types: the large-flowered; the stellata or Star-flowered; the intermediate, with flowers similar to the stellata and having the compact growth of the large-flowered; and the dwarf intermediate strain, growing 1-foot tall and having a compact, free-flowering growth. They all come in a wide range of colors. There are two main types of the tall, small-flowered Cinerarias. The most popular is the Star-flowered, which produces an abundance of small flowers in blue, pink, salmon, white and other hues. The large-flowered Cinerarias come in a brilliant array of colors. Mixed seeds of a good strain will provide flowers in blue, purple, rose, pink



and other gorgeous colors, many having noticeable white sections.



### 28. Pansy (*Viola tricolor*)

The pansies are a large group of hybrid plants cultivated as garden flowers. Pansies are hardy annuals whose flowers have “faces.” These plants offer colorful flowers for any season in your garden. They have one of the widest ranges of colors and are good for containers, borders, and ground covers.



### 29. Verbena (*Verbena brasiliensis*)

Verbena is a spreading plant ideal for cascading over retaining walls, pots, baskets, and window boxes. As long as the soil is extremely well drained, verbena will reward gardeners with countless clusters of small

blooms all season. It's fairly drought-tolerant, making it a great choice for hanging baskets, rock gardens, planting in cracks between stones, and other tight places. The plant ht. From 9 to 18 inches tall, Width: From 12 to 20 inches Landscape, 7-9 Plant.



### 30. Nemesia (Nemesia violiflora)

Nemesia is a charming cool-season annual with pretty little snapdragon-shape flowers -- often fragrant -- that bloom in a wide range of colors. It does best in spring and fall (winter in mild-winter climates), though



some varieties have better heat-tolerance than others. In cool-summer areas, such as the Pacific Northwest, nemesia will continue to bloom right through the summer into fall. Nemesia prefers moist, well-drained soil that's rich in organic matter. The plant ht. 60 cm, Width: 60 cm blooms best in spring and fall Landscape.

### 31. Candy Tuft (Iberis gibraltarica)

Sparkling white candytuft, with its cool evergreen foliage, brightens any rock garden or wall for several weeks in spring. At bloom time, plants are covered with umbels of pure white flowers that fade to pink. Compact selections are now available. Where happy, this plant will spread. Supply good drainage, and cut back spent flowers to keep plants neat. The plant ht. 30 cm, width 8-16 inches, 5-9 Plants, Easy to Grow.



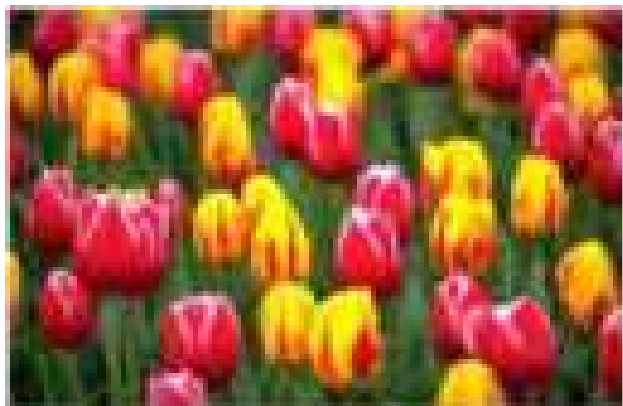
### 32. Antirrhinum (Antirrhinum majus)



Season Winter Name Antirrhinum Common Name Snapdragon, dwarf Description These are bright, jolly flowers and look great in the garden or in big flower pots. If you look at their flowers carefully they look like a dragon's mouth! They like a sunny position in any garden soil. Seeds can be sown from January to March.

### 33. Tulip (Tulipa tarda)

The tulip is one of the most popular garden flowers. Tulips are hardy and require little care. Some types of tulips bloom for years, once established. Tulips generally are divided into 15 different classes, which vary



in appearance and season of bloom. The early bloomers include single early, double early, kaufmanniana, and fosterana tulips.

### 34. Carnation (Dianthus caryophyllus)

The old-fashioned carnation name pinks comes from the serrated flower edges, which look as if cut with pinking shears. And the name of the color pink is said to come from these perennials, which have been popular in gardens for hundreds of years. The many dianthus species and hybrids come in red, white, orange, purple, cranberry, and of course, many shades of pink. Flower size ranges from less than an inch to several inches wide, and height ranges from just a few inches to several feet tall. How to grow: Dianthus prefers average to rich well-drained soil in full or nearly full sun. Refresh older plantings by dividing and resetting plants every few years.



### 35. Alyssum (Lobularia maritima)

Sweet alyssum, with its dainty, fragrant flowers, is often used in containers and hanging baskets to spill over the edges,

creating a soft, frothy look. It's also a great edging plant because of its tidy, compact habit. Regardless of how you use it, sweet alyssum does best in spring and fall's cool conditions (or use it for winter color in very warm climates). In cool-summer conditions, such as the northern third of the United States, sweet alyssum will bloom steadily through the summer. It halts bloom in summer in warmer areas. The plant ht. 8 inches tall, width 30 cm, Easy to Grow.



### 36. Stock (Matthiola incana)

Stock is best known for its spicy, sweet fragrance and as an excellent choice for flowerbeds and cut flower arrangements. Depending on the variety, stock can grow from about a foot tall to almost three feet, making it a versatile choice for any garden bed. Use taller varieties towards the back of a design to add height, or smaller ones towards the front so you can better admire their scent and their wide range of colors; stock is available in shades of white, yellow, purple, pink, peach, and red. While many varieties are single, meaning that they have four petals per flower, some are double, giving them a softer, more ruffled and romantic appearance.



### 37. Primrose (Primula malacoides )

Take a walk down the primrose path and you'll never look back! Primroses are a classic cottage flower and are popular with collectors. They covet the hundreds of different primroses available, especially some of the tiny rare alpine types. Many are staples of cottage gardens and rock gardens, while others provide spring color to damp places, rain gardens, and bog gardens. Their basal rosettes of oval leaves are often puckered or are very smooth. The colorful flowers may be borne singly or rise in tiered clusters, or even spikes. Provide humus-high soil that retains moisture and some shade for best results. The plant ht. 2 inches, width 4 inches, colour whites, pink, lavender, purple red, yellows, orange and green, 2-8 plant, Easy to Grow.



### 38. Dianthus (Dianthus caryophyllus)

The species are mostly herbaceous perennials, a few are annual or biennial, and some are low subshrubs with woody basal stems. The leaves are opposite, simple, mostly linear and often strongly glaucous grey-green to blue-green. The flowers have five petals, typically with a frilled or *pinked* margin, and are (in almost all species) pale to dark pink. One species, *D. knappii*, has yellow flowers with a purple centre. Some species, particularly the perennial pinks, are noted for their strong spicy fragrance.



### 39. Daisy (Bellis perennis)

Easy, always fresh, and always eye-catching, Shasta daisy is a longtime favorite. All cultivars produce white daisy flowers in various degrees of doubleness and size. The sturdy stems and long vase life make the flowers unbeatable for cutting. Shasta daisy thrives in well-drained, not overly rich soil. Taller sorts may need staking.

Light: Sun, Part Sun Zones: 5-8 Plant Type: Perennial Plant Height: 20-30 cm

tall Plant Width: 1-2 feet wide Landscape Uses: Containers, Beds & Borders Special Features: Flowers, Attractive Foliage, Cut Flowers, Dried Flowers, Attracts Butterflies, Drought Tolerant, Easy to Grow.



### 40. Asiatic Lilies (Lilium chalcedonicum)

Asiatic lilies are one of the most beautiful flowers that you can grow. I love to walk in the garden and see the new blooms and my garden just wouldn't be complete without them. These are my favorite flowers next to daylilies which aren't really lilies at all. Here you will find all the information you need to grow asiatic lilies.

Once you plant lily bulbs or plants they will give you pleasure for years to come and multiply and become even more beautiful. They are grown from a hardy bulb that multiplies quickly and takes little care. They come in many sizes, heights and shapes. Lilies are called bulbs but are really tubers with fleshy scales that never go into



dormancy like other bulbs that you might be familiar with.



#### 41. Gladiolus (*Gladiolus angustus*)

Gladiolus is a perennial favored for its beautiful, showy flowers. Its flowers grow on tall spikes and are often found in cutting gardens or in the back along the border (because they are tall). Gladioli have many different colored flowers, and grow between 60 to 180 cm in height. It's good for cut flowers.



#### 42. Hyacinths (*Hyacinths orientalis*)

Hyacinth bulbs are planted in the fall and borne in spring. The Victorians revered hyacinths for their sweet, lingering fragrance, and carefully massed them in low beds, planting in rows of one color each. The loose to dense racemes of strongly fragrant flowers are closely packed with tubular-bell-shaped, single or double flowers. As well as growing in the ground, colorful hyacinths are excellent for forcing in containers and some are available for early flowering indoors.



#### 43. Dahlia (*Dahlia variabilis*)

Planting dahlias in a spot that gets at least eight hours of direct sunlight a day. In dry, hot-summer climates, choose a spot that provides direct sun from the morning into midday, offering shade or filtered shade by the hottest part of the late afternoon.

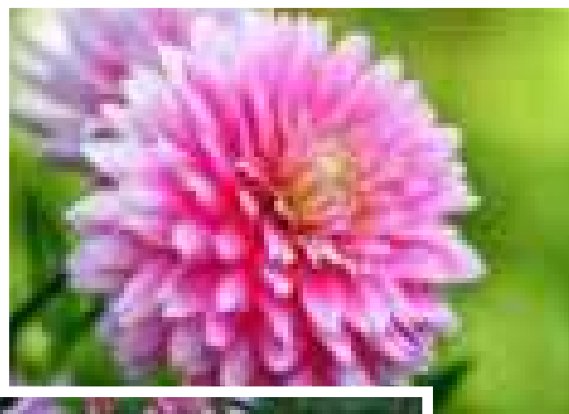
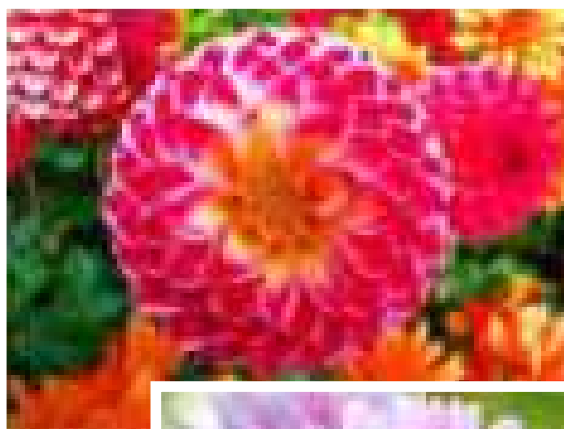
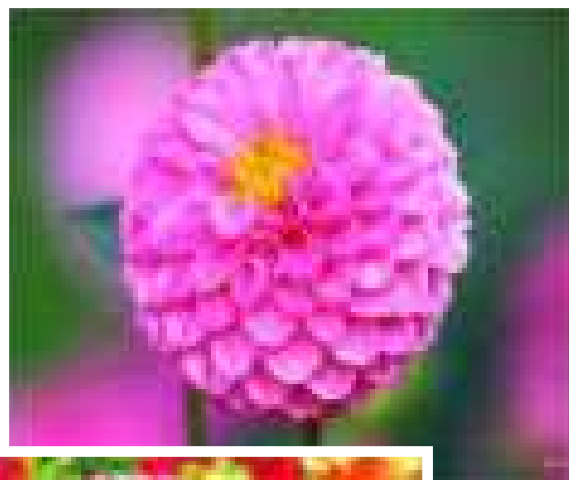
Like potatoes, dahlias grow from tubers so good soil preparation is key to best performance. Loosen or dig soil to a depth of about 10 inches. Your soil should be easily worked and offer superb drainage. If you have heavy soil, amend with peat moss, compost, or aged cow manure.

Planting is a good time to incorporate an organic fertilizer with an N-P-K ratio of 5-10-15 or 5-10-10, 10-20-20, or 0-20-20. The higher middle number -- phosphorous -- assists with bloom production. The third number -- potash or potassium -- helps root development. Any fertilizer recommended for vegetables can be used for dahlias.

Although you can start dahlias from seeds, it's easiest to begin with tubers. After the soil is prepared, dig a hole 4-6 inches deep, lay the tuber horizontally, and cover with soil. If you're planting several dahlias, grow the smaller varieties 9-12 inches apart. Taller dahlias can be spaced 2-3 feet apart, or half their final height (some can grow taller than 6 feet, so be prepared!).

Except in hot climates, don't water the tubers until the first shoots and leaves appear. Because the surface of the ground needs to stay warm (at least 60 degrees F) for the tubers to sprout, avoid mulching until the plants are actively growing.

Once the plants are established, add mulch to conserve moisture and prevent weeds. Because dahlia roots are shallow, pulling large weeds can easily disrupt the roots, so pull weeds only by hand when they are still small. Avoid using chemical weed controls and weeding instruments like hoes because they kill dahlia roots.



## A - Flowering Winter Season Annual

**Sowing time : October - Novemebr except those marked with asterisks**

**All raised by seed - Other methods used are mentioned in column 9 )**

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	2	3	4	5	6	7	8	9
1	Acroclinium	Acracelinum album A roseum (Compositae)	Both	Situ	7.5-15	30-60	White, rose colour	Flowers may be single or double, keeping colour and form even dry.
2	Agreratum	Ageratum houstonianum (Curciferae)	Both	Transplanted	20-25	30-45	White and Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
3	Alyssum (Madwort)	Lobularia maritima Sym Alyssum maritimum (Curciferae)	Both	Transplanted	05-10	15-25	White, yellow and pink	Sweet scented flower as of candytuft. Suits well a long the edge of a flower-bed or a rocky. Suitable for hanging baskets.
4	Anchusa	Anchusa capensis (Boraginaceae)	Both	Transplanted	15-20	45-60	Blue	Good for edging and massing in beds. Good as cut flower. Well suited for rockery
5	Antirrhinum (Snap dragon)	Antirrhinum majus (Scrophulariaceae)	Both	Transplanted	15-30	30-90	Pink, Yellow, rose, orange, crimson, white and mauve	Three distinct strain (a) Tall, (b) Intermediate, (c) Dwarf. Good for mixed borders. Good as a cut-flower.
6	Arctotis	Arctotis grandis (Compositae)	Both	Transplanted	10-15	30-60	Pink	Can alsoe be multiplied by division. Cut-flowers have long keeping quality.
7	* Aster	Callistephus chinesis (Compositae)	Both	Transplanted	20-25	30-75	Expect yellow all colours are met	Important groups, (a) Giant asters (b) Comet, (c) Branching aster, (d) Imbricated pampon. All are very good for pots and borders.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
8	Brachycome (Swan Daisy)	Brachycome iberidifolia (Compositae)	Both	Situ	10-15	20-35	White , blue, rose	Seed should be sown in August-September.
9	Calendula (Pot-Marigold)	Calendula affinalis (Compositae)	Both	Transplanted	20-30	30-45	Yellow or orange	Flower may be single or double. It is good cut-flower
10	Candytuft	Iberis umbellata (Crucifere) l. amara	Both	Transplanted	15-20	24-36	Pure white, rose, purple	Flower may be single or double. Plants have medicinal value.
11	*Carnation	Dianthus spp. (Carpophyllaceae)	Pot	Transplanted	-	30-60	Rose white, pink and spotted	Cuttings. layerings are also possible, flowers are sweet scented.
12	Chrysanthemum (Annual)	Chrysanthemum spp. (Compsitae)	Both	Transplanted	15-30	30-60	Colour depends upon species	Very goof annual for borders. Grows well in poor soil.
13	Calleopsis (Coreopsis)	Calleopsis tinctoria (Compositae)	Bed	Transplanted	15-20	45-60	Golden yellow orange and bronze	Flowers are single or double. Good for pots as well for beds.
14	*Cineraria	Cinceraria spp. (Compositae)	Pots	Transplanted	-	20-46.25	All possible colour and combinations	Very good for pet—sown in July-Aug. Single and double flowers are common. Does better in cool and shady places.
15	Clarkia	Clarkia elegans (Onagraceae)	Both	Transplanted	20-30	30-45	Pink, white, red	Flowers are borne in long spikes, very good for cut flower.
16	Dianthus (indian Pink)	Dianthus nobilis (Caryophyllaceae)	Both	Transplanted	15-20	20-30	Pink, white in various other combinations	Flowers are single as well as double.
17	Dimprphotheca (Capemarigold)	Dimporphotheca pluvialis (Compositae)	Both	Transplanted	-	30-45	Orange, white golden yellow	A good pot annual. Flowers open in bright sunlight. Prefers a sunny situation.
18	Eschscholtzia (Californian poppy)	Eschscholtzia Californica (Papaveraceae)	Both	Situ	-	30-45	Orange light yellow and white	Flowers open in bright sunlight.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
19	Gaillardia (Blanket flower)	Gaillardia drummondii (Compositae)	Both	Transplanted	15-20	30-45	Combination of orange purple yellow and crimson	Flowers may be single or double, some are perennial.
20	Godetia	Godetia grandiflora (Onagraceae)	Both	Transplanted	20-30	30-45	Pure white, rose and red	May be single or double. Does well in partiable shade
21	Heliotrope	Heliotrope Sp. (Borangenaceae)	Both	Transplanted	20-30	20-45	White, blue and purple	Flowers are sweet scented, and are borne in clusters
22	Helichrysum (Everlasting, or straw flower)	Helichrysum bracteatum (Compositae)	Both	Transplanted	20-30	30-60	White, pink, yellow and gold	Very good as cut flowers. Does well in any garden soil.
23	Larkspur	Delphinium spp. (Compositae)	Bed	Situ	15-20	45-60	Purple, white and Blue pink	Single or double flowers are produced in spikes. Requires thinning.
24	Leptosyne	Leptosyne meritema (Compsitae)	Both	Both	20-30	45-60	Yellow	Good for borders and pots. Flowers are borne singly.
25	Linaria (Toadflax)	Linaria bipartite (Scrophulariaceae)	Both	Transplanted	10-15	20-30	Blue, pink and Mauve	Flower spike look like miniature antirrhinum prefers a suny situation.
26	Linum (Flax)	Linum grandiflorum (Linaceae)	Both	Situ	15-20	"	Scarlet	Good for beddings, flowers are five petalled.
27	Lobelia	Lobelia erinus (Campanulaceae)	Pot	Transplanted or Situ	10-15	"	Blue, scarlet	Good for hanging baskets; makes excellent edging.
28	Lupin	Lupinus hartwegii (Leguminosae)	Both	Situ	15-20	30-45	White, yellow and Mauve	Flowers are produced in long spikes.
29	Nasturtium	Tropaeolum majus, T.minor (Geraniaceae)	Bed	Situ	10-15	20-25	Orange and Yellow	Thinning of foliage is essential; good for hanging basket.



S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
30	Nemesia	Nemesia strumosa (Scrophulariaceae)	Both	Transplanted	5-10	15-20	Yellow with brown stripes	Good for mass effect.
31	Pansy	Viola tricolor (Violaceae)	Both	Transplanted	5-10	15-20	Flowers of different shades and combinations	Single and double kinds are excellent for borders, rockery and for pots.
32	Petunia	Petunia hybrid (Solanaceae)	Both	Transplanted	20-30	30-45	Except yellow all colours with stripes	Can be used for hanging baskets. Produces flowers even in summer months. Very good for mass effect. Double flowering varieties are also available.
33	Phlox	Phlox diumondi (Polemoniaceae)	Both	Transplanted	20-30	15-30	All colours and bicolors	One of the best annuals for beds and pots. Requires well-drained soils and sunny situation for good results.
34	*Salvia (Scarlet Sage)	Schizanthus wisetonensis (Solanaceae)	Both	Transplanted	20-30	30-45	Red, blue, white and yellow	Flower spikes are 15-30 cm. long; good as cut-flower. Seed should be sown in July–August.
35	Schizanthus	Schizanthus wisetonensis (Solanaceae)	Both	Transplanted	20-30	45-60	White with pink shade	Seeds take long time for germination. Good for pots.
36	Stock	Mathiola incana (Cruciferae)	Both	Transplanted	20-25	20-30	Pink and white	Flowers are either single or double, and are scented. Flowers are borne on spikes.
37	Verbena	Verbena hybrid (Verbenaceae)	Both	Transplanted	15-20	20-30	Pink, pale yellow, blue white	One of the best annuals for pots and beds. Good for rockery and edging.
38	Vendedium	Venedium fastuosum (Compositae)	Both	Transplanted	20-30	20-30	Orange and yellow	Flowers are fairly large which are daisy like yellow.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
39	Wallflower (Gilli flowers)	Cherianthus cherrii (Cruciferae)	Both	Transplanted	15-20	20-30	Orange and yellow	Flowers are borne in long spikes, good as cut-flowers.
40	*Dahlia	Dahlia varibilis (Copositae)	Beds	Transplanted	30-45	60-1.20	All possible colours and combinations	Varieties true to type, are multiplied by cutting or tubers. The eyes are present on stalk attached with tuber. One of the best winter-annuals. The seeds as well as the tuber should be planted in August - September. Thinning of the flowers buds to 1-2 gives flower of larger size. Requires heavy feeding.

## B - Rainy Season Annual (Sowing Time : June - July)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Amaranthus	Amaranthus tricolor (Amarantaceae)	Both	Transplanted	15-20	31-90	Crimson and red	Leaves are also very attractive as they are coloured. Good for edging and mixed border.
2	Balsam	Imatiens balsamina (Balsaminaceae)	Beds	Transplanted	15-75	30-45	Red, crimson, white, pink scarlet and purple.	Flowers are single as well double, should be trained to clean stem.
3	Celosia (Cockscomb)	Celosia crestata, C. plumose C. chidsi (Amarantaceae)	Beds	Transplanted	20-30	30-45	Yellow, crimson, purple and red	Large compact velvety head of flowers of large size 30 cm x 25 cm. are borne well above the foliage.

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ or transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
4	Cosmos (Mexican Aster)	Cosmos bipinata (Compositae)	Beds	Transplanted	25-5	90-120	White, crimson, rose purple and orange	Pinching the shoot is desirable to encourage the branching.
5	Gaillardia (Blanket flower)	Gaillardia grandiflora (Compositae)	Both	Transplanted	20-30	45-60	Orange, purple yellow and crimson	Both single and double kinds of flowers are met.
6	Gomphrena (Bachelor's Button)	Gomphrena globosa (Amarantaceae)	Both	Transplanted	15-20	20-30	Red, crimson and white	Plants in pot are good for verandah and indoor decoration.
7	Helianthus (Sunflower)	Helianthus Sp. (Compositae)	Bed	Transplanted	2.5-5	150-210	Orange and yellow	Flowers are single or double.
8	Marigold	Tegetes Sp. (Compositae)	Bed	Transplanted	20-30	60-90	Orange and yellow	Flowers are single or double, can continue to flower up to winter.
9	Mina lobata	Mina lobata (Convolvulaceae)	Pot	Transplanted	Creeping	-	Red and creamy	Good for training on arches and arbors.
10	Torenia	Torenia speciosa (Compositae)	Both	Transplanted	10-15	20-25	Blue with white spots	Good for beds and rockeries and verandah decoration.
11	Vinca	Vinca rosea (Apocynaceae)	Both	Transplanted	20-25	30-45	Red and white red with white eye	Plant can also be multiplied by cuttings.
12	Zinnia	Zinnia elegans (Compositae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thumb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

## C - Summer Season (Sowing Time - February - March)

All raised by seed - Flowering Time : September - November

S. No.	English Common name	Botanical name and Natural order	Pot or Bed	Sown in situ of transplanted	Planting distance in bed (cm)	Height (cm)	Colour	Remarks
1	Cosmos	Same as given above			20-30	20-30		Cultivated for green leaves, can be trimmed to any desired shape.
2	Kochia (Mock Cypress)	Kochia scoparia var. trichophylla (Chenopodiaceae)	Both	Transplanted	20-25	10-15	Red, white, crimson, yellow and scarlet	The flowers are rose in shape and are single and double, can also be multiplied by cuttings. Flowers open only in the mornings.
3	Portulaca	Portulaca grandiflora (Portulacaceae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.
4	Zinnia	Zinnia elegans (Compositae)	Bed	Transplanted	20-30	45-60	White, red orange, scarlet, yellow and pink.	Pompon, Cupid Tom Thomb, California gaint are important groups of Zinnia. Linearis produces single bright yellow flowers. Excellent for edging and beds.

D-Classification of Winter Annuals		
I. White	II. Purple and Mauve	III. Pink and Light Red
Antirrhinum	Ageratum	Acroclium
Aster	Antirrhinum	Antirrhinum
Daisy	Cornflower	Asters
Candytuft	Phlox	Daisy
Gypsohylla	Heliotrope	Candytuft
Phlox	Larkspur	Clarkia
Stock	Sweetpea	Cosmos
Petunia	Lobelia	Godetia
Sweet alysum	Negella	Larkspur
Verbena	Pansy	Lupin
Dahlia	Pentunia	Petunia
Larkspur	Salvia	Phlox
Dimorphoteca	Stock	Poppy
Eschacholtzia	Torenia	Verbena
	Verbena	
	Viola	
	Aster	
	Anchusa	
	Lupin	
	Sweet Williams	
E-Classification of Winter Annuals		
Dwarf		Medium
(Upto 30 cm)		(Up to 60 Cm)
Gamolepsis	Stock	Antirrhinum
Lobillia	Sweet alyssum	Aster
Linum	Torenia	Ageratum
Mimulus	Viola	Anchusa
Nemesia		Acroclium
Nasturtium		Cornflower
Nigella		Candytuft
Phlox		Calendula
Pansy		Daisy
		Gillardia
		Heliotrope



According to their colour		
IV. Crimson and Scarlet		V. Orange and Yellow
Argemone		Antirrhinum
Antirrhinum		Calendula
Aster Candytuft		Calliopsis
Celosia		Dimorphoteca
Salvia		Leptosyne
Phlox		Eschscholtiza
Stock		Marigold
Petunia		Nasturtium
Linum		Pansy
Dianthus		Sunflower
Cosmos		Phlox, Chrysanthemum (annual)
Salvia		Cosmos
Verbena		Minulus
Marigold		
According to their height		
	Tall	
	(Above 60 Cm)	
Larkspur	Antirrhinum	Leptosyne
Petunia	Chrysanthemum	Marigold
Salvia	Clarkia	Sunflower
Wallflower	Calliopsis	Schizanthus
	Cosmos	Sweetpea
	Eshscholtiza	
	Dahalia	
	Dimorphoteca	
	Gypsohila	

## CHAPTER - 24

### SUMMER AND RAINY SEASON FLOWERS

The summer season start in India from the month of April and continues till the month of June, from July to September the season is rainy. In summer the temperature rise up to 45 c and winds are dry all around. After the sparky spring, where various choice of flowers are available, in summer season there are very limited variety available because of adverse weather conditions, which the gardener can grow for adding color and flowers in his garden. The way of planting are by grow seedlings and planting them in beds or pots, secondly showing the seed directly in the beds or pots. During propagation for summer flower gardener should keep in mind to add the compost and sand in mixture to maintain the moisture during dry summer before planting seedling or seeds. The gardener should also keep in mind about the availability of irrigation water. Here, we are suggesting some popular summer and rainy season flowers for gardeners to choose from them.

#### 1. Portulaca (Portulaca oleracea)

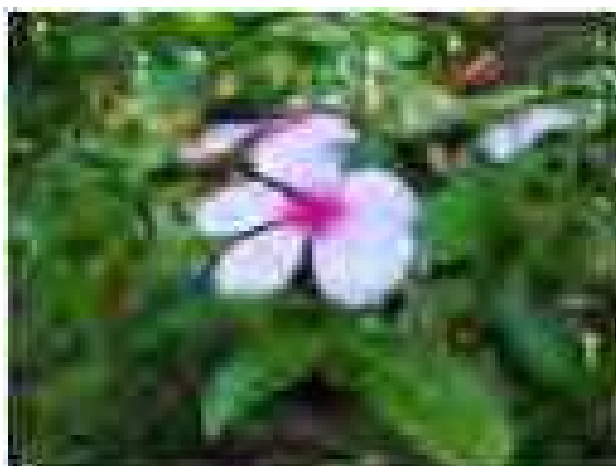
Portulaca also known as Moss roses, they are excellent flowers to have if you live in a dry climate, since they can store water well, and also provide lots of low lying color for your garden. They also are very easy to take care of after you get started. Moss rose is the gardener's choice for the hottest, driest, most problematic spots in the garden. This succulent plant thrives in heat, drought, and lousy soil, rewarding gardeners with nonstop color. Coming in sunny warm reds, oranges, magentas, and yellows, moss rose looks at

home in a sun-drenched area. There's also a whole pastel color palette for moss rose -- creamy white, pink, and peach varieties. It often happily reseeds, coming back every year with gusto. The plant ht. 7-20 cm, width. 30 cm, Easy to Grow.



## 2. Cosmos (Cosmos bipinnatus)

**Cosmos** are annuals, grown for their showy flowers. The flower heads may be bowl- or open cup-shaped and are atop of long stems. Cosmos are easy to grow and make good border or container plants. The cosmos plants are able to flower from early summer and long lasting up to winter season. They make for good decorations in flower arrangements and also attract birds, bees, and butterflies to your garden. The height of the plants should be very from 15 cm to 45 cm according to the variety. Its commonly available in dark orange to yellow colour. It is easy to grow.



## 3. Vinca Flowers (Cartharanthus roseus)

Annual vincas aren't new or flashy flowers on the gardening scene, but recent cultivar developments warrant a new examination of this common bedding plant. Horticulturists have been hard at work bringing us new colors in plants with showier flowers that are easier to start from seed. The height of the plants varies from 15 cm to 45 cm according to variety, the common Vinca plants have only two colours white and dark pink. Now a days various colours in hybrid varieties are available in single colour or contrast. But the hybrid varieties are very susceptible to the water logging and they can not be prolonged during rainy season.

## 4. Sunflower ( Helianthus annuus)

Sunflower is an annual plant, growing up to 4.6 m tall. It has large, rough and hairy leaves, oval to cordate in shape. Flower heads are also large, growing about 20-30 cm in diameter. It consists of numerous, densely arranged florets. Sterile ray florets on the outer side vary in color- they can be yellow, red or orange. The disc florets inside the circular head produce seeds. The florets inside the circular head are called disc florets, which mature into seeds. The florets inside the sunflower's cluster are spirally arranged, which is a most efficient packing of seeds within the flower head. **Parts used:** Seeds, leaves, root.



### 5. Sunflower dwarf ( *Helianthus annuus* )

These dwarf sunflowers are free of pollen, making them perfect as indoor gift plants. They are also tolerant of mildew to perform well in the garden. Miss Sunshine flowers uniformly about 7 to 10 days earlier than Ballad. It is shorter, and flowers are 25% smaller than Ballad's 4 to 5-in.(10 to 13-cm) blooms. Miss Sunshine displays warm golden flowers, and produces secondary blooms more quickly. For larger flowers and bright yellow color, Ballad excels.



### 6. Zinnia (*Zinnia acerosa*)

Zinnias are one of the easiest **annuals** to grow, grow quickly, and bloom heavily. They make a massive burst of color in your garden. Zinnias have bright, solitary, daisy-like flowerheads on a single, erect stem. The most common zinnia is "dahlia-flowered" and grows up to three feet. Other types are "cactus-flowered." Use in an annual or mixed border. Smaller zinnias are suitable for edging, windowboxes or other containers. The narrow-leaf zinnia also works well in hanging baskets. Zinnias are very popular for cut flowers.



## 7. Gaillardia (*Gaillardia aristata*)

Gaillardia, or Blanket Flower, is a group of about 30 species that include both annuals and perennials. With bright and colorful daisy-like flowers it is no wonder this native wildflower has earned a spot on the heart of gardeners everywhere. The most common species for garden use is *Gaillardia grandiflora*. It is this perennial, and some of its most unique cultivars that we will discuss here. Hardy, sun-loving and easy to keep it deserves a place in every garden.



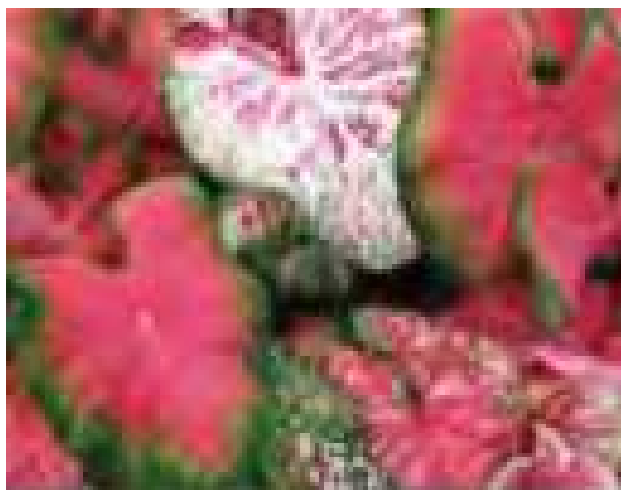
## 8. Gomphrena (*Gomphrena globosa*)

*Gomphrena* easily grown in average, well-drained soils in full sun. Although mature plants exhibit good drought resistance, plants grow best with regular moisture throughout the growing season. Extremely good heat tolerance. Sow seed directly in the garden. Use ample amounts of seed since germination rate can be quite low. Set seedlings or purchased plants out. Pinch young plants to promote more foliage and flowering. The plants ht. 30 to 60 cm. The plant is hardy nature and easy to grow.



## 9. Cladium (*Cladium californicum*)

Cladium is a very popular bulbous plant for rainy and summer season. It can be grown easily from April to September in north India plain. On onset of the winter the plants leaves dried and bulb can be collected for the next season and they can be stored in cold storage during dormancy. The Cladium have very decorative leaves of different colours and shapes. It can be easily planted in semi shaded beds or pots. The lower dry leaves should be eradicated regularly for new shoots / leaves. The height of plants vary from 15 cm to 40 cm mainly leaves of the Cladium is a combination of red, white and green colour. According to the variety.





## 10. Balsam (*Impatiens balsamina*)

Balsam is a very favorite rainy season flower this old-fashioned annual adds an exotic, almost gaudy touch to the garden. It offers interesting, trumpet-shape blooms, mostly in shades of pink. Many selections have bicolor flowers. Balsam often self-seeds in the garden and is very easy to grow. Plant established plants outdoors in spring after all danger of frost has passed. Balsam needs rich, well-drained soil to do best, so work in plenty of compost. (It's ideal in containers as long as you don't let the plants dry out for even a second.) Fertilize lightly but regularly. The plant ht. 30-90 cm tall, width 30-60 cm wide and easy to grow.



## CHAPTER - 25

### FLOWER BEDS

Plants which flower profusely, when planted in groups to give a mass effect are termed as flower beds. They may be perennial (living for more than two years), biennials (living for two years) and annuals or seasonal (living for one season or for one year). They enhance the outdoor surroundings and are a good source of cut flowers. They are a good source for attracting pollinators, such as bees and butterflies.

Perennial plants are plants that lives for more than two years. The term is often used to differentiate a plant from shorter-lived annuals and biennials. The term is also widely used to distinguish plants with little or no woody growth from trees and shrubs, which are also technically perennials.

The most popular type of flowers in gardens are annuals which are raised from seed. They grow, bloom, seed and exhaust them selves during a season. It has the advantage of a tremendous variety of colour, size and form and occupies garden space for less time and can be easily replaced. The seasonal flowers allow the gardener to see all the stages of growth in the shortest possible period. This satisfies the “Growth Instinct” of gardener more than any other type.

Seasonal and perennial flower beds in various shapes and sizes can be designed. Flowers of all rainbow colours are available.

Perennials offer a lot of color without a lot of work. Among seasonal flowers, some species are specific to winter; summer and rainy season and some can be grown throughout the year.

#### Laying of Flower Beds:

1. Dig Trenches of 1'- 6" depth of required shape and size.
2. Remove weeds and other unwanted materials.
3. Fill up trenches with dug out soft soil by adding 3 kg compost or 1kg vermi-compost + 0.5 kg neem cake +
4. + 0.25 kg super phosphate per cft. + 25 gms of foliol dust.
5. Water the beds and refill the trench to cover up the shrinkage and form a bund around the bed to form a basin.
6. Plants seedlings at 6'-9" spacing after clipping lower 1/3rd leaves.
7. Water gently with a rose can.
8. Regular weeding, mulching and watering are required.
9. Clipping of primary buds to promote bushy growth and better flowering should be done.

### (a) Seasonal Flower Beds

S. No.	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS	S	Plant Name	Ht.	RWS
1.	Plant Name Antirrhinum	M	W	12	Dianthus	L	W	23	Pancy	L	W
2.	Aster	L	AYR	13	Gaillardia	L	AYR	24	Petunia	L	AYR
3.	Balsum	M	AYR	14	Gamphrena	L	AYR	25	Phlox	L	W
4.	Callendula	L	W	15	Galdiulus	M	AYR	26	Poppy	L	W
5.	Candytuft	L	W	16	Hollyhock	T	AYR	27	Portulaca	L	AYR
6.	Carnation	M	W	17	Kochia	M	w	28	Salvia	M	W
7.	Chrysanthemum	L	W	18	Lady's Lace	T	w	29	Sunflower	T	AYR
8.	Coreopsis	T	AYR	19	Larkspur	M	w	30	Verbena	L	AYR
9.	Celosia	MT	AYR	20	Marigold- tall	M	AYR	31	Zinnia	M	AYR
10.	Cosmos	T	AYR	21	Marigold-dwarf	L	AYR	32	Zinnia linearis	M	AYR
11.	Dahlia	T	w	22	Nasturtium	L	w				

### (b) Perennial Flower Beds:

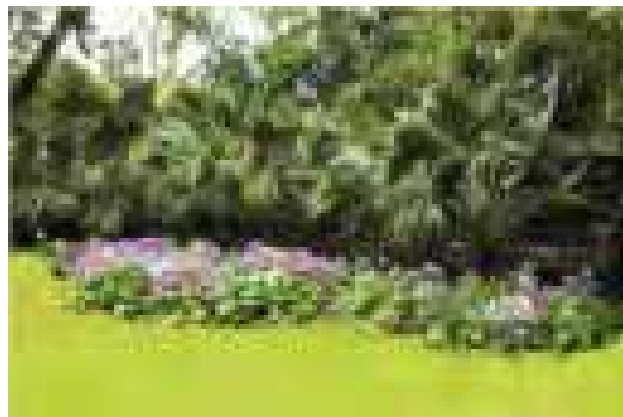
S.No	Plants Name	S.No	Plants Name	S.No	Plants Name	S.No	Plants Name
1	Balsam impatiens	5	Gazania	9	Lantanas	13	Tuberose
2	Beloperone guttata	6	Geranium	10	Portulaca	14	Verbena- Perennial
3	Cannas	7	Gerbera	11	Russalia	15	Azalea
4	Daisy	8	Lilies	12	Roses-Miniature	16	Lobelia

### (c) Biennial Flower Beds:

S. No.	Plant Name	S. No.	Plant Name
1.	Onion	5.	Sweet William
2.	Parsley	6.	Colic weed
3.	Lunaria	7.	Carrot
4.	Silverbeet	8.	Hollyhock (some varieties)

H = Height, T = Tall, M = Medium, L = Low

W= Winter Season, AYRV = All year Round





## CHAPTER - 26

### POTTED PLANTS

Potted plants are displayed both indoors and outdoors, as groups or singles, on plane areas or steps, on ground or pot stands. Hanging pots are also used extensively. Pots in a group give very good effect.

Plants grown in pots are called pot plants. When open spaces are not available, as in the case of apartments, residences and offices, pot plants can be effectively used. Pot plants have the advantage of mobility. For indoor locations and rooftop gardens pot plants can be both indoor and outdoor. Most of the plants can be potted and used as pot plants.

Pot plants are used as indoor plants and also as outdoor plants on terraces, balconies, in driveways & also as decorative plants for display during special functions, conferences and other events. Pot plants comprise of Seasonal plants Flower, Foliage, Fruits, and Specimen plants.

Lot of plants can be grown as pot plants. When a plant is selected for planting in a pot, care should be taken that the nutritional requirements of the plant is fulfilled, as the media in a pot is restricted to the size of the pot. If the nutritional requirement of the plant is high, we have to replenish the same by periodical application of fertilizer and manure

Depending on the growth potential of the plant species, the container or pot size is selected. Plants which are used as ground covers or which like to droop are planted in hanging baskets (such plants have shallow root system). Plants which grown up to a certain height, and which require less area

for spreading can be used in small and medium containers and species which have a tendency to grow big and tall are used in big pots. Generally fruit plants and trees are planted in bigger containers, or in planter boxes.

Whatever the size of the container are size of the plant, pot plants require regular application of manures and fertilizers and pest control measures taken to keep them healthy. It is recommended to apply fertilizers and pesticides at regular intervals of 15 days 30 days, by loosening the top soil. Repotting of plants is recommended once in a year. Whenever repotting is done, it is advised to go in for a bigger pot than the existing pot, for a healthy growth. It is advisable to prune some of the roots at the time of repotting as it allows the plants to develop new roots which help in absorbing the nutrients better. Some plants like Cycads, Adeniums and Beau-carneas etc. Have to be repotted once in 2 to 4 years.

The media for potting should be porous and rich. For making the media porous Cockpit and perlite are used. For making it rich, use Vermicompost. Sand or broken clay pieces are added to media to improve the drainage, before repotting the plant, as improper drainage kills the plant due water logging.

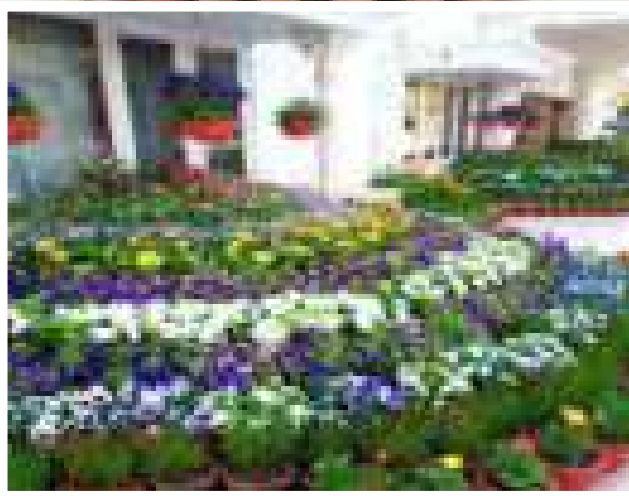
Watering of potted plants should be regulated with care, as excess/ shortage of water can damage the plant. Generally in ground plantation, a plant can tolerate irregularity in watering because of sub-soil moisture which is not possible in pot plants.



## POTTING MEDIA

1. Soil Media or Pot Mixture is prepared for plants grown in containers.
2. Media normally means, soil mixed with other ingredients in a particular proportion as required by a specific group of plants. Presently soil media is available which allows better growth, good moisture retention, thereby preventing diseases and weeds. It contains Vermiculite, Perlite, Sterilized Coco peat etc.
3. Different types of Soil media are available which contain materials like soil, sand, compost, vermicompost, wood Ash, Coco peat, Leaf Mould, Charcoal, Brick Bats, Neem Cake, Bio Fertilizers and Bone Meal etc. which are mixed in different proportions as per plant requirement.
4. Small quantities of fertilizers including micro nutrients and pesticides are also mixed in pot mixture
5. Basic criteria for selection of ingredients are aeration, moisture retention, and availability of nutrients.
6. Soil should neither be alkaline nor acidic; it should be neutral with PH value ranging from 6 to 7.5
7. The media should neither be very sticky due to excess clay content, which causes drainage problem, nor very sandy, which does not allow moisture retention to the required extent.
8. Function of the media is to hold the plant upright, holding moisture for a good period and nutrients for a long period and gradually supply to the plant.
9. For aeration of roots and conservation of moisture in media its top layer of about 4 - 5 cms should always be kept loose by periodic mulching.
10. Media should be changed or enriched once or twice a year for better nourishment and maintain physical condition of the soil media.

S. No.	Plant Name	S. No.	Plant Name
1.	Aechmea chantinii	16.	Asparagus densiflorus sprengeri
2.	Aglaonema colour	17.	Asparagus plumosus
3.	Aglaonema commutatum elegans	18.	Asparagus setaceus pyramidalis
4.	Aglaonema commutatum maculatum	19.	Aspidistra elatior variegata
5.	Aglaonema commutatum	20.	Begonia rex
6.	Alocasia amazonica	21.	Begonia semperflorens red pearl
7.	Alocasia korthalsii	22.	Bromelia balansae
8.	Alocasia macrorrhiza variegata	23.	Caladium hortulanum conbidum
9.	Alocasia macrorrhiza	24.	Caladium hortulanum attala
10.	Alpinia sanderar	25.	Calathea insignis
11.	Alpinia zerumbet	26.	Calathea rufibarba
12.	Anthurium andraeanum	27.	Codiaeum variegatum gold dust
13.	Aphelandra squarrosa	28.	Codiaeum variegatum mammy
14.	Asparagus densiflorus myers	29.	Codiaeum variegatum petra
15.	Asparagus densiflorus myriocladus	30.	Codiaeum variegatum

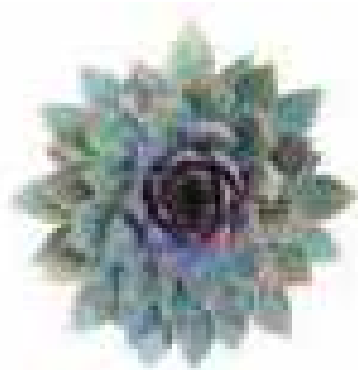


## CHAPTER - 27

### CACTUS & SUCCULENTS



Variegated Sempervivum



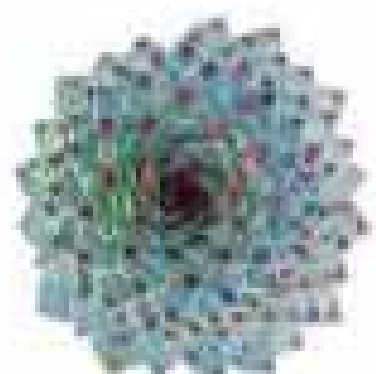
Sempervivum Grape Tone



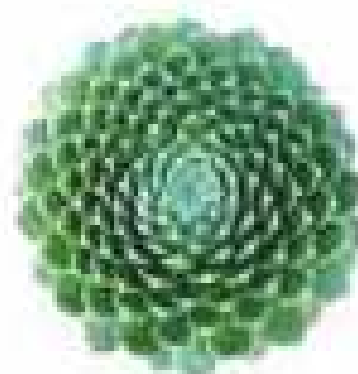
Sempervivum Cobweb



Sempervivum Red Lion



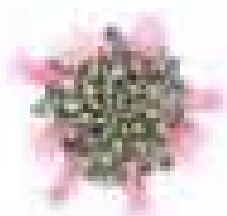
Sempervivum Calcareum



Sempervivum Ciliosum



Powder Puff



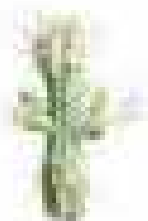
Powder Puff



Red Thorn



Britton & Rose



Corn Cob



Blue Candle



Paper Spine



Joseph's Coat



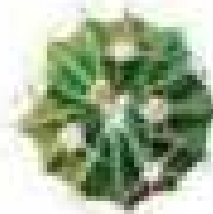
Domino



Bishop's Cap



Golden Barrel



Latispinus



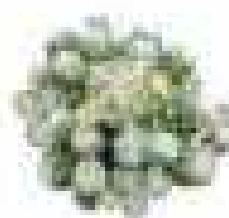
Peanut



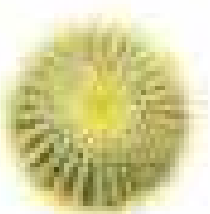
Pine Cone



Angel Wing



Thimble



Golden Ball



Peruvian Old Man

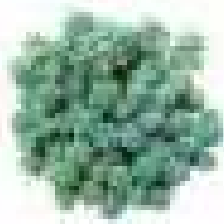


Pincushion

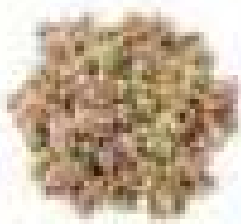


Albiflora

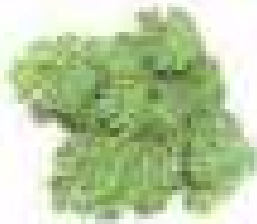
## SEDUM



Major



Minor



White Diamond



Dragon Blood



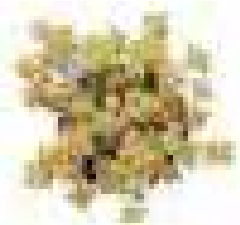
Little Gem



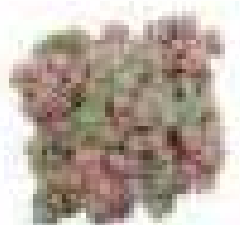
Cape Blanco



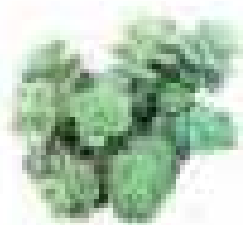
Little Missy



Tricolor



Hispanicum



Sieboldii



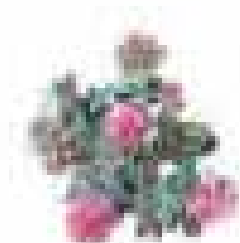
Fire Storm



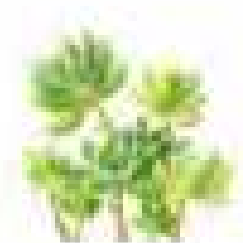
Lime Zinger



Fuzzy Wuzzy



Sunsparkler

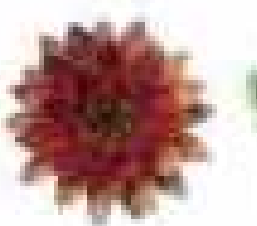


Green Jelly Bean

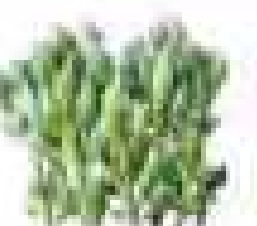
## SENECIO & SEMPERVIVUM



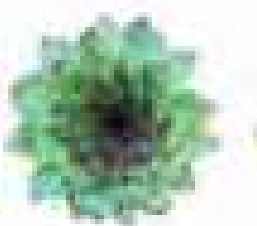
Ruby Necklace



Red Lion



Citriformis



Mahogany



Vertical Leaf



## COTELYDON & KALANCHOE



Key Lime Pie



Bear Paw



Orbiculata



Mother of Millions



Chocolate Soldier



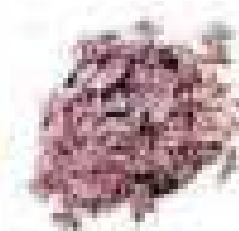
String of Pearls



Purple Heart



Donkey's Tail



Calico Kitten



Ruby Necklace



Sedum Sieboldii



Baby Necklace



String of Hearts



Little Missy



String of Bananas

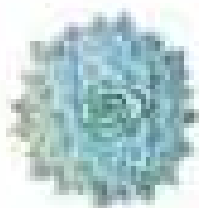
## ECHEVERIA



Black Prince



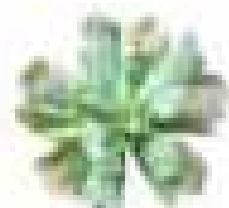
Blue Rose



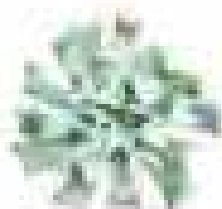
Violet Queen



Cubic Frost



Culibra



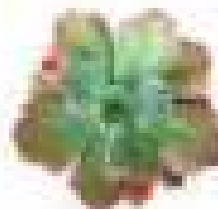
Topsy Turvy



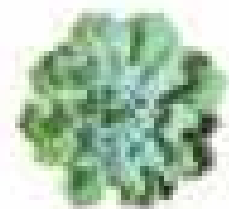
Lipstick



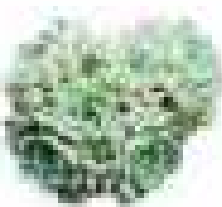
Painted Lady



Crinoline Ruffles



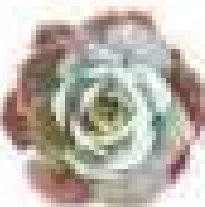
Gray Curl



Minima



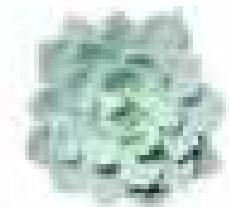
Atlantis



White Rose



Raindrops

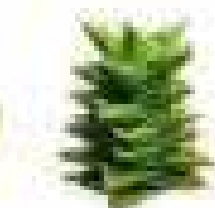


Blue Fairy

## CRASSULA



Devil's Horns



Tiger Jade



Red Pagoda



Gollum Jade



Campfire



Springtime



Baby Necklace



Hummel's Sunset



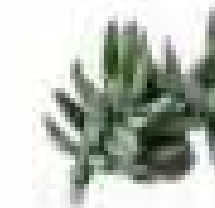
Brevifolia



Ruffle Jade



Giant Watch Chain



Mesembryanthemoides



Pagoda Village



Devil's Horns



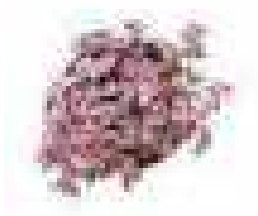
Tiger Jade



Ovata f. variegata



Red Pagoda



Colico kitten



Campfire



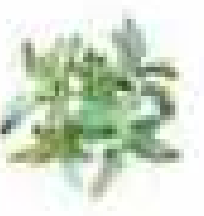
Ruffle Jade



Baby Necklace



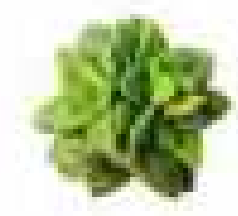
Silver Springtime



Tiger's Jaw



Ivory Towers



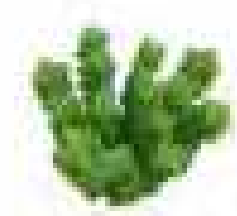
Springtime



Cotyledonis



Moonglow



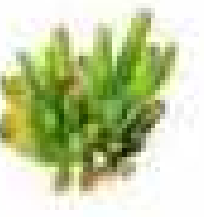
Green Pagoda



Rubricaulis Candy Cane



Rupestris High Voltage



Gollum Jade



Falcata Propeller



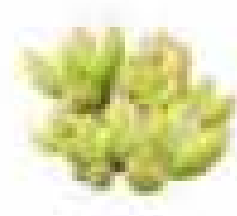
Tom Thumb



Orbicularis



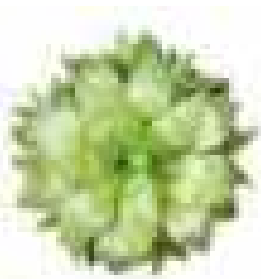
Giant Watch Chain



Nudicaulis var. herrel



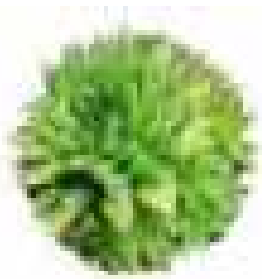
Pagoda Village



Window



Venosa



Cooperi



Cuspidata



African Pearls



Batesiana



Silver



Zebra Plant



Panda Plant



Flapjacks



Panamensis



Chocolate Soldier

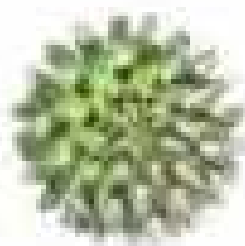


Mother of Thousands



Mother of Millions

# CACTUS



Powder Puff



Thimble



Hedgehog



Bishop Cap



Paper Spine



Corn Cob



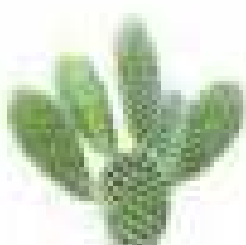
Pine cone



Joseph's Coat



Golden Barrel



Angel Wing



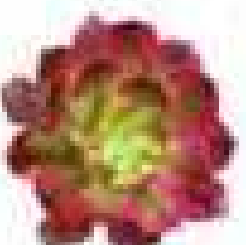
Dwarf Chin



Echinopsis



Sunburst



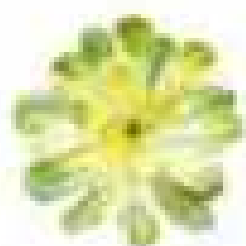
Mardi Gras



Lily Pad



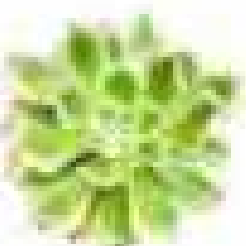
Black Rose



Suncup



Kiwi



Luteovariegatum





Sedum  
cuspidatum



Senecio  
rowleyanus



phedimus



crassula  
ovata



crasula  
ovata 'gollum'



crassula  
ovata 'hobbit'



graptosedum  
bronze



sedum  
luteoviride



kalanchoe  
rombophylla



crassula  
wolkensii



cyanotis  
somalensis



kalanchoe  
houghtonii



kalanchoe  
blossfeldiana



portulaca gilliesii



lenophyllum



sedum  
rubrotinctum



echinopsis



sedum  
diffusum



pachyveria  
'powder puff'



echeveria  
palida



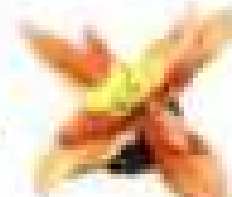
tradescantia  
sillamontana



pachyphytum  
oviferum



sedum  
sediforme



crassula  
capitella 'campfire'



Echeveria  
black prince



sedum  
golden glow



crassula  
capitella thyrsiflora



scilla  
pauciflora



sedum  
hernandezii

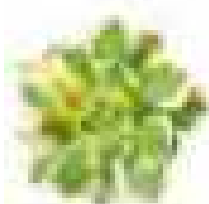


sedum  
pachyphytum

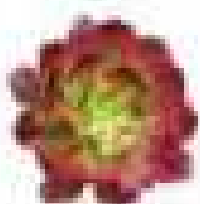




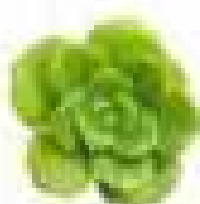
## AEONIU



Sunburst



Mardi Gras



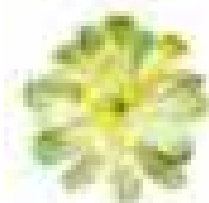
Lily Pad



Kiwi



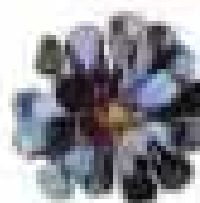
Crested Sunburst



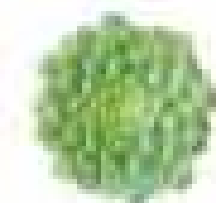
Suncup



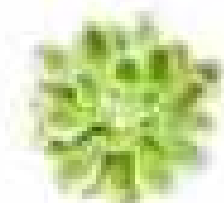
Green Platters



Black Rose

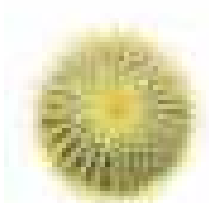


Dinner Plate

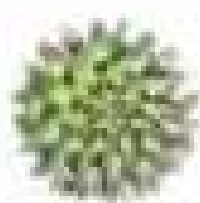


Luteovariegatum

## CACTUS



Golden Ball



Powder Puff



Thimble



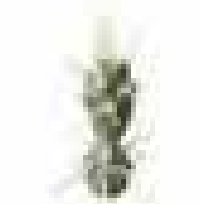
Hedgehog



Bishop Cap



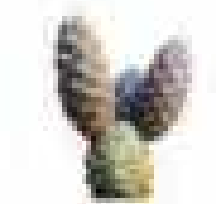
Britton & Rose



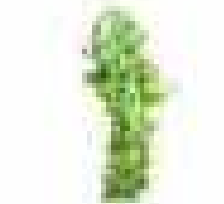
Paper Spine



Corn Cob



Pine cone



Joseph's Coat



Old Man



Golden Barrel



Angel Wing



Dwarf Chin



Echinopsis



Lady Finger



Mammillaria Albiflora



Devil's Tongue

# CHAPTER - 28

## ESSENTIAL ELEMENTS AND THEIR SOURCES

MAJOR			MINOR
Essential elements used in relatively large amounts			Essential elements used in relatively small amounts
Mostly from Air and water	From Soil		
Carbon (C)	Calcium - (Ca)	Copper	- (Cu)
Hydrogen (H)	Magnesium - (Mg)	Manganese	- (Mn)
Oxygen (O)	Sulphur - (S)	Zinc	- (Zn)
	Nitrogen - (N)	Molybdenum	- (Mo)
	Phosphorus - (P)	Cobalt	- (Co)
	Potassium - (K)	Boron	- (Bo)
	Iron - (Fe)		
ROLE OF PLANT NUTRIENTS			
Group I	Energy Exchanges		Hydrogen and Oxygen
Group II	Energy Storers		Carbon, Nitrogen, Phosphorus, Sulphur
Group III	Translocation Regulators		Potassium, Sodium, Calcium and Magnesium
Group IV	Oxidation-Reduction Regulators		Iron, Manganese, Zinc, Copper, Boron and
			Molybdenum

### C-Deficiency Symptoms of Major and Minor Elements

#### Major (Micronutrients) Elements

S. No.	Element		Symptoms Major (Macronutrients ) Elements
1	Nitrogen	1	Older or lower leaves of plant mostly affected; effects localized or generalized.
		2	Effects mostly generalized over whole plant ; more or less drying or firing of lower leaves ; plant light or dark green.
		3	Plant light green ; lower leaves yellow, drying to light brown colour; stalks short and slender if element is deficient in later stages of growth.



S. No.	Element		Symptoms Major (Macronutrients ) Elements
2	Magnesium	1	Effects mostly localized ; mottling or chlorosis with or without spots of dead tissue on lower leaves ; little or no drying up of lower leaves.
		2	Mottled or chlorotic leaves, typically low ridden, as with cotton, sometimes with dead spots ; tips and margins turned or capped upwards stalks slender.
3	Phosphorus		Plant dark green, often developing red and purple coulurs, lower leaves sometimes yellow, drying to greenish brown or black colour, stalk short and slender if element is deficient in later stages of growth.
4	Potassium	1	Mottled or chlorotic leaves with large or small spots of dead tissues.
		2	Spots of dead tissue small, usually at tips and between veins, more marked at margins of leaves, stalk slender.
5	Calcium	1	New or bud leaves affected, symptoms localized.
		2	Terminal bud dies, following appearance of distorts on at tips or bases of young leaves.
		3	Young leaves of terminal bud at first typically hooked, finally dying back at tips and margins, so that later growth characterized by cut-out appearance at these points, stalk finally dies at terminal buds.
6	Sulphur	1	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
		2	Dead spots not commonly present, chlorosis may or may not involve veins, making them light or dark green in colour.
7	Zinc		Spots generalized, rapidly enlarging, generally involving areas between veins and eventually involving secondary and even primary veins; leaves thick ; stalks with shortened internodes.
8	Boron		Young leaves of terminal buds becoming light green at bases, with final breakdown here, in later growth; leaves becomes twisted, stalk finally dies back at terminal bud.
9	Copper	1	Terminal buds commonly remain alive, wilting or chlorosis of younger or bud leaves with or without spots of dead tissue, veins light or dark green.
		2	Young leaves permanently wilted (wither-tip effect) without spotting or marked chlorosis; twig or stalk just below tip and seed head often unable to stand erect in later stages when shortage is acute.
10	Manganese	1	Young leaves not wilted, chlorosis present with or without spots of dead tissue scattered over the leaf.
		2	Spots of dead tissue scattered over the leaf, smallest veins tend to remain green, producing a checkered or reticulating effect.
11	Iron		Young leaves chlorotic, principal veins typically green, stalks short and slender.

## CHAPTER - 29

### IMPORTANT FERTILIZERS

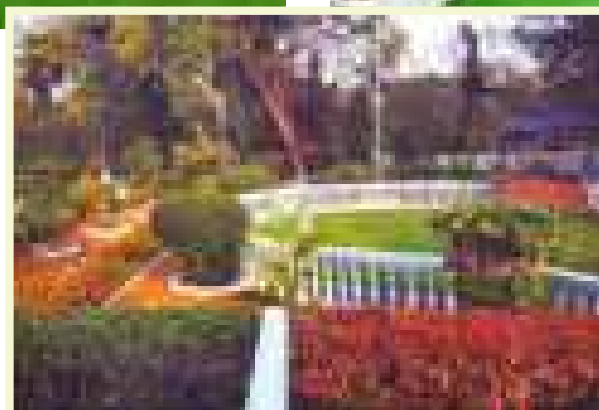
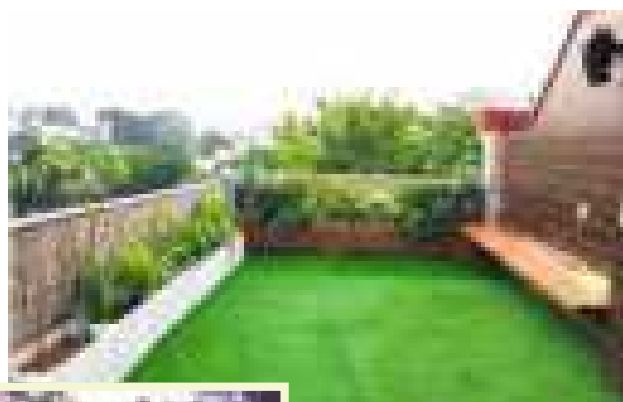
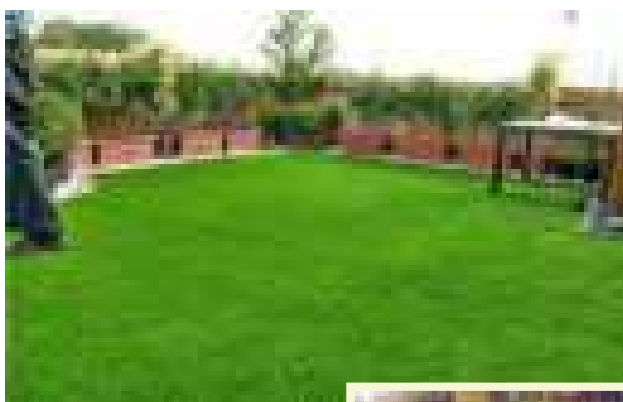
The fertilizers and their uses in addition to the percentage of elements contained in them

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
Nitrogenous Fertilizers						
1	Sodium Nitrate	Na No4	16.0	-	29	Produces alkalinity in the soil. No accumulation in light soil suitable for use in acid soils. Soils not used in larger amounts.
2	Ammonium Sulphate	(NH4)2 SO4	20.5	110	-	Mostly used in present days. Acid forming fertilizer. Higher doses are harmful. It does not leach easily. Easy to handle.
3	Ammonium Nitrate	NH4 NO3	33.5	60	-	Best for dry land crops. It is completely used. More effective on heavier soils, because leaching is not very pronounced. In heavy rain-fall area, nitrate is completely leached out.
4	Ammonium Chloride	NH4 CL	25.0	128	-	Can be applied to light as well as heavy soils without loss of nitrogen. Nitrogen is absorbed by soil particles. Should not be used in acidic soils.
5	Ammonium Phosphate	(NH3)2 HPO4	21.0	55-77	-	They are primarily used on leguminous crops including pulses. They can be applied to any type of soil. Loamy, neutral soils are best, because phosphate and nitrogen both will be available.
6	Ammonium Sulphate Nitrate	-	26.0	93	-	It has the same effect as ammonium sulphate. Where leaching occurs on heavier soils, it is better. Transplanted paddy responds better to this fertilizer. It is safe to apply on highly acid soils than ammonium sulphate.

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
7	Urea	CO (NH <sub>2</sub> ) <sub>2</sub>	46.0	80	-	Well aerated soil helps in the decomposition of urea which is converted into ammonical nitrogen. Applied in dry land. Being less acidic, hence can be used on wider range of soils. Anaerobic condition may cause loss of nitrogen from urea. Very good for foliar application.
8	Calcium Cyanamide	Ca CN <sub>2</sub>	22.0	63	-	It is highly based producing fertilizer, well aerated soil condition may help in the reduction of nitrogen in acid soils. It take longer time to release nitrogen for crops.
9	Calcium Ammonium Nitrate	-	20.5	-	-	This neutralizes the acidity of the soil due to the presence of lime. It should be used in those soils, where leaching is not heavy. For light soils it should be given in smaller doses.
10	Calcium Nitrate (Calnitro)	Ca(NO <sub>3</sub> ) <sub>2</sub>	15.0	-	-	It is suitable for acidic soils more prominently than for calcareous or saline alkaline lands. Should not be used under wet conditions as nitrate is likely to leach out in the soil.
11	Potassium Nitrate	KNO <sub>3</sub>	13.0	-	29	It is a basic salt and is more for the supplying of potas-sium rather than nitrogen. It leaches out very quickly in wet soils.
Phosphatic Fertilizers						
			P <sub>2</sub> O <sub>5</sub> Content	Acidic or Alkaline		
1	Single Super-phosphate	16.0-20.0	neutral	90		Suitable for all types of soil. The effect of it on heavy soils more than on lighter soils because of low level of other nutrients.
2	Triple Super-Phosphate	48.0-50.0	Acidic	95		Alluvial soil of North India responds very much to this fertilizer. Both are water soluble.

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
3	Basic Slag	3.4 Indian	alkaline			It reacts on acidic soils. The availability is more under water soils, which contain high contents of organic matter. It is not soluble in water. It is applied much earlier than it is required for the crops.
4	Rock Phos-Phate	Ca (Po <sub>4</sub> With impirities	20.0-25.0	acidic	-	It is much more effective on acidic soils than alkaline soils. Insoluble in water. It does dissolve in soil water in the presence of organic matter or green manure. Highly effective on heavily leached soils. Its effectiveness increases if it is mixed with super-phosphate.
5	Bonemeal	Ca <sub>3</sub> (PO <sub>4</sub> ) <sub>2</sub>	25-28 and 1.2% N	alkaline	70	As already stated, it is not water soluble fertilizer. It takes time to get dissolved in the soils. The efficiency of this fertilizer increases in the presence of organic matter in large quantities. Suited for acidic soils. The availability of phosphorus from bone meal is higher in water soil conditions than in drylands.
6	Ammonium Phosphate	NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub> and (NH <sub>4</sub> ) <sub>2</sub> PO <sub>4</sub>	48-54 And 11-21% N	acidic	100	Most suitable fertilizer for Indian soils. Ammo. phos. is liked on account of 20 : 20 percentage P and N with water solubility Can be used on light medium and heavy soils. Its response is most pronounced on medium and heavy soils than on lighter ones. It is equally effective in wet as well as dry lands,

S. No.	Name of the fertilizer	Chemical formula	Percentage of the elements	Equivalent		Remarks
				Acidity/ basicity		
Potassic Fertilizers						
1	Potassium Sulphate	K <sub>2</sub> SO <sub>4</sub>	47-52			Response to this has been obtained on all soils in India where it is deficient. Soils of high calcium content retain the sulphate ions than low content ones Suitable for application on calcareous and alkaline soils. Not suited on heavy soils. In highly leached acid soils sulphur deficiency is actually observed. It contains 38 — 49% Sulphur.
2	Potassium Chloride (Muriate of potash)	KCl	60-62			It is imported in large amounts due to high percentage of K <sub>2</sub> O. In acidic soils it has greater response than potassium sulphate. Cl ions are not retained by soils of heavy type hence can be used on such soils. In alkaline soils Cl ions prove toxic for crops.





## CHAPTER - 30

### MEDICINAL PLANTS

**Common Name :** Ghrita Kumari  
**Botanical Name :** Aloe vera  
**Family Name :** Asphodelaceae



#### MEDICINAL PROPERTIES / USES

Aloe Vera is very popular and also called as “Ghrita Kumari”. Aloe is commonly used can be grown in various climatic conditions. It is sensitive to water logged conditions and also cold climate is not favourable for this plant.

**Medicinal Uses:** Detoxifies the body, hydrates skin, lowers high cholesterol, stabilizes blood sugar, prevents kidney stone, reduces high blood pressure, supports immune system, and helps in inflammation, wounds, burns and eczema, etc.

**Other Uses:** Aloe Vera has been widely used for cosmetic use such as for making lotions, facial creams, etc. The commonly used element is leaf juice and leaf gel.

**Common Name :** Ashwagandha  
**Botanical Name :** Withania somnifera  
**Family Name :** Solanaceae



#### MEDICINAL PROPERTIES / USES

Ashwagandha Withania somnifera is also known as Poison gooseberry. It is a short shrub herb of 35 to 75 cm with a single stem with branches extend radially. The flowers are small and green while ripe fruit is orange red and has milk coagulating properties. The plants long, brown roots are used for medicinal purpose.

**Medicinal Use:** In Ayurveda, the leaves and fruit of ashwagandha are applied to tumours, tubercular glands and ulcers. It has capability of improving arthritis symptoms, helps in reducing symptoms of anxiety, reduces cholesterol level and can improve attention and impulse control in children with ADHD (Attention deficit hyperactivity disorder).

**Side Effects & Safety:** Higher dose of ashwagandha might cause stomach upset, diarrhoea and vomiting and can irritate the gastro intestinal tract. So the patient having stomach disease are advised not use ashwagandha.

**Common Name :** Brahmi  
**Botanical Name:** Bacopa monnieri  
**Family Name :** Scrophulariaceae



#### MEDICINAL PROPERTIES / USES

Brahmi (*Bacopa monnieri*) is one of the most valuable medicinal plants in Ayurveda and has been used traditionally from several years. This is well known as “Brahmi” in Ayurveda and considered as “Medhya Rasayana” i.e. Brain Tonic. This herbal plant is also known as Thyme leaved gratiola. It is a small prostrate herb with fleshy leaves which can be propagated by cuttings. Brahmi can be grown in rich soil with regular and heavy watering up to 2 to 3 times a day and should permanently be kept in moist.

**Medicinal Uses:** It is extensively used as neurotonic in traditional Indian Medicine. Brahmi is also used for treating mental and nervous disorders. It is also beneficial for the patient of Alzheimer’s disease and of Liver cancer. It is also used as herbal supplement in epilepsy, anxiety and depression.

**Common Name :** Chirata  
**Botanical Name:** Swertia chiraytia  
**Family Name :** Gentianaceae



#### MEDICINAL PROPERTIES / USES

Chirata is an annual herb mostly found in temperate region. The part used in the medicine is that which grow above the ground. It is also known as Indian gentian.

**Medicinal Uses:** Chirata is a powerful anti-inflammatory agent which is good for rheumatoid arthritis, for joint diseases, swelling, pain and redness. It is a ayurvedic therapeutic plant and used for fever, constipation, upset stomach, loss of appetite, intestinal worms, skin diseases and cancer. It is often called as a “Bitter tonic”. In India it is used for malaria.

**Side Effects & Safety:** Diabetes patient are not allowed to use chirata in their diet as it might lower the blood pressure. Pregnant and Breast feeding ladies should stay on safe side and avoid use.

**Common Name :** Giloy

**Botanical Name:** Tinospora cordiflora

**Family Name :** Menispermaceae



## MEDICINAL PROPERTIES / USES

Giloy is also known as Guluchi, is a famous ayurvedic perennial climber herb found in India. It has a significant heart shaped leaves, yellow flowers and ripe berry fruit of red colour. Guluchi is an excellent rasayana for the treatment of various diseases. Though it is used broadly these days but it has the reference in Ramayana and Durga Saptashati. The roots, stems, leaves and fruits are used in the treatment of various diseases.

**Medicinal Uses:** The benefits of giloy are countless. It is used in increasing immunity of the body, its fight against infecting organisms. The leaves of the plant in juice cure psychological disorder. Even leaves are also used in swine flu treatment; it is also used for the treatment of fever due to infection. Giloy is a remedy for diabetes. The traditional use of the leaves is to cure urine infection and stomach ulcer. Its helps in purifying blood and helps in controlling level of Blood Pressure. It is also used in curing rheumatic pain. When leaves of giloy are mixed with cow milk it helps in curing leucorrhoea. The leaf extract also used in curing jaundice and anaemia. It also removes the toxins from the brain. It adds strength and vigour to the body and removes the weakness.

It is considered a most divine herb because of its various ayurvedic uses. Therefore, it is also called as “Amruta” for its divine healing nature.

**Common Name :** Gurmar

**Botanical Name:** Gymnema sylvestre

**Family Name :** Asclepiadaceae



## MEDICINAL PROPERTIES / USES

Gurmar is also known as Madhunashini. It is a vulnerable species, slow in growing, perennial, medicinal woody climber which has much therapeutic application in Ayurveda. Leaves of Gurmar in India are well known for their sweet taste suppressing activity.

**Medicinal Uses:** Since India is becoming the diabetic capital of the world, here is the hope called as Gurmar. It is used for reducing blood sugar level since centuries; the paste of the root is used for the treatment of snake bites or wounds. It also brings down a high cholesterol level. Leaf juice is helpful in avoiding constipation and also helps in regulating the weight of the body. The plant extract is used as a liver tonic and is used to refresh the cardiac activities by improving circulation of blood. Traditionally, it is used for the treatment of gastric troubles. The leaf extracts also cures eye problem and root bark is useful for the treatment of piles. It's give comfort in colic pain and dropsy.

**Common Name :** Holy Basil  
**Botanical Name:** *Ocimum basilium*  
**Family Name :** Lamiaceae



#### MEDICINAL PROPERTIES / USES

Holy Basil is commonly known as “Tulsi” which is a common herb grown in many households with wide range of therapeutic properties. Tulsi is an erect much branched sub shrub of 30 to 60 cm tall with green or purple leaves that are strongly scented and hairy at stem. Generally two varieties of Tulsi are found Rama Tulsi and Krishna Tulsi.

**Medicinal Uses:** Tulsi has a beneficial effect in cardiac disease and reduces the level of blood cholesterol. The juice of Tulsi is beneficial in the treatment of ringworms, leucoderma and other skin diseases. Tulsi leaves have strengthening effect on the renal stone. It is rich in antioxidant properties and can reduce stress, enhance stamina, promote healthy metabolism and is a natural immune-modulator. Its oil is also used against the insects and bacteria. The Rama Tulsi is the effective remedy for the severe acute Respiratory Syndrome. Juice of its leaves gives relief in cold, fever, bronchitis and cough. Tulsi oil is also used as the ear drop. Tulsi helps in curing malaria. It is very effective against indigestion, headache, hysteria, insomnia and cholera. The fresh leaves of Tulsi are taken by the people every day. Due to its remarkable healing properties it is also known as “Queen of Herbs”

**Common Name :** Sarpagandha  
**Botanical Name:** *Rauvolfia serpentina*  
**Family Name :** Apocynaceae



#### MEDICINAL PROPERTIES / USES

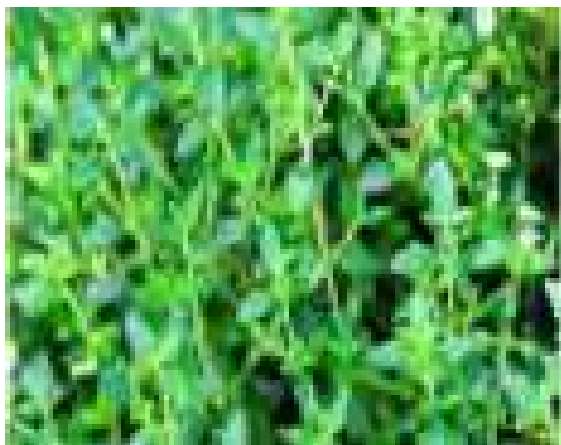
Sarpagandha is also known as “Indian Snake Root” is an evergreen plant which has been in use since years in Indian Medicines. It is an erect under shrub with spear shaped leaves and with white and red flower. It is a useful herb in Ayurveda and Homoeopathy treatments.

**Medicinal Uses:** It is used for the treatment of high blood sugar, it cures hysteria and hypertension. It is also useful for in the treatment of cataract. It also cures plague and fever. Sarpagandha is used for the treatment of Schizophrenia. In different countries it is used as a sedative. It is also used against irregular heart action in old ages. It can also cure rheumatism, edema and intestinal diseases. It is also used against constipation and dizziness.

**Common Name :** Thyme

**Botanical Name :** *Thymus vulgaris*

**Family Name :** Lamiaceae



### MEDICINAL PROPERTIES / USES

Thyme is a small perennial shrub with lots of branches and light purple to pink flowers. It grows in hot and sunny locations. The parts which are used for medicinal purposes are flowers, leaves and oil.

**Medicinal Uses:** Thyme is used for curing bronchitis, whooping cough, sore throat, colic, arthritis, upset stomach, gastritis, diarrhoea, a movement disorder in children (dyspraxia), parasitic worm infection and skin disorders. It is also used to increase urine flow, to disinfect the urine and as an appetite stimulant. Thyme oil is used as a germ killer in mouthwashes. It is also applied to the scalp to treat baldness and to the ears to fight bacterial and fungal infections.

**Common Name :** Calihari

**Botanical Name :** *Gloriosa superba*

**Family Name :** Colchicaceae



### MEDICINAL PROPERTIES / USES

*Gloriosa superba* is composed of two words “Gloriosa” means full of glory and “superba” means superb is a perennial herb and grown as a climber. It is also known as Glory Lily because of its eye catching and multi-coloured glorious flowers. The tendrils which are present in the leaves help the plant to grow with the support of other plants in order to get sunlight. The flowers are red, orange, yellow and multi-coloured. It is the state flower of Tamil Nadu. The height of plant is about 3.5 m to 6 m. This medicinal plant is having underground V shaped tubers.

**Medicinal Uses:** The plant *Gloriosa superba* gives ease from the neuralgic pain. It helps in curing skin disease and itching in the skin. It also kills worm in the body. It gives comfort from abdominal pain and used in the treatment of piles and chronic ulcer. The extract from the root is used as a tonic that can add vigour to the body. Since, this plant is rich in colchicine's, so the seeds are used in the treatment of rheumatism and gout. The tubers of glory lily are used against snake bite and the extract is used to kill lice. The tubers of this plant are also used for the treatment of kidney problem. Due to its laxative nature, it can be used as a home remedy for constipation. It also cures haemorrhoids disease and also helpful for the treatment of small pox.



**Common Name :** Isabgol  
**Botanical Name:** Plantago ovata  
**Family Name :** Plantaginacea



### MEDICINAL PROPERTIES / USES

It is called as “Psyllium”. Isabgol is a stem less annual herb. The part used in medicinal property is husk and seed. Husk of Isabgol is having absorbing and retaining property. Isabgol requires light soil and well irrigation. It can grow in cool climate and dry weather. It is propagated by seeds.

**Medicinal Uses:** It is beneficial in chronic dysenteries and for treating constipation and intestinal disorders. It work as calorie free fibre food and promotes regular bowel movement. The seeds of isabgol are having cooling effect as is used in ayurvedic, unani and allopathic medicines. The seed and husk cures inflammation of the mucous membranes of gastro intestinal and urinary tracts, piles and gonorrhoea. It can treat diarrhoea, can lower blood sugar levels and also lowers cholesterol levels and is good for heart.

**Common Name :** Neem  
**Botanical Name:** Azadirachta indica  
**Family Name :** Meliaceae



### MEDICINAL PROPERTIES / USES

It is also called as “Margosa” in English. Azadirachta indica is derived from words Azad means Free, Dirakht means Tree and Indica means Indian Origin which literally means “The Free Tree of India” or “Noble Tree”. It is commonly called as Indian Lilac and is very fast growing, evergreen tree which reaches the height of 15 to 20 meters. Its fruits and seeds are the source of neem oil.

**Medicinal Uses:** All parts of neem tree are anti-fungal, anti-diabetic, antibacterial, antiviral and sedative in nature. The neem oil obtained from the seeds is used as a medicine. Neem gum is used as a bulking agent and for the preparation of special purpose food (for diabetics). The neem leaf paste is applied to the skin to treat acne and also used against pox viruses in India. People who are affected with pox viruses are generally made to lie in bed of neem leaves and branches. The flower produces nectar that can be used as a sweetener. Roots of neem are used in relieving fever. Neem is also helpful in the treatment of cough, asthma, ulcers, piles, intestinal worm, and urinary diseases.

**Common Name :** Kalmegh  
**Botanical Name :** *Andrographis paniculata*  
**Family Name :** Acanthaceae



### MEDICINAL PROPERTIES / USES

Kalmegh is commonly called as “King of Bitters” and the part used in medicinal properties is leaves. This medicinal plant grows up to the height 110 cm. The seeds are yellowish brown and small white flowers with rose purple spots are borne in this plant. All plant parts are extremely bitter in taste.

**Medicinal Uses:** Kalmegh is an antioxidant and anti-inflammatory in nature. It is used for the treatment of cancer and HIV. The regular use of Kalmegh is helpful to cure cough, cold, sinus and body pain. It is also used as a blood purifier and enhances immunity. It protects the liver and used as a liver tonic. Traditionally, Kalmegh is used in the treatment of leprosy and Cholera. The tonic made by kalmegh is used against weakness to add strength and vigour to the body. The extract of Kalmegh is used in the treatment of slow digestion, bowel irritation and irregular menstrual syndrome. The syrup of kalmegh is used against fever and malaria. It is also used against the respiratory infection and juice of kalmegh is used to cure ulcer. The bitter extract of the leaves is useful in killing worms in the stomach. The entire plant is very useful in the treatment of snake and scorpion bite. It is also used against heart disease and helps in reducing high blood sugar.

**Side effects and Safety:** The plant is strongly avoided during pregnancy because of its anti-fertility property.

**Common Name :** Mandukparni  
**Botanical Name :** *Centella asiatica*  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Indian Pennywort”. Mandukparni is known since the ancient times to enhance intellect and wisdom. Its leaves resembles with human brain, thus this medicinal plant is treated as brain food.

**Medicinal Uses:** It is used as a nerve tonic, cardiac tonic, sedative, laxative and blood purifier. It also help in curing skin diseases like eczema and prevents from leprotic ulcers. It is good for healthy hair. It also act as a mood elevator from the conditions like stree, anxiety, tension, depression, etc. Respiratory conditions like asthma, bronchitis, hiccups, etc may be treated with the help of mandukarni. It is beneficial in case of epilepsy. It is also recommended to the patients ho have low red blood cell count.

**Common Name :** Jawarnkush  
**Botanical Name:** Cymbopogon  
jwarancusa  
**Family Name :** Poaceae



### MEDICINAL PROPERTIES / USES

It is an important perennial medicinal herb found as a weed throughout India. Roots and shoots are the important parts which are used medicinally. Traditionally, the species name has been derived from two sanskrit words “Jwar” and “Ankusha” meaning “Fever” and “Breaker”.

**Medicinal Uses:** This medicinal plant is used against different diseases like vomiting, abdominal tumors, unconsciousness, blood impurities, skin problems, etc. It is used in the treatment of gout, rheumatism and fever.

**Common Name :** Sadabahar  
**Botanical Name:** Catharanthus roseus  
**Family Name :** Apocynaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Periwinkle” and “Nityakalyani”. It is a very commonly grown plant in India. It is an evergreen shrub that grows to about 90 cm in height having smooth, glossy and dark green leaves and flowers throughout the year.

**Medicinal Uses:** This medicinal shrub helps in treating gastritis, cystitis, diarrhoea and diabetes. The leaves and stem are a source of alkaloids that have anti-tumor and anti-cancer properties. Sadabhar controls nosebleeds, bleeding gums, mouth ulcers and sore throats. It also helps in increasing blood circulation in the brain, support brain metabolism, prevents memory and concentration problems, prevents early ageing of brain cells. Periwinkle also helps in cough, lung congestion, eye irritation and skin infections.

**Common Name :** Shatavari  
**Botanical Name:** *Asparagus racemosus*  
**Family Name :** Asparagaceae



#### MEDICINAL PROPERTIES / USES

Shatavari is considered one of the most beneficial ayurvedic herbs for health issues to women. It is perennial climbing plant extending to a height of 1 to 2 meters. The flowers having fragrance are white in colour with small spikes. Roots are white tuberous, radish in shaped and found in clusters.

**Medicinal Uses:** The root powder of this herb supports female reproductive system, promotes fertility, strengthens female reproductive system, strengthens the uterus, helps in removing pathogen and other toxins, help in digestion, boosts the immune system, helps in regulating menstrual cycle, helps in treating PMS and relieves menstrual pain. It also helps in ease for menopausal symptoms. Support healthy milk production in lactating mothers and also helps in maintain normal hormone levels. It also supports normal oestrogen (hormone) production and utilization. Shatavari can enhance the level of white blood cell count and has properties to fight against cholera, typhoid fever and dysentery.

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**Common Name :** Gudhal  
**Botanical Name:** *Hibiscus rosasinensis*  
**Family Name :** Malvaceae

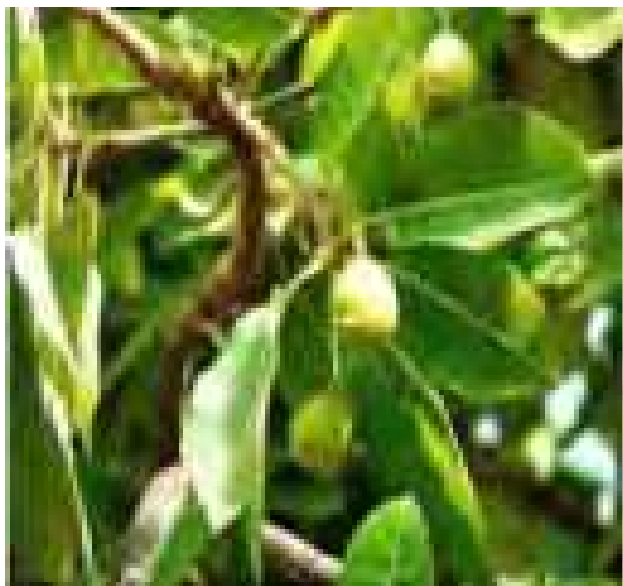


#### MEDICINAL PROPERTIES / USES

It is an annual growing shrub grows up to the height of 2.5m. The leaves are simple and dark green in colour. The flowers are long, trumpet shaped with five petals in the shades of white to pink, red, purple or yellow with size of 4 to 15 cm.

**Medicinal Uses:** It is used in kidney stone remedy and helps in reducing blood pressure. This medicinal plant also helps in liver protection and is having anti-oxidant and anti-cancerous properties. It also helps in wounds, boils and in scalp treatment. It reliefs from headache and from upset stomach. Hibiscus also lowers the cholesterol and helps in managing blood pressure. It has anti-ageing and anti-depressant properties.

**Common Name :** Mahuwa  
**Botanical Name :** *Madhuca indica*  
**Family Name :** Sapotaceae



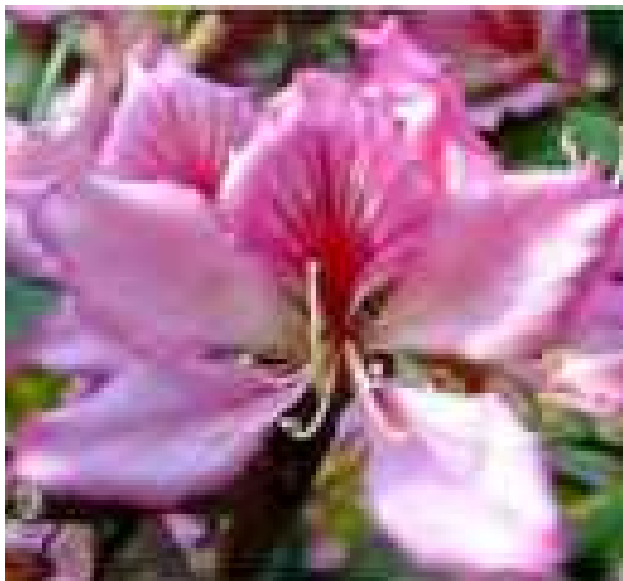
#### **MEDICINAL PROPERTIES / USES**

The bark of this tree is grey to dark brown in colour, leaves are dark green and flowers are small pale yellow which grow in dense clusters. The Part used in medicinal properties is seeds, bark, flowers, and fruits, oils of seeds, leaves and bark.

**Medicinal Uses:** Various parts of mahuwa are used for the treatment of a variety of diseases. The bark of trees is used for rheumatism, chronic bronchitis, diabetes mellitus, bleeding, spongy gums, diarrhoea and in curing scabies and other skin diseases. The fruits are also edible and used to treat ulcer and chronic tonsillitis and pharyngitis. The edible flowers are nutritive and used as tonic, analgesic, diuretic, cooling agent, in treatment of helminths, bronchitis, etc. The leaves of Mahuwa are used in the treatment of eczema and the roots of the tree can be applied on ulcers.

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**Common Name :** Bauhinia  
**Botanical Name :** *Bauhinia variegata*  
**Family Name :** Fabaceae



#### **MEDICINAL PROPERTIES / USES**

It is commonly called as “Kachnar”. It is a deciduous medicinal plant whose height is moderate. Its bark is greyish brown with irregular dark patches. The flowers are pink in colour.

**Medicinal Uses:** Kachnar is very useful in various glandular diseases. Flowers are laxative in nature and flower buds are helpful in piles, cough. It is also beneficial in case of obesity, osteoporosis, swelling glands and in menstrual cycle. It helps in healing up the wounds and also helpful in providing relieve due to burning sensation in the body.



**Common Name :** Dhak  
**Botanical Name :** Butea monosperma  
**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Dhak” or “Palaash” and is found throughout India. It is deciduous medicinal tree with terminal flowers which are red in colour giving tree an appearance of fire flame. Due to this reason it is also called as “Flame of Forest”. The part which is used in medicinal properties is seeds, leaves and flowers.

**Medicinal Uses:** It is useful in treating inflammation, swelling conditions related to bones. The seeds of Palaash are also laxative in nature and are often used to treat worm infection. The gum of Butea monosperma is used to treat dysentery and diarrhoea. Dried flowers are used to cure skin rashes and infection in summers. Paste of flowers is also applied externally to cure joint pain, swelling, sprain injury and arthritis. The bark of the tree also helps in blood purification. Roots of Palaash tree are useful to cure night blindness.

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**Common Name :** Papaya  
**Botanical Name :** Carica papaya  
**Family Name :** Caricaceae



### MEDICINAL PROPERTIES / USES

It is commonly known as “Papaya” or “Tree melon”. It is an evergreen herb having tree like appearance which is 2 to 10 m tall. It contains white latex with green colour leaves of 25 to 75 cm in diameter. Flowers are yellow and tiny funnel shaped. Fruit of papaya is large with fleshy orange pulp when ripe skin is thin yellow in colour.

**Medicinal Uses:** Papaya is a fruit which is highly helpful for weight loss. Its provides approximately 39 Kcal per 100 gm. Papaya is helpful in preventing atherosclerosis and other heart diseases, diabetes as it's an excellent source of vitamin C as well as a good source of Vitamin E and Vitamin A. Due to its antioxidant properties papaya prevents the oxidation of cholesterol. It is also rich in fibre content so helpful in lowering the bad cholesterol level. The nutrients present in papaya are found to be helpful in the prevention of colon cancer. Papaya contains protein digesting enzyme namely papain which are responsible to lower inflammation and improves healing from burns. Papaya is found to be beneficial for the immune system and helps in preventing from cold, infections and flu. It is also responsible in providing protection against inflammatory polyarthritis. Taking papaya regularly in diet is helpful in reducing the risk of prostate cancer.

**Common Name :** Dhania  
**Botanical Name:** *Coriandrum sativum*  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Coriander commonly known as “Dhania” in India is an herb that is extensively used around the world as a condiments, garnish or decoration on culinary dishes. Its leaves and fruits have a pleasant aroma and are commonly used raw or dried for culinary applications. The part used in medicinal property is leaves and seeds.

**Medicinal Uses:** Coriander oil is used as stimulant for gastric secretion. It has benefits as a carminative, digestive, wormicidal, diuretic. It is also found beneficial for brain development and can be used as tonic for various neurological disorders. It is helpful in reducing cholesterol level, blood pressure. It acts in diarrhoea treatment by helping in smooth digestion and regular functioning of liver. Coriander is rich in iron that can directly give positive effects in anaemic conditions. It also helps in treating mouth ulcers, menstrual problems and in getting remedy from eye problems as it is rich source of Vitamin A, Vitamin C and Minerals like Phosphorus which are beneficial for eye problems. Coriander leaves and seeds are also beneficial in health problems like small pox, conjunctivitis and diabetes. It can also cure ulcers and inflammations.

**Common Name :** Haldi  
**Botanical Name:** *Curcuma longa*  
**Family Name :** Zingiberaceae



### MEDICINAL PROPERTIES / USES

Turmeric is commonly called as ‘Haldi’. It is used in India, as food substances as well as medicine. It can be used both internally & externally. It is found in rhizome with oval, long and thick roots. It is bitter in taste, pungent with warm effects.

**Medicinal Uses:** It is anti-septic, useful in ulcers, wounds, antimicrobial, antibacterial, Anti-viral treatment, cold, cough, bronchitis, conjunctivitis, liver diseases, sprain, and painful oedema. It is helpful in improving digestion, in relieving from arthritis, prevents cancer. Boost up the immune system. Haldi is found beneficial for weight management and also is reducing cholesterol level. It is also helps in preventing Alzheimer’s disease. Turmeric is also rich in Iron so helpful for anaemic person. It is used in the treatment of all skin disorders, discoloration of skin, anomalies of urine and of blood. Turmeric is very effective in eosinophilia. Effective medication in all nature of allergies.

**Common Name :** Long pepper

**Botanical Name :** Piper longrum

**Family Name :** Piperaceae



### **MEDICINAL PROPERTIES / USES**

It is commonly called as 'Pippali' cultivated for its fruit which is usually dried. It is a slender, aromatic climber with perennial woody roots creeping and jointed stems, fleshy fruits embedded in the spikes. Long piper leaves are memerous, dark green, shinning above and pale & dull beneath. Fruit is long and attains red colour when it ripens and when it dries it turn into black.

**Medicinal Uses:** Long pepper has a wide range of application in medicines. It is used as a "Rasayana" in the treatment of respiratory disorders and also an important constituent in digestive formulations. It treats stomach-ache, heartburn, indigestion, intestinal gas, diarrhoea and cholera; it is also used for lung problem including asthma, bronchitis & cough. Other uses include treatment of headache, toothache epilepsy, fever, and stroke, trouble sleeping (insomnia), leprosy, extreme tiredness, enlarged spleen, muscle pain, nasal discharge, paralysis, snakebites, tetanus, thirst, tuberculosis and tumours. It is also used in treating menstrual cramps infertility.

**Common Name :** Baheda

**Botanical Name :** Terminalia bellerica

**Family Name :** Combretaceae



### **MEDICINAL PROPERTIES / USES**

Terminalia bellerica is also known as "Baheda". The plant grows up to 60-80 feet in height. The trunk is straight and dark brown in colour. The leaves are broad, oval and 4 to 8 inches long. The flowers grow in both upper and lower part. When fruit dries it looks like a pentagon and is fibrous. In Sanskrit it is called as "VIBHEETA" which means the one which takes away the fear of diseases.

**Medicinal Uses:** It is rejuvenating, presents ageing and adds longevity. It is also cures vomiting and excessive thirst. The plant is useful for improving mental disorder. It cures lose of appetite and also proved anti-diarrheal because of its astringent property. Baheda is useful for piles and curing intestinal worms. The fruit is useful for curing eye related problems such as immature cataract or nay kind of infection. It is used to lower the blood pressure and levelling the cholesterol. Terminalia bellerica promotes hair growth, adds nutrition's and useful against greying. The fruit chewed is believed to cure cough, cold, asthma and hoarse voice. It is also helpful in stopping bleeding, in curing bronchitis, and in curing digestive problem. It is also helpful for ear pain. It has been proved beneficial against jaundice, leprosy and anaemia. Baheda is useful against cardiac problems, diabetes & urinary disorders. The tonic is good for brain and stomach.

**Common Name :** Vacha  
**Botanical Name :** Acorus calamus  
**Family Name :** Acoraceae



### MEDICINAL PROPERTIES / USES

Acorus calamus is commonly known as “Sweet flag” or “Sweet Root”. It is a perennial, erect, aromatic herb common on river banks and marshes. The medicinal purpose the roots of the plant are used. It has aromatic leaves and rhizomes.

**Medicinal Uses:** The rhizome of vacha has stomachic, carminative and nervine properties. It is used in the treatment of diseases of the body and mind. It is given to improve memory and functioning of brain. Vacha is also used in the treatment of paralysis, cholera, headache, joint pain, fever, cough, diarrhoea epilepsy, and retention of urine, intestinal worms, cough, bronchitis, diarrhoea, gas, hair loos, indigestion, vocal problems and various skin disorders. It can also be useful in syphilis, boils, wounds for acne, etc.

**Common Name :** Bael  
**Botanical Name :** Aegle marmelos  
**Family Name :** Rutaceae



### MEDICINAL PROPERTIES / USES

Bael is the most ancient sacred tree in India. Mostly it is planted near the temple and used as a dedication to Gods. The use of this plant is seen in scripture like Vedas and Mahabharata. The plant act as a climate purifier by absorbing poisonous gas from the atmosphere.

**Medicinal Uses:** The juice of the fruit gives comfort from constipation and dyspepsia. The fruits are use against viral and intestinal parasites. It is also used for the treatment of tuberculosis and gynaecological disorders. It can also be used against the urinary complaint. The fruits are also used to increase appetite. Due to bitter and pungent taste of fresh fruit, it can be used to decrease the Blood Sugar. The fruit is also used in intestinal disorder. It is also used in the treatment of diarrhoea, dysentery and irritation in the elementary canal. The juice can be used as brain and heart tonic. The leaves are used for a diabetic person and can be used against peptic ulcers. Leaves are also useful for the treatment of jaundice, leucorrhoea, wounds, deafness; conjunctivitis raw leaves can be used to cure gastric problems and irritation in the bowel. Flowers of Bael is use to prepare tonic for curing epilepsy and the extract can be used for the treatment of dysentery and diabetics.

**Common Name :** Motha  
**Botanical Name :** *Cyperus rotundus*  
**Family Name :** Cyperaceae



### MEDICINAL PROPERTIES / USES

*Cyperus rotundus* is commonly called as “Motha” which can be seen growing as weed in garden, lawn, fields and waste lands. It looks like grass and have tuberous roots underground. It is a perennial plant. Its blackish lustrous roots have distinct small due to the presence of essential oil. These rhizomes roots are rich in medicinal properties and are used for the treatment of diseases since time immemorial. They are used fresh and dried.

**Medicinal Uses:** Motha is used in the treatment of a variety of diseases. It is one of the best herbs for treating many female disorders like yeast, candida and premenstrual syndrome. It is also used for menopause, menstrual disorders and breast tumours. It is used for treating digestive disorders and breast tumours. It is used for treating digestive disorders pain in abdomen, low appetite, digestive weakness, indigestion, diarrhoea and bleeding dysentery.

**Common Name :** Amla  
**Botanical Name :** *Emblica officinalis*  
**Family Name :** Phyllanthaceae



### MEDICINAL PROPERTIES / USES

*Emblica officinalis* is also known as “Amla” (Indian gooseberry). It is a medium sized plant that grows not more than 18m in height. The trunk is slightly curved and the branches are scattered around. The bark of amla plant is grey with hard reddish wood. It has a yellowish green or pinkish colour flower and the fruit is pale yellow in colour round in shape. The leaves are lighter in weight, long in shape and small like lemon.

**Medicinal Uses:** The Vitamin C content in Amla helps in improving the digestive system, rejuvenates the body, cures stomach constipation, helps in blood purification, reduces cough and asthmatic problems and improves eyesight. Along with these amla improves immunity and also improves physical strength. It is used for scalp treatment as it is having carotene and iron; Amla ensures proper absorption of calcium that directly or indirectly is beneficial for bones, teeth and nails. Amla is good for weight loss and helps in preventing eye related problems such as cataract, vision improvement. The presence of vitamin A and carotene over comes many problem related with eyes. It is also used for healthy heard by reducing the level of cholesterol. It also relieves from asthma, bronchitis respiratory congestion, chronic cough and cold.



**Common Name :** Amaltas  
**Botanical Name:** Cassia fistula  
**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

Cassia fistula commonly called as 'Amaltas' is a medium sized tree with brilliant yellow flowers growing at roadside and garden long cylindrical pods are used in medicinal property seeds are shiny black in colour for medicinal purpose, all parts of the tree viz. roots, bark leaves, fruits are used.

**Medicinal Uses:** Amaltas is very effective laxative. This herb is used to treat fever, heart disorders, bleeding disorders, abdominal distension, and abdominal pain. Fruit are used to treat leprosy and are best anti-pyretic and purgative in nature. It is also used in skin disorders and in protecting liver. Cassia is also used in the treatment of rheumatism, gout the fruit pulp is a medicine for curing constipation the leaves are rubbed on skin in case of severe itching. It is also used in treating fever, inflammation and legatorial infections.

**Common Name :** Ashok  
**Botanical Name:** Saraca indica  
**Family Name :** Caesalpiaceae



### MEDICINAL PROPERTIES / USES

Ashok tree is one of the most legendary and sacred trees of India. It is an evergreen tree 15-20 meter high. The leaves are 15cm long and of oblong shape. The flowers are yellowish orange and scarlet. All parts of the tree such as bark, leaves, flowers and seeds are used medicinally. Due to its medicinal value, it is known as a universal plant.

**Medicinal Uses:** Ashok tree is popularly used in the treatment of gynaecological problems and menstrual disorders in women. The Ashok herb can naturally improve the skin's complexion. The bark is used to cure bacterial and fungal infections. Ashok helps in treating irritations and burning sensation in the skin. It also helps in curing diarrhoea and purification of blood. Ashok is also used for curing of piles and bleeding caused due to piles. Powder made from Ashok seed cures kidney stones and act as a memory enhancer, helps in urine retention. Saraca indica is also used for heart diseases and tumours.

**Common Name :** Ginger  
**Botanical Name :** *Zingiber officinale*  
**Family Name :** Zingiberaceae



#### MEDICINAL PROPERTIES / USES

Ginger is also known as 'Adarak' is a flowering plant whose rhizome/root is widely used for medicine. It is an herbaceous perennial which grows through pseudo stems about a meter tall bearing narrow leaf blades.

**Medicinal Uses:** It is carminative, analgesic, antiviral, and anti-inflammatory in nature. Ginger can treat many forms of Nausea like nausea caused by cancer treatment by HIV/AIDS, reduces muscle pain and soreness. Due to anti-inflammatory in nature it can help with Osteoarthritis. Ginger is commonly used for various types of "stomach problem" including motion sickness. Other uses include pain relief from rheumatoid arthritis menstrual pain. The oil made from ginger is sometimes applied to the skin to relieve pain.

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**Common Name :** Elaichi  
**Botanical Name :** *Elettaria cardamomum*  
**Family Name :** Zingiberaceae



#### MEDICINAL PROPERTIES / USES

*Elettaria cardamom*, commonly known as "Green or True Cardamom", is an herbaceous perennial plant. It is also been called as Queen of Spices." It grows about 2 to 4 m in height. The leaves are alternate about 40-60 cm along with long pointed tip.

**Medicinal Uses:** Cardamom is a stimulant and carminative which is used for indigestion and flatulence. In India, is broadly used to treat infections in teeth and gums. It is used to prevent and treat throat troubles, congestion of the lungs and pulmonary tuberculosis. It is also used in inflammation of eyelids and also digestive disorders. It is also used as an antidote for both snake and scorpion venom. Cardamom is used as a breath- freshener and is use to thin the blood.

**Common Name :** Yastmadhu / Mulethi

**Botanical Name:** Glycyrrhiza glabra

**Family Name :** Fabaceae



### **MEDICINAL PROPERTIES / USES**

It is commonly called as “Mulethi” or “Licorice”. It is a hardly leguminous undershrub attaining the height of about 3 meters with compressed pods. The roots are sweet in tastes and used in medicinal property. The flowers of mulethi is whitest purple in colour with green colour leaves.

**Medicinal Uses:** It is conventionally used in the treatment of respiratory and digestive disorders. Mulethi is specifically use in the treatment of chronic acidity, ulcers and chronic bronchial conditions. It is also used in reducing stress, depression and anxiety. Mulethi is also effective remedy for lowering the level of bad cholesterol in the body. The root of mulethi is beneficial in boosting the immune system of body which helps in giving body strength to fight against various harmful diseases. It also keeps liver healthy and is extremely beneficial for skin against eczema and dryness. The root of Licorice is considered to be extremely effective remedy for weight loss. Mulethi is also beneficial for treating sore throat and cough. It reduces the infections such as bronchitis and asthma

**Common Name :** Pudina

**Botanical Name:** Mentha spp.

**Family Name :** Labiatae



### **MEDICINAL PROPERTIES / USES**

It is commonly called as “Mint” and is a popular branching; perennial grows up to 60-80cm in height. It is propagated mainly by its stolons. Leaves are sharply toothed, green in colour. Flowers are abundant in number and purplish in colour. This plant does not produce seeds.

**Medicinal Uses:** Pudina is helpful in promoting digestion, it can help in weight loss, it is a good treatment for irritable bowel syndrome and colic spasms. It can also treats nausea and headache. Pudina is an effective relief for respiratory disorders and cough. It fights against depression and fatigue. It is also helps in improving memory and can promote oral health. It is also helpful in preventing cancer and is good for skin health. It alleviates allergies, hay fever and protects against radiation induced DNA damage. Mint is also useful from getting relief from muscle pain and from sinus disorder. It also reduces risk of cancer and Alzheimer’s disease. It is beneficial in treating arthritis and ulcerative colitis.

**Common Name :** Cinnamon  
**Botanical Name :** Cinnamomum zeylanicum  
**Family Name :** Lauraceae



### MEDICINAL PROPERTIES / USES

Cinnamon is commonly called as “Dalchini”. It is evergreen tree which grows from 20 to 30 feet. The plant has strong branches and thick scabrous bark which is smooth and yellowish. Leaves are dark green on top and lighter green underneath. It has small yellowish-white flowers which bears dark purple berries (Fruit). Bark of cinnamon is used in medicinal property.

**Medicinal Uses:** The Bark of cinnamon is carminative, astringent, stimulant, antiseptic in action. The essential oil which is extracted from cinnamon is a potent antibacterial, anti-fungal and uterine stimulant. It stops vomiting, relieves flatulence and is useful in diarrhoea and haemorrhage of the womb. It is also useful in reducing blood sugar and cholesterol level. Dalchini is also useful in prevention of acne, pimple, cough, cold. It is also helpful in arthritis pain in improving memory and in insomnia.

**Common Name :** Garlic  
**Botanical Name :** Allium sativum  
**Family Name :** Amaryllidaceae



### MEDICINAL PROPERTIES / USES

Garlic is one of the most widely used medicinal plants since ancient times. It is commonly called as “Lahsun”. Allium sativum is an herbaceous, annual, bulbous plant grown for its pungent and edible bulb. The bulb is up to 7cm in diameter and is made up of 1 to 15 cloves. The flowers are spherical in shape initially enclosed in a cluster of papery bracts which splits and open into a green white or pinkish flower.

**Medicinal Uses:** Garlic is used to treat cough, contains allicin, which reduces blood pressure and improves circulation. It is good for rheumatism, arthritis, gout, fluid retention and obesity. Garlic is also useful in strengthening the immune system. It has vitamin B6 which helps in boosting up the mood. It is also helpful in regulating blood sugar, in treating fever, cough & stomach ache. It may prevent cancer of the prostate colon and stomach. It is applied to skin for fungal infections. Garlic cures from urinary tract, kidney infection and yeast infections. It is also helpful in weight control & weight loss. It also helps in preventing heart attack and atherosclerosis.

**Common Name :** Drumstick  
**Botanical Name:** Moringa oleifera  
**Family Name :** Moringaceae



### MEDICINAL PROPERTIES / USES

Moringa oleifera is commonly called as “Senjana” fast growing, deciduous tree. It can reach a height of 10-12m. The Bark has a whitish grey colour. The flowers are fragrant with yellowish white petals.

**Medicinal Uses:** Moringa is used for anaemia, arthritis, rheumatism, asthma, cancer, constipation, diabetes, diarrhoea, epilepsy, stomach pain, stomach and intestinal ulcers, intestinal spasms, headache, heart problem, high blood pressure, thyroid disorders, fluid retention and bacterial, fungal, viral and parasitic infections. It is also use in reducing swelling, boosting immune system and helps in increasing breast milk production. Drumstick is helpful in protecting and nourishing skin and hair. It also helps in treating edema and protects the liver. Moringa contains Calcium and Phosphorous which helps in making bones healthier. It is also helpful in treating depression, anxiety and fatigue.

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**Common Name :** Parsley  
**Botanical Name:** Petroselinum crispum  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Parsley is a biennial herb grows up to 80 cm long with thin stem and triangular outline leaves. The part used in medicinal property is the entire plant: leaves, fruits and roots.

**Medicinal Uses:** Parsley has been used as a source of certain vitamins and minerals. The seeds of parsley have been traditionally as a carminative to decrease flatulence and colic pain. The root of parsley is use as a diuretic and the juice to treat kidney ailments. The oil of parsley is been use to regulate menstrual flow in the treatment of amenorrhea. Leaves are been used to treat tumours, insect bites, lice, skin parasites. It also helps in the treatment of diseases of the prostate cancer. It is also been use as a scalp lotion to stimulate the growth of hair. Parsley is also helpful in stimulating the appetite, improving digestion and increasing urine production.



**Common Name :** Arjun

**Botanical Name:** Terminalia arjuna

**Family Name :** Combretaceae



### MEDICINAL PROPERTIES / USES

Terminalia arjuna is commonly called as “Arjun” is an evergreen large tree, grows up to 20-25 meters in height. Bark is smooth and grey. Leaves are simple, hard and around 10-20 cm long. Flowers are yellowish white and blooms in March – June. Fruiting in Arjun takes place in September- November.

**Medicinal Uses:** The Bark of Arjun has been used from ages for the treatment of heart and blood vessels disorders. It helps in relieving chest pain, high blood pressure and high cholesterol. It is also used for urinary tract diseases. Arjun is helpful in protecting liver and to treat respiratory conditions including respiratory tract infections, cough and sore throat. It is also used for dysentery. The wine of Arjun bark is very useful in treating bleeding piles and leucorrhoea. The paste of the bark is applied over the fractures helps in promoting the early healing. The herb contains a substance called casuarinin that seems to prevent breast cancer. Arjun helps in promoting normal blood flow and reduces the symptoms of giddiness, headache and insomnia.

**Common Name :** Tejpatta

**Botanical Name:** Cinnamomum tamala

**Family Name :** Lauraceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Talisha Pattri” or “Tejpatta” and is a medium sized evergreen tree of about 2 to 10 m tall. Its mature leave are dried and commonly known as bay leaves are used in medicinal properties.

**Medicinal Uses:** Cinnamomum tamala leaves and bark have aromatic, astringent, stimulant and carminative qualities. It is used in rheumatism, colic, diarrhoea, nausea and vomiting. Tejpatta is also used in the treatment of cold, cough, allergy and headache. It can also be used for scalp infection, for lice in hairs. Abdominal pain, abdominal gas, indigestion can be cured by Tejpatta. Regular intake of bay leave can prevents stone formation in kidney. Heart diseases, uneasiness and uterus infection can also be prevented by the use of Tejpatta. Arthritis, joint pain, gout are also cured by the application of bay leaves at the affected area.

**Common Name :** Fenugreek / Methi

**Botanical Name :** *Trigonella foenum-graecum*

**Family Name :** Fabaceae



### MEDICINAL PROPERTIES / USES

Fenugreek also known “Methi” is an herbaceous annual plant that stands around 2-3 feet (60-90cm) tall. It has green leaves, small white flower and pods that contain small, golden-brown seeds. The plant has an erect growth habit and have strong, sweet aroma.

**Medicinal Uses:** Fenugreek is helpful in digestive problem such as loss of appetite, upset stomach, constipation, gastritis. It is also used for diabetes, painful menstruation, polycystic ovary syndrome, atherosclerosis and for high cholesterol. Fenugreek is helpful in kidney ailments, mouth ulcers, boils, bronchitis, cellulitis, tuberculosis, baldness, cancer and Parkinson’s disease. Methi is also used for hernia, male infertility and in women’s methi promotes milk flow after child birth and reduces menstrual cramps.

**Common Name :** Lemon Grass

**Botanical Name :** *Cymbopogon citratus*

**Family Name :** Poaceae



### MEDICINAL PROPERTIES / USES

It is commonly called as “Lemon grass” and is a perennial grass grown for its fragrant leaves and stalk which is used as a flavouring agent. Lemongrass is also referred to as Ginger grass or citronella grass.

**Medicinal Uses:** Lemon grass is useful in relieving anxiety, lowering cholesterol, preventing infection, boosting oral health, relieving pain, boosting red blood cell level and relieving bloating. It also helps in reducing fever, blood sugar level and stimulates the uterus and menstrual flow.

**Common Name :** Beetroot  
**Botanical Name:** Beta vulgaris  
**Family Name :** Chenopodiaceae



### MEDICINAL PROPERTIES / USES

Beets are herbaceous biennial root vegetable. The plant is usually erect with long main root and purple green leaves growing on stems. The beets are propagated by seeds.

**Medicinal Uses:** Beet is commonly used in the treatment of liver diseases and fatty liver. They are also useful in reducing the levels of triglycerides (a type of fat) in the blood, blood pressure and muscle soreness. Beet root also helps in preventing cancer of breast and prostate. It helps in boosting up the energy level, fight against inflammation. It promotes brain health by preventing Alzheimer's disease. It controls blood sugar, aids digestion, helps in the treatment of Anaemia. Beets are the great source of carotenoids which reduce the risk of cataract formation. It also promotes stronger bones and teeth as they are a good source of calcium.

**Common Name :** Ajwain  
**Botanical Name:** Trachyspermum ammi  
**Family Name :** Apiaceae



### MEDICINAL PROPERTIES / USES

Trachyspermum ammi is also known as ajwain or bishop's weed. It is an annual herb. Both the leaves and the seed-like fruit of the plant are consumed for medicinal properties. The leaves are green in colour and flowers are of white colour. The height of the plants is approximately 60-90 cm.

**Medicinal Uses:** Ajwain helps in providing instant relief from acidity and indigestion. It also helps in treating common cold, provides relief from migraine headache. Ajwain is also useful for ear tooth ache. A component called thymol in ajwain seed acts as a strong germicide. Thus ajwain seeds can be crushed and applied on the skin to treat infection or cuts. Ajwain seeds help in halting premature greying of hairs. It also eases the pain due to arthritis and helps in cleaning the skin by lightening acne scars.

**Common Name :** Clove

**Botanical Name:** Syzygium aromaticum

**Family Name :** Myrtaceae



### **MEDICINAL PROPERTIES / USES**

Cloves are the aromatic dried flower buds. The tree of clove is an evergreen that grows to a height ranging from 8 to 12m, having large leaves with blood red colour flowers which are numerous in groups.

**Medicinal Uses:** Clove is most commonly applied directly to the gum for toothache, pain control during dental work and other dental related issues. Cloves are applied to minor cuts for healing purposes. Tea of clove is a popular warm beverage to relieve congestion. Oil of clove is helpful in relieving headache, flatulence as well as reduces stretch marks clove is used as a carminative and also use for boosting the immune system by purifying the blood and help to fight against various diseases. Cloves are good expectorants that promote the discharge of mucous and secretions in the respiratory passage. Clove oil stimulates blood flow and circulation making useful for the people having cold extremities. It is also helpful for preventing the breakdown in retina of the eye and also enhances memory retention. Clove is also beneficial for diabetic patients by controlling the blood glucose levels. Eugenol found in clove is powerful enough for preventing blood clots. Sucking of clove bud reduces the desire of alcohol. Clove oil is very effective in curing foot and nail fungus.

**Common Name :** Fennel

**Botanical Name:** Foeniculum vulgare

**Family Name :** Apiaceae



### **MEDICINAL PROPERTIES / USES**

Fennel is an aromatic perennial herb grown for its edible shoots, leaves, and seeds. The height of the plant is about 1 meter (3 feet) tall and has stalks with finely divided leaves. The flowers are small yellow in colour and fruits are small, dry, greenish-brown to yellowish-brown. The dried ripe seeds and oil are used to make medicine.

**Medicinal Uses:** There are many health benefits of fennel which include relief from anaemia, indigestion, flatulence, constipation, colic, diarrhoea, respiratory disorders, and menstrual disorders. It also aids in eye care. It has anti-cancer properties and reduces heart diseases. It also helps in regulating blood pressure and improves brain function. Fennel helps in boosting immunity and regulates menstruation. It also protects against the harmful effects of radiation during cancer treatment.

**Common Name :** Rosemary  
**Botanical Name :** *Rosemaria officinalis*  
**Family Name :** Lamiaceae



### MEDICINAL PROPERTIES / USES

Rosemary has a strong fragrance. It is used in oil, perfumes and cooking. The leaves are evergreen 2-4cm (0.8-0.16 in) long and 2-5mm broad, green above and white below with dense short woolly hair. It is considered easy to grow for beginner gardeners. It grows all year round and strong healthy plants flower in summer with pale to deep blue colour flowers.

**Medicinal Uses:** Rosemary improves memory, helps in reducing blood sugar, body weight, helps in preventing cataracts, protects the body's cell and DNA from radical free damage, simulates liver enzyme which help inactivating estrogen hormones which can cause breast cancer. Rosemary also helps in preventing age related skin damage, encourages enzymes which flush harmful toxins out of the liver and body. Rosemary also helps in improving kidney function and increases urine flow. It act as a stimulant for hair growth, boost mental activity, relieve respiratory problems and pain due to menstrual cramps, prevents from peptic ulcers, leukaemia and kidney stone.

**Common Name :** Aak  
**Botanical Name :** *Calotropis procera*  
**Family Name :** Asclepiadaceae



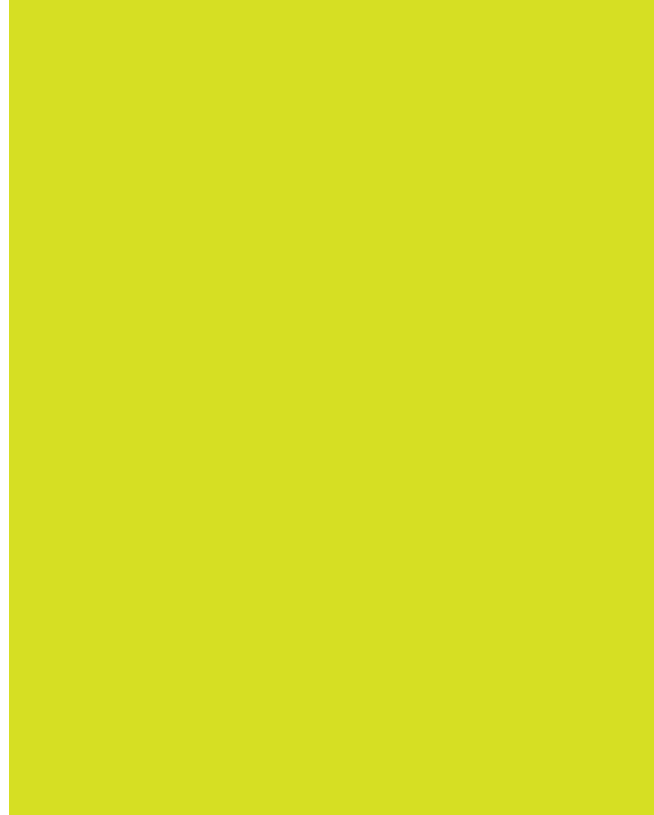
### MEDICINAL PROPERTIES / USES

Aak is commonly called as "Madar". It is a perennial shrub growing 2.5 m high with various branches and sub branches. Leaves are simple. It has bunch of waxy flowers that are white or lavender in colour and in shape of crown. The name of this plant is synonymous with Sun as the herb is very strong and astringent in action same as powerful rays of sun.

**Medicinal Uses:** Whole plant is used to treat common diseases such as fever, rheumatism, indigestion, cold, and eczema, diarrhoea for the treatment of boils and for the treatment of jaundice. Root is use for the treatment of elephantiasis, asthma, cough and leprosy. Stem of madar is use for the treatment of skin diseases, intestinal worms, and leprosy and cure leucoderma. The leaves and latex of Aak are used as an antidote for snake poison. It also improves appetite thereby fighting anorexia and also helps in healthy working of the respiratory system.







California Poppy  
Flowers

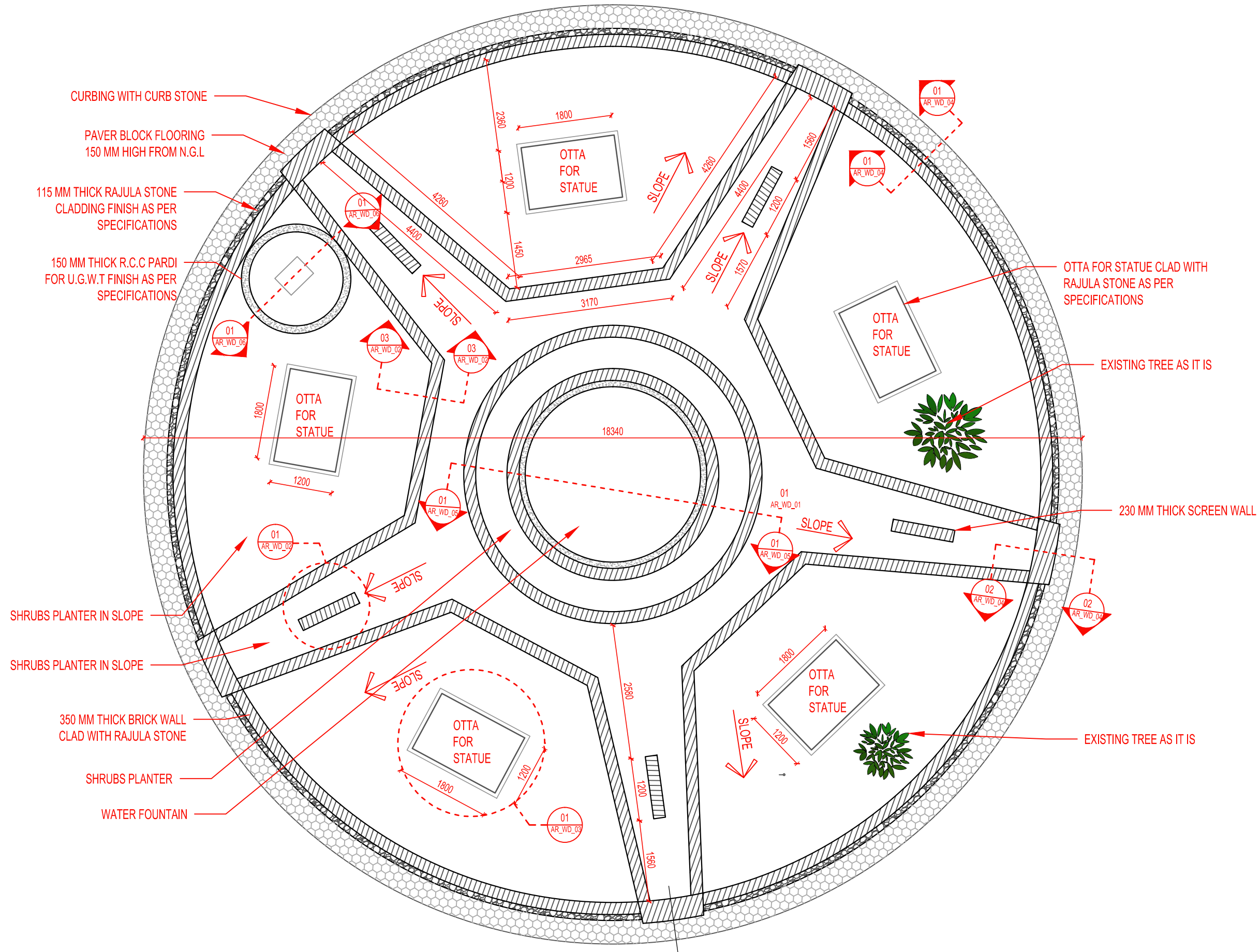




# **CENTRAL PUBLIC WORKS DEPARTMENT**

Ministry of Housing and Urban Affairs

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PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI THEME  
AT - VIJAYRAJNAGAR, BHAVNAGAR



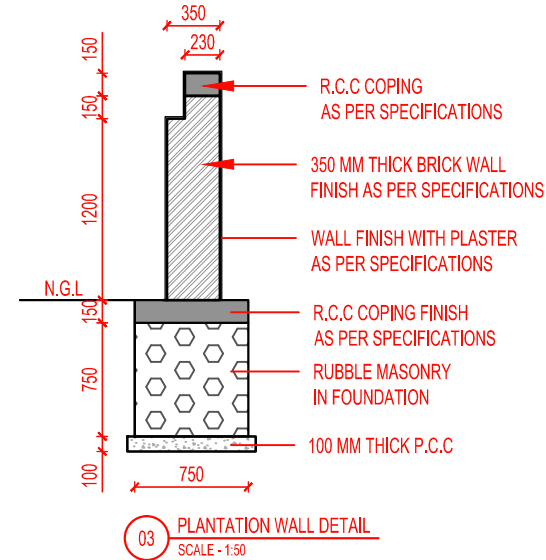
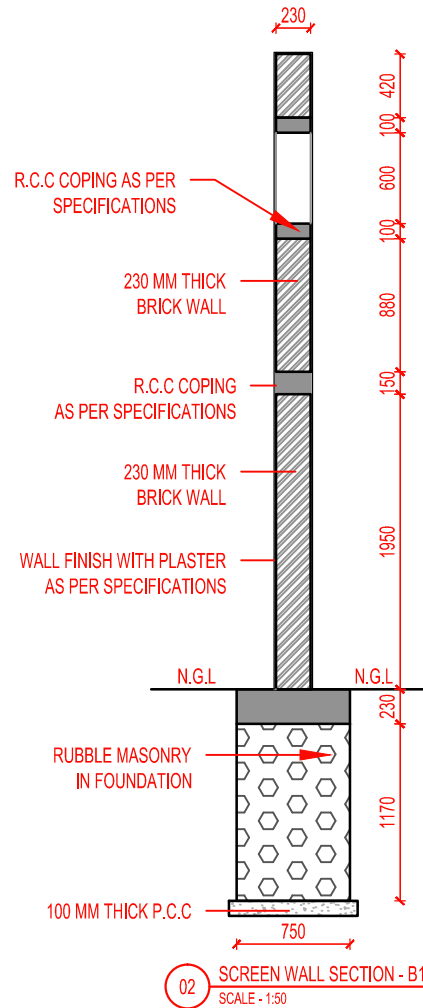
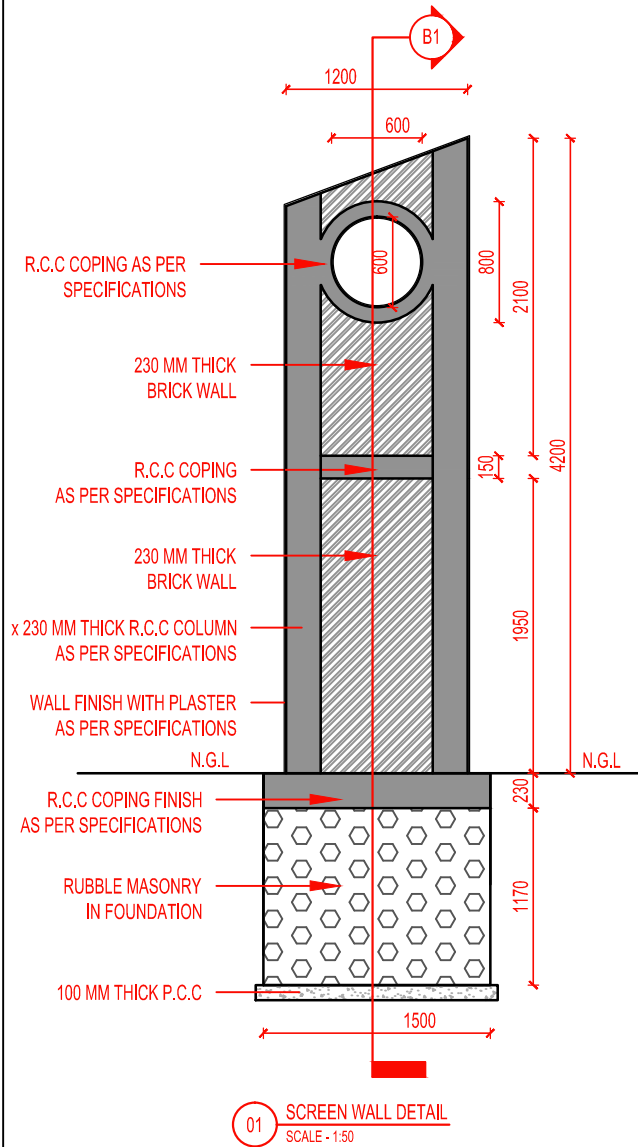
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#### CIRCLE LAYOUT PLAN

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DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A3	
DRAWN BY : DH	
CHECKED BY : S.N.G	



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ISSUED FOR  
TENDER ONLY.

PRINTS ISSUED :		DIGITAL	PHYSICAL
P1	08-07-24 ISSUED FOR TENDER	✗	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR

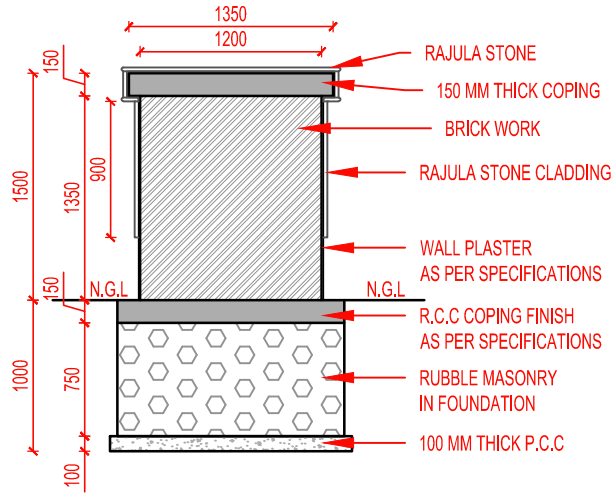


ARCHITECT : SURYARAJ SINH. N. GOHIL  
suryaraj.architect@gmail.com

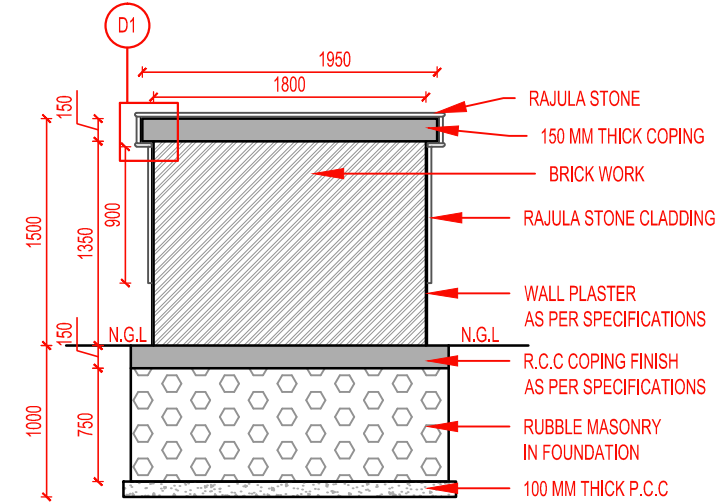
#### SCREEN WALL & PLANTATION WALL DRAWING

TENDER DRAWING	DRAWING NO.
DATE : 08 - 07 - 2024	AR_WD_02
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

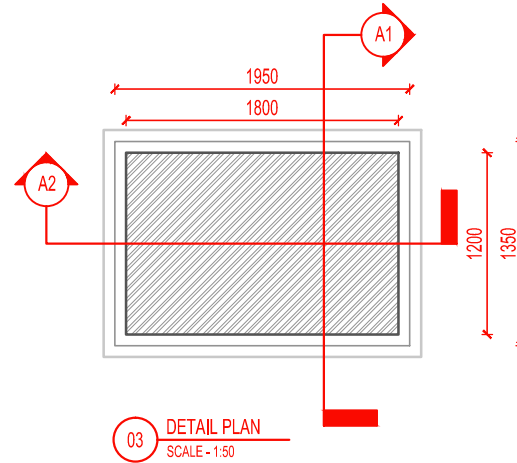
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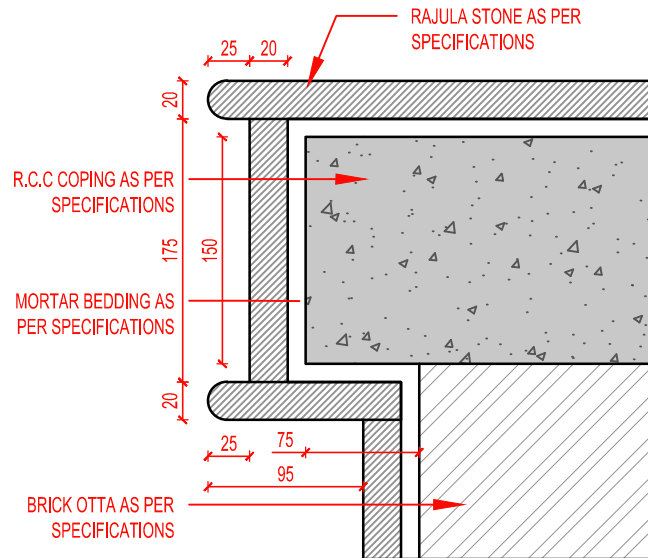
01 SECTION - A1  
SCALE - 1:50



02 SECTION - A2  
SCALE - 1:50



03 DETAIL PLAN  
SCALE - 1:50



04 STONE FIXING DETAILS - D1  
SCALE - 1:5

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PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	08-07-24	ISSUED FOR TENDER	✗	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR

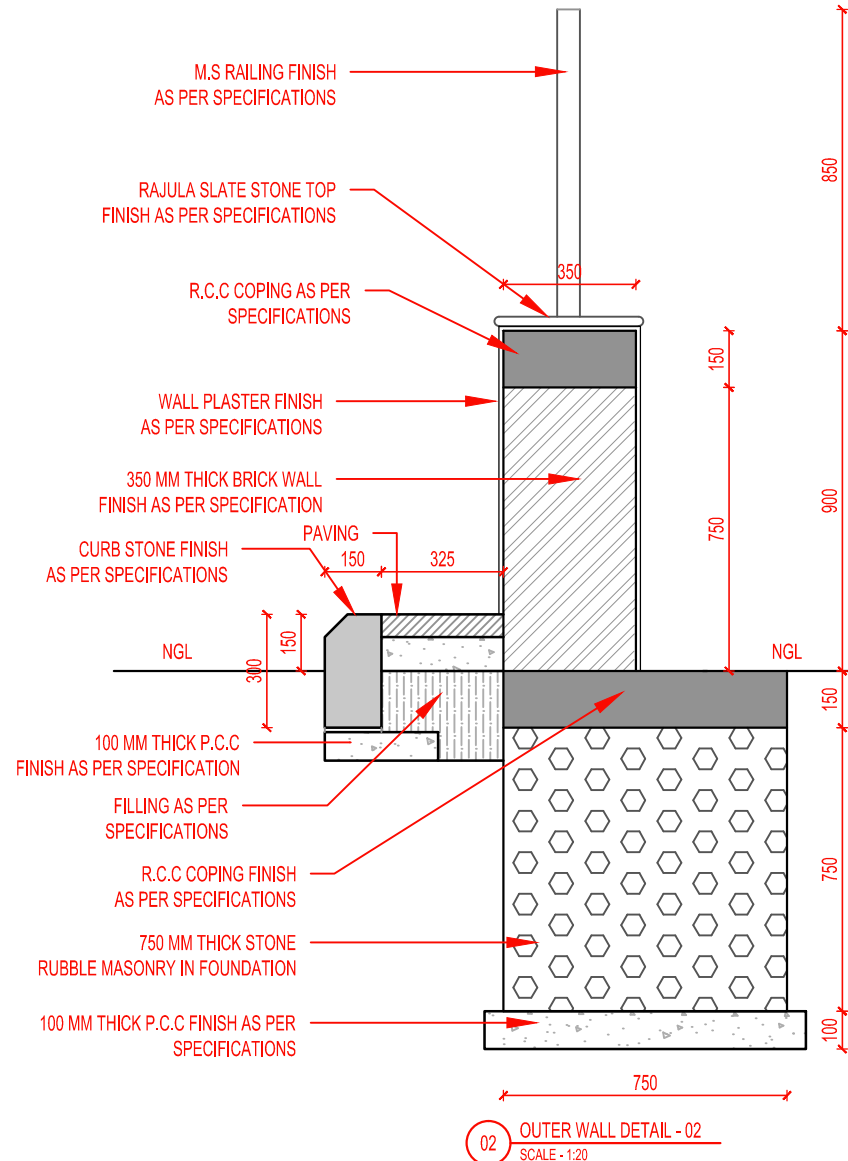
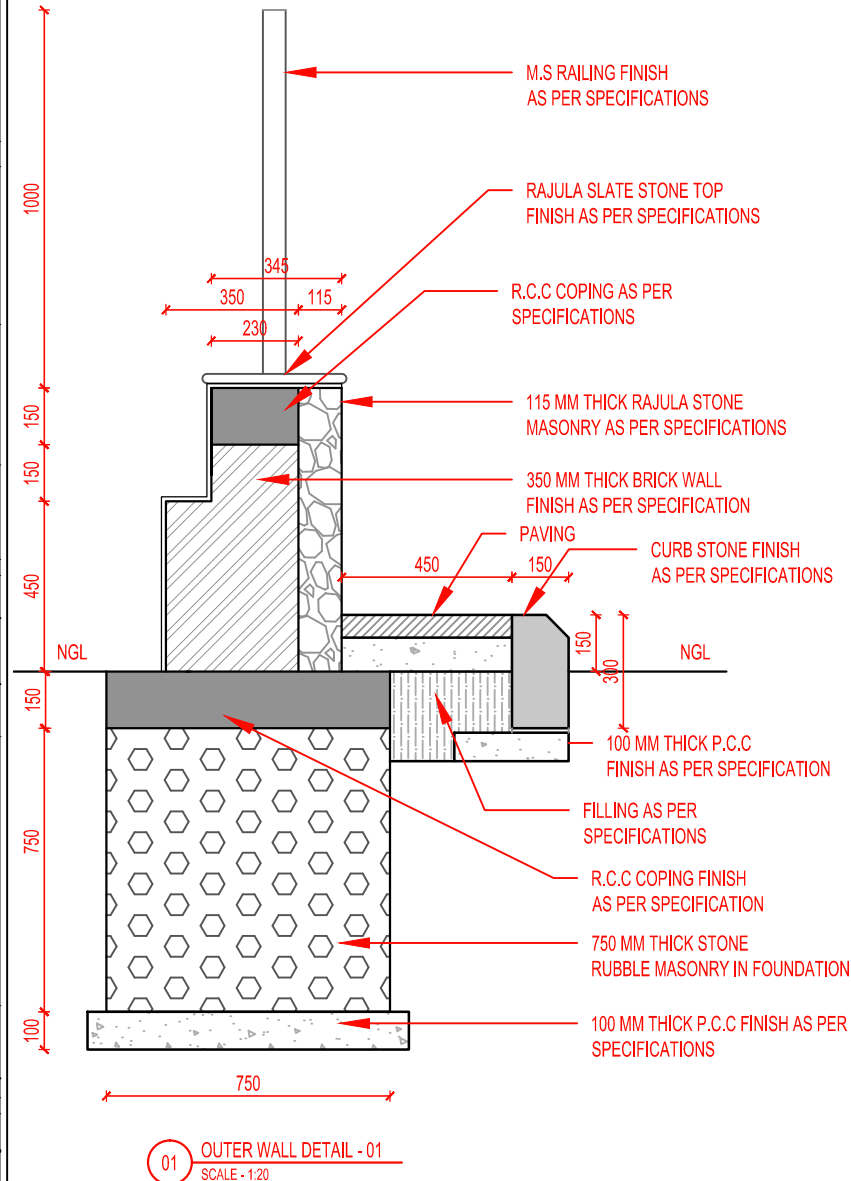


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#### SCULPTURE OTTA DRAWING

TENDER DRAWING	DRAWING NO.
DATE : 08 - 07 - 2024	AR_WD_03
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

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PRINTS ISSUED :		DIGITAL	PHYSICAL
P1	08-07-24 ISSUED FOR TENDER	✗	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR

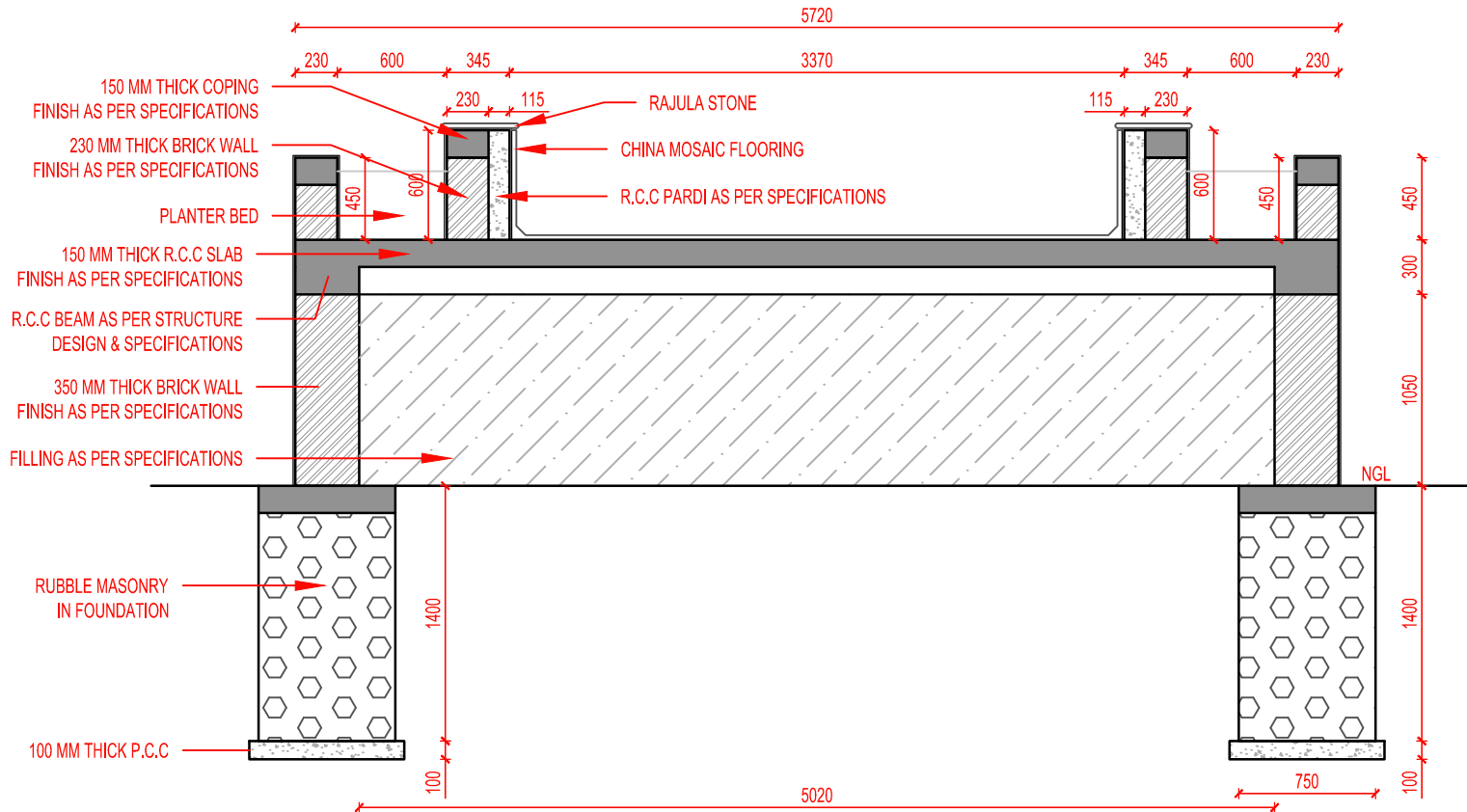


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#### OUTER PERIPHERY WALL DETAIL

TENDER DRAWING	DRAWING NO.
DATE : 08 - 07 - 2024	AR_WD_04
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

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01 FOUNTAIN WALL DETAIL  
SCALE - 1:40

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PRINTS ISSUED :		DIGITAL	PHYSICAL
P1	08-07-24 ISSUED FOR TENDER	✗	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR

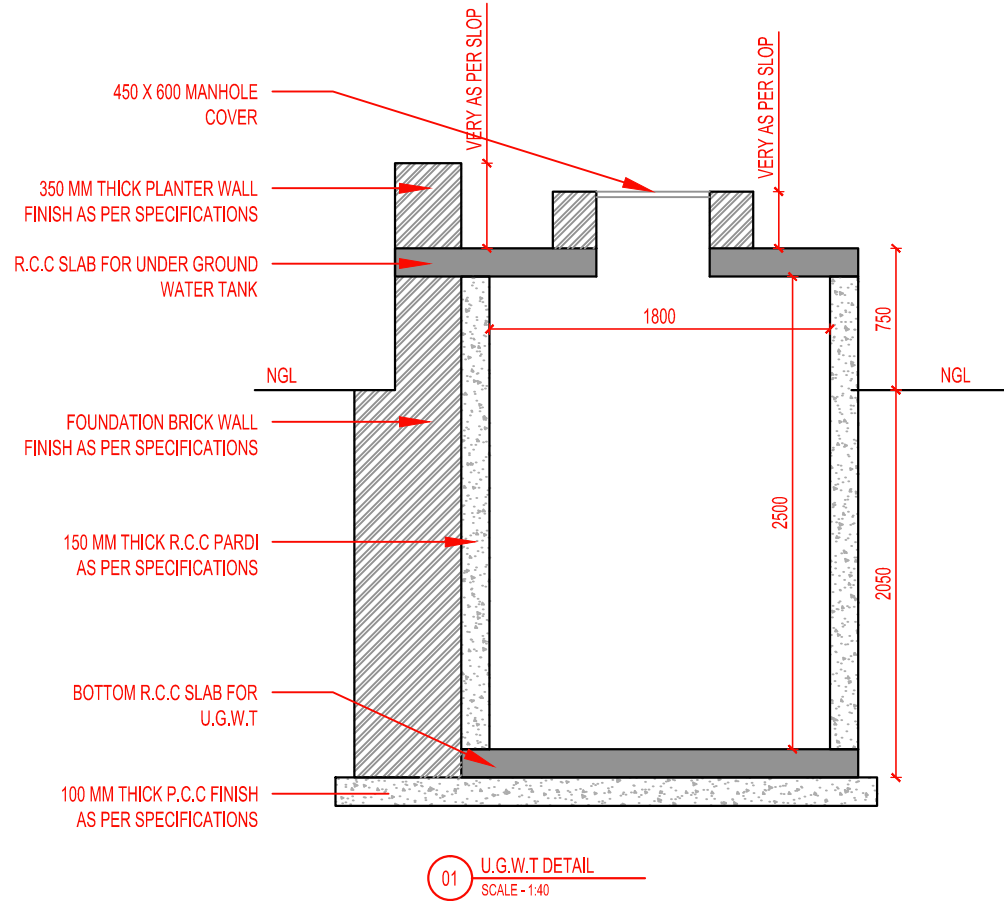


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suryaraj.architect@gmail.com

#### OUTER PERIPHERY WALL DETAIL

TENDER DRAWING	DRAWING NO.
DATE : 08 - 07 - 2024	AR_WD_05
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

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PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	08-07-24	ISSUED FOR TENDER	X	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR



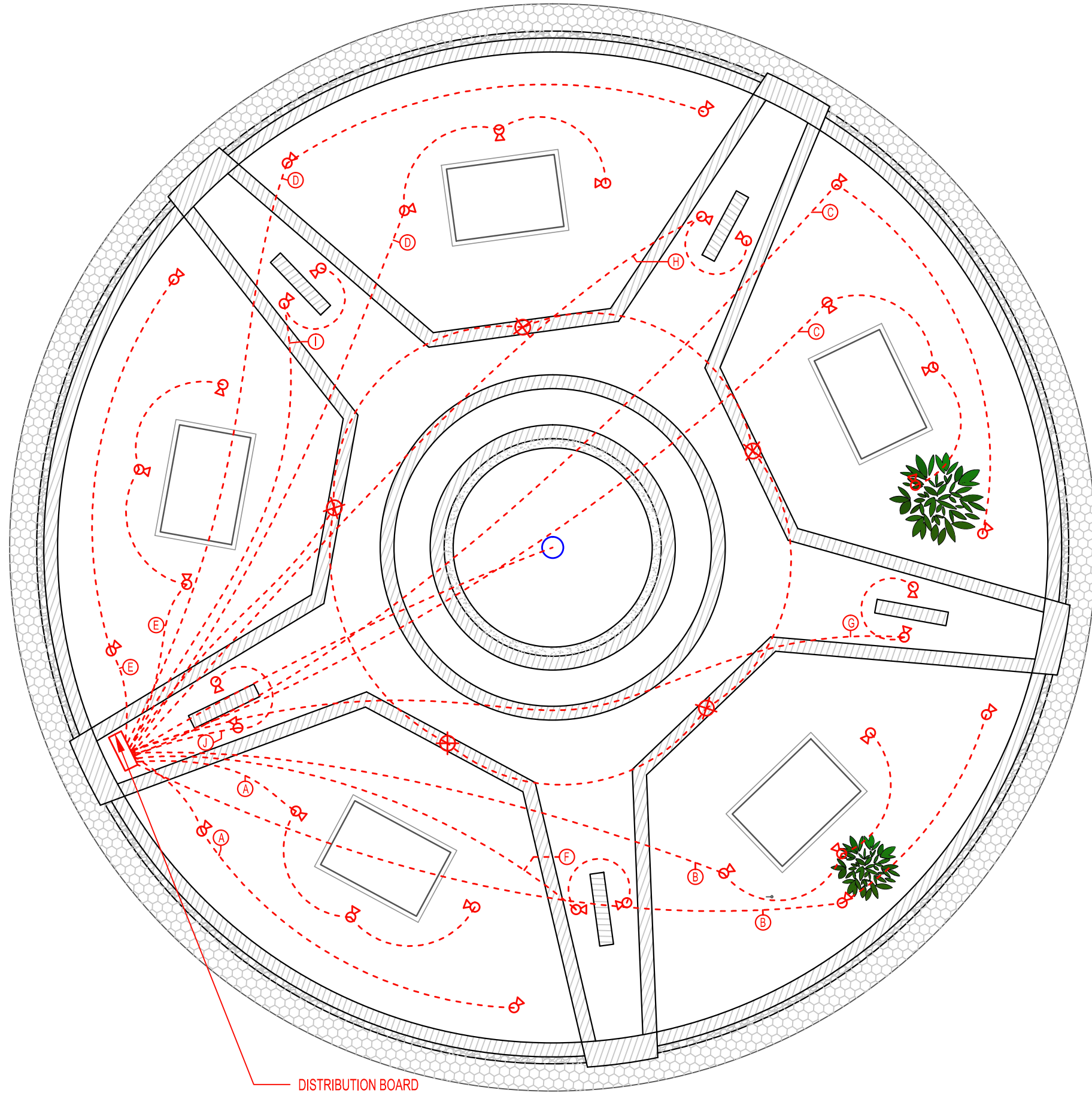
ARCHITECT : SURYARAJ SINH. N. GOHIL  
suryaraj.architect@gmail.com

#### U.G.W.T DETAIL

TENDER DRAWING	DRAWING NO.  AR_WD_06
DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	



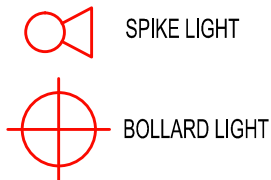
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LEGENDS :



PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	08-07-24	ISSUED FOR TENDER	×	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

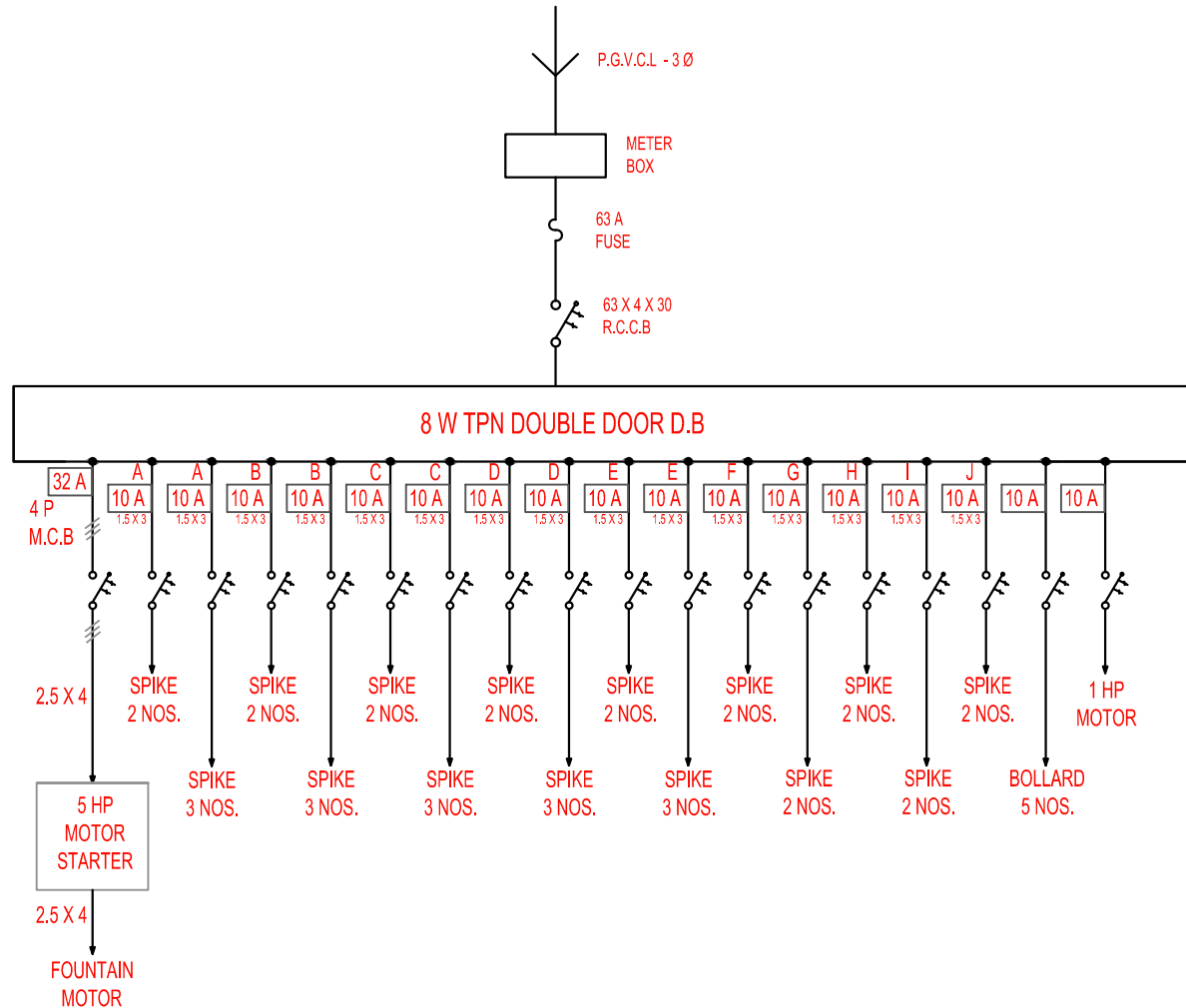
PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI THEME  
AT - VIJAYRAJNAGAR, BHAVNAGAR



ARCHITECT : SURYARAJ.SINH. N. GOHIL  
suryaraj.architect@gmail.com

CIRCLE ELECTRIC PLAN

TENDER DRAWING	DRAWING NO.  AR_ED_01
DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A3	
DRAWN BY : DH	
CHECKED BY : S.N.G	



NOTES :

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PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	08-07-24	ISSUED FOR TENDER	X	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF TRAFFIC ISLAND  
CIRCLE BASED ON PANCH SHAKTI  
THEME AT - VIJAYRAJNAGAR,  
BHAVNAGAR



ARCHITECT : SURYARAJ.SINH. N. GOHIL  
suryaraj.architect@gmail.com

DISTRIBUTION BOARD DIAGRAM

TENDER DRAWING	DRAWING NO.  AR_ED_02
DATE : 08 - 07 - 2024	
SCALE : N.T.S	
SHEET : A4	
DRAWN BY : DH	
CHECKED BY : S.N.G	

## ELECTRICAL LOAD CALCULATION & SPECIFICATIONS

SR NO.	CONNECTED ITEM	ITEM LOAD	NOS.	TOTAL LOAD	PHASE
1	SPIKE LIGHT	12 W	35	420 W	SINGLE
2	FOUNTAIN LIGHT	20 W	5	100 W	SINGLE
3	BOLLARD LIGHT	30 W	5	150 W	SINGLE
4	1 HP PUMP	750 W	1	750 W	SINGLE
5	5 HP PUMP	3700	1	3700 W	THREE
	TOTAL LOAD -			<b>5120 W</b>	

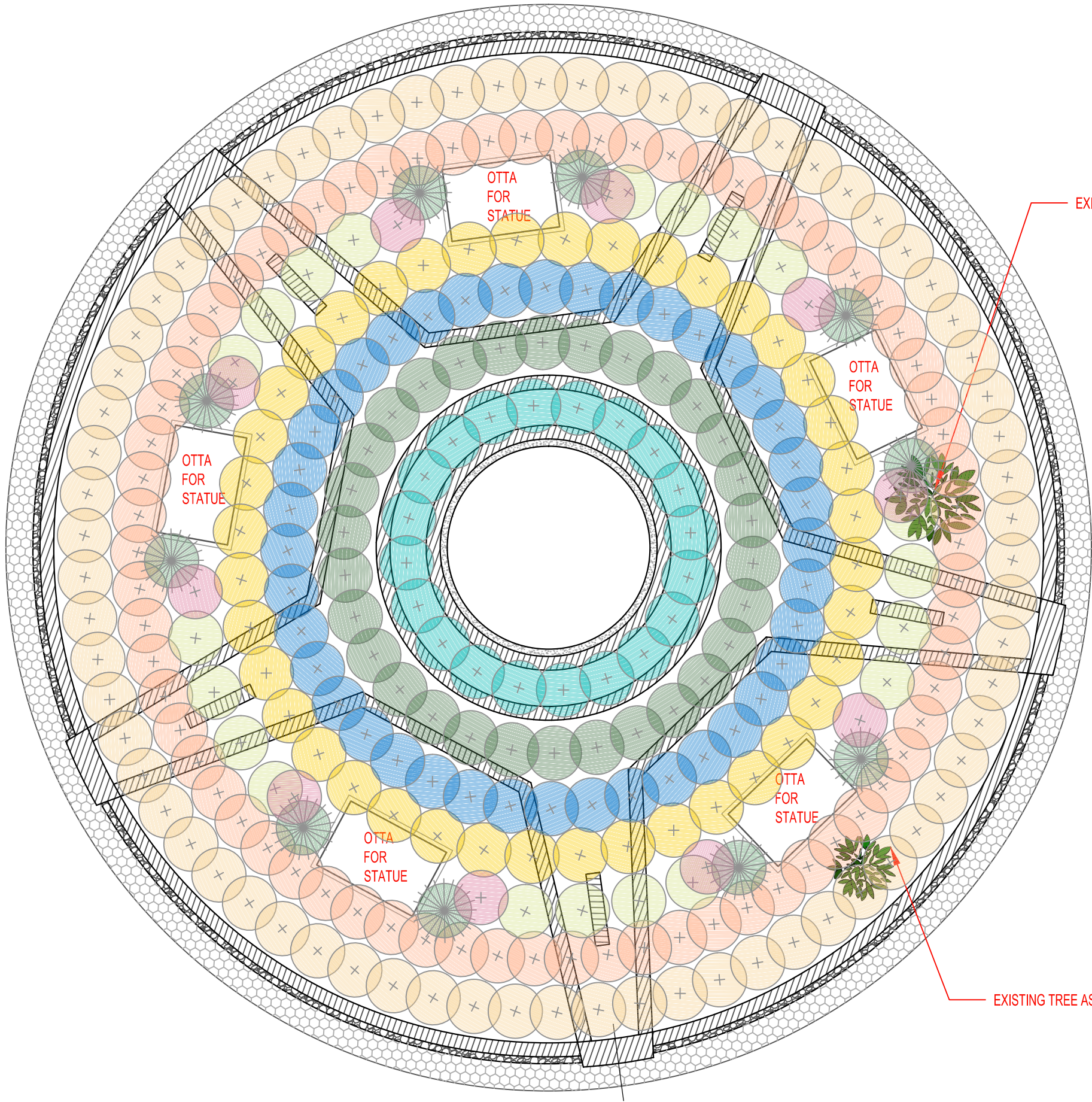
## ELECTRICAL ITEMS SPECIFICATIONS

SR NO.	ELECTRICAL ITEM	APPROVED BRAND
1	P.V.C Pipes	precision, vraj, nihar
2	M.C.B, R.C.C.B, D.B	Schneider, Legrand, Hager
3	WIRES & CABLES	R.R, K.E.I, polyclab
4	Motor starter	siemens, or as per selection

**NOTE\* - ALL ELECTRICAL ITEMS AS PER ATTACHED SPECIFICATION BOOKLET  
OR AS PER DIRECTION & SELECTION BY AUTHORITY**



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- TECOMA (ORANGE) DRAFT
- TECOMA (YELLOW) DRAFT
- TECOMA (RED) DRAFT
- GREEN VICHA PALM
- FOUNTAIN GRASS (SILVER)
- EXORA (WHITE) DRAFT
- EXORA (PINK) DRAFT
- EXORA (RED) DRAFT
- FOUNTAIN GRASS (PURPLE)

- NOTES :
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PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	09-09-24	ISSUED FOR TENDER	×	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF VIJAYRAJNAGAR  
CIRCLE



ARCHITECT : SURYARAJ.SINH. N. GOHIL  
suryaraj.architect@gmail.com

GARDEN LANDSCAPE LAYOUT PLAN

TENDER DRAWING	DRAWING NO.  AR_LD_01
DATE : 09 - 09 - 2024	
SCALE : N.T.S	
SHEET : A3	
DRAWN BY : DH	
CHECKED BY : S.N.G	



રસ્તા, પુલો તથા મકાનોના બાંધકામની વિગતો તથા  
સ્પેશીફિકેશન અંગેના કામના સ્થળ પર બોર્ડ મુકવા બાબત.

ગુજરાત સરકાર  
જાહેર બાંધકામ વિભાગ  
પરિપત્ર ક્રમાંક બીડીજી/૩૨૭૭/(૧૬૫૭)સ  
સચિવાલય, ગાંધીનગર.  
તા. ૨૬/૪/૧૯૭૮

**પરિપત્ર:-**

જાહેર બાંધકામ વિભાગ મારફત થતાં રસ્તા, પુલો તથા મકાનોના બાંધકામની વિગતો તથા સ્પેશીફિકેશનની માહિતી જાહેર જનતાને જે તે કામના સ્થળ ઉપર આ માટે મળી શકે તેથી જાહેર જનતા તે અંગે યોગ્ય સુચનો કરી શકે. તે માટે કામ સાર્થક ઉપર સરળ ભાષામાં બોર્ડ મુકવા અંગેની બાબત સરકારશ્રીની વિચારણામાં હતી. સરકારે આ અંગે યોગ્ય વિચારણા કરી ઠરાવેલ છે કે આ વિભાગ તરફથી કરવામાં આવતાં રસ્તા, પેલો તથા મકાનોના કામો માટેની નીચે જણાવ્યા મુજબની વિગતો દર્શાવતા બોર્ડ કામના સ્થળ ઉપર જાહેર જનતાની જાણ માટે મુકવા :-

**જાહેર વિજ્ઞપ્તિ**

આ ..... રસ્તાનું / પુલનું મકાનનું કામ ગુજરાત રાજ્યના જાહેર  
બાંધકામ વિભાગ હેઠળના ..... વિભાગ હેઠળ .....  
..... પેટાવિભાગ હસ્તક ચાલે છે.

આ કામના સામાન્ય સ્પેશીફિકેશન નીચે પ્રમાણે છે.

**૧. રસ્તા અંગેના સ્પેશીફિકેશન :-**

૧. ઓવરસાઈઝ મેટલનું ..... સે.મી. દર્શાયેલ જાડો થર .....
૨. મેટલ ..... સે.મી. દર્શાયેલ જાડો થર.
૩. પેટીનું નામ ..... સે.મી.નું ભરવામાં આવે છે.

**(૨) પુલનું કામ :-**

૧. પુલના ..... ગાળા દરેક ..... મીટર લંબાઈનો
૨. પીયર કેપનું ક્રોક્કીટ ૧:૨:૪ ના પ્રમાણમાં.
૩. સ્લેબનું ક્રોક્કીટ ૧:૨:૪ હાઈડ્રેડ કે વીલીટી કન્ટ્રોલ ૧૫ કે ૨૦૦ એમએમ.
૪. પુલના પાયાનો ક્રોક્કીટ ૧:૩:૬ ના પ્રમાણમાં થાંભલા અને એબટમેન્ટનું ક્રોક્કીટ ૧:૩:૬ ના પ્રમાણમાં.



(૩) મકાનો :-

૧. પાયાનું કોક્રીટ પત્થરનું ૧:૩:૬ નું

૨. ઈટોનું ચણતર અને ૧ અને ૬ નું પ્રમાણ

૩. ભોંયતળીયુ ૧:૨:૩ નું ચુનાનું કોક્રીટ કે ૧:૪:૭ સીમેન્ટનો કોક્રીટ ઉપર ૧ ઈંચ ..... સાઈઝની મોઝેક ટાઈલ્સ.

૪. બારી બારણા સાગી લાકડાના.

૫. આર.સી.સી.કામ ૧:૨:૪ કે ૧૫૦ એમ.કે. ૨૦૦૦ એમ.નું .....

આ કામની વિગતે સ્પેશીફિકેશન નામબ ઈજનેરશ્રી ..... પેટા વિભાગની કચેરીએ ઓફીસના સમય દરમ્યાન કોઈપણ સમયે જોઈ શકાશે.

તો માહિતી માટે તે અધિકારીનો સંપર્ક સાંધવો.

આ કામની માલિકી જાહેર જનતાની છે અને કામમાં જોઈ ક્ષતિ કે ઓનયમિતતા જણાય તો તે બાબતમાં જાહેર બાંધકામ વિભાગના અધિક્ષક ઈજનેરશ્રી ..... જેની કચેરી ..... સ્થળે છે તેમનું ધ્યાન કરવા વિનંતી છે.

કાર્યપાલક ઈજનેર  
માર્ગ અને મકાન વિભાગ

રસ્તા, પુલો તથા મકાનોના બાંધકામની વિગતો તથા  
સ્પેશીફિકેશન અંગેના કામના સ્થળ પર બોર્ડ મુકવા બાબત.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
ઠરાવ ક્રમાંક ટીએનસી/૧૦૮૨/૨૧/સ  
સચિવાલય, ગાંધીનગર.  
તા. ૧૮/૧૧/૧૯૮૧

સંદર્ભ: સરકારશ્રીની સરખા ક્રમાંકની તા. ૨૦/૧૨/૮૦ નો ઠરાવ.

આમુખ: રસ્તા, પુલો તથા મકાનોના બાંધકામની વિગતો તથા સ્પેશીફિકેશન અંગેના કામના સ્થળ પર બોર્ડ મુકવા અંગેની બાબત  
સરકારશ્રીની વિચારણા હેઠળ હતી.

**ઠ રા વ :-**

પુખ્ત વિચારણાને અંતે આથી ઠરાવવામાં આવે છે કે, રસ્તા, પુલો મકાનો વર્કઓર્ડર મળ્યા પછી તુર્તજ કામના સ્થળે  
કરવાના કામના સ્પેશીફિકેશન અંગેનું બોર્ડ કોન્ટ્રાક્ટરે પોતાના ખર્ચે મુકવાના રહેશે.

ઉપરોક્ત શરત ટેન્ડરના ભાગ તરીકે ગણવાની રહેશે અને ટેન્ડરમાં તેનો સમાવેશ કરવાનો રહેશે.

આ હુકમોનો અમલ હુકમો રવાના થયાના તારીખથી કરવાનો રહેશે.

આ હુકમો આ વિભાગના સરખા ક્રમાંકની ફાઈલ પર નાણાં સલાહકારશ્રીની તા. ૧૧/૮/૮૧ ના મળેલ સંમતિથી બહાર  
પાડવામાં આવેલ છે. આ હુકમો માર્ગ અને મકાન વિભાગના બધા જ કામોને લાગુ પડશે.

ગુજરાતના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે,

(એ. જે. દોશી)  
નાયબ સચિવ  
માર્ગ અને મકાન વિભાગ

રસ્તા પુલો તથા મકાનો બાંધકામની વિગતો તથા સ્પેશીફિકેશન અંગેના કામના સ્થળ પર બોર્ડ મુકવા બાબત.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
ઠરાવ ક્રમાંક ટીએનસી/૧૦૮૦/૨૪/સ  
સચિવાલય, ગાંધીનગર.  
તા. ૨૭/૧૧/૧૯૮૦

સંદર્ભ: જા.બાં.વિ.ના પરિપત્ર ક્રમાંક બી.કે.જી/૩૨૭૭/(૧૬૫)ન, તા. ૨૬/૪/૭૮

**ઠ રા ૧ :-**

રસ્તા, પુલો તથા મકાનોના બાંધકામની વિગતો તથા સ્પેશીફિકેશન અંગેના કામના સ્થળ ઉપર બોર્ડ મુકવા અંગેની સંદર્ભમાં દર્શાવેલ પરિપત્રથી જરૂરી સુચનાઓ આપવામાં આવેલ છે. આવા કામની વિગત દર્શાવતા બોર્ડ મુકવા અંગેનો ખર્ચ વિભાગ તરફથી કરવામાં આવતો હતો. કામ પુર્ણ થયા બાદ આવા બોર્ડ બીન જરૂરી પડી રહેતા હતા. આવો ખર્ચ નિવારવાની બાબત સરકારશ્રીની વિચારણામાં હતી. પુનઃવિચારણા અંગે આથી ઠરાવવામાં આવે છે કે જ્યારે રસ્તા / પુલ / મકાનનું કામ હાથ ધરવાનું નક્કી કરવામાં આવે ત્યારે આવું બોર્ડ કામ રાખનાર ઠેકેદારે તેમના ખર્ચે મુકવાનું રહેશે. કામ ચાલુ કરવાનો હુકમ આપવામાં આવે તે પહેલાં આ બાબતની જરૂરી સંમતિ સંબંધી ઈજારદાર પાસેથી લેખિતમાં મેળવી લેવી. તેમજ કોન્ટ્રાક્ટ ધ્વારા આવું બોર્ડ મુકવામાં આવે તે અંગે પુરતી કાળજી રાખવી.

આ હુકમો આ વિભાગની સરખા ક્રમાંકની ફાઈલ ઉપર નાણાંકીય સલાહકારશ્રીની તા. ૧૫/૨/૮૧ ની નોંધથી મળેલ સંમતિથી બહાર પાડવામાં આવેલ છે.

ગુજરાતના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે,

(પ્ર. ર. ચોકસી)  
ખાસ ફરજ પરના અધિકારી  
માર્ગ અને મકાન વિભાગ

ક્રમાંક : ૫૨૪-૬૧૦૪-સ્ટાર રેઈટ-ડીટીપી-૩૯૭૧-ન,

ગુજરાત સરકાર  
માર્ગે અને મકાન વિભાગ,  
બ્લોક નં. ૧૪/૨, સરદારભવન,  
સચિવાલય, ગાંધીનગર  
તા. ૨૯-૦૭-૨૦૦૪

પ્રતિ,  
અધિક્ષક ઈજનેરશ્રી ( સર્વે ),  
રાજ્ય વિભાગ,

વિષય :- ટેન્ડરમાં સ્ટાર રેઈટ તથા ડી.ટી.પી. મંજૂરીના માસ અને વર્ષ દર્શાવવા બાબત.

સંદર્ભ :- ઠરાવ ક્રમાંક ટીએનસી - ૧૦૮૯/૪-સી, તા. ૩૧-૦૮-૧૯૯૧.

જે ટેન્ડરમાં સીમેન્ટ / સ્ટીલ ઈજારદારે ખરીદવાનો હોય અને તેઓને આ માલસામાનના ભાવો તથા ટેન્ડરમાં દર્શાવેલ સ્ટાર રેઈટના ભાવોનો તફાવત સરભર કરી આપવાનો હોય તેવા ટેન્ડરમાં આ માલસામાનના સ્ટાર રેઈટની જોગવાઈ નીચે મુજબ કરવાની ટેન્ડરના કલોઝ પલ A માં જોગવાઈ છે.

૧. જે માસ તથા વર્ષમાં ડી.ટી.પી. મંજૂર થયા હોય તે માસ અને વર્ષ કોરા ટેન્ડર ઈસ્યુ કરતી વખતે તેમાં દર્શાવવાના રહેશે.
૨. સીમેન્ટ માટેના ભાવો જે માસમાં ડી.ટી.પી.માં મંજૂર થયું હોય તે માસના અધિકત વિક્રેતા પાસેથી મેળવી કોરા ટેન્ડર ઈસ્યુ કરતી વખતે તેમાં દર્શાવવાના રહેશે.
૩. સ્ટીલ તથા એચ.વાય.એસ.ડી.બાર માટે સેઈલ કંપની માંથી જે માસમાં ડી.ટી.પી.મંજૂર થયું હોય તે માસનો ભાવ મેળવી કોરા ટેન્ડર ઈસ્યુ કરતી વખતે તેમાં દર્શાવવાનો રહેશે.
- ૪/- એવું જણાય છે કે આ જોગવાઈનો યુક્ત પક્ષે અમલ થતો નથી અને સ્ટાર રેઈટમાં વિવિધ વિભાગો દ્વારા એક સુત્રતા જળવાતી નથી.
- ૩/- આથી સર્વેને આજ્ઞાનુસાર સુચના આપવામાં આવે છે કે કોરા ટેન્ડર પેપર્સ ઈસ્યુ કરતી વખતે આ જોગવાઈ મુજબના ભાવો અને ડી.ટી.પી. મંજૂર થયાનું માસ, વર્ષ અવશ્ય દર્શાવવા ટેન્ડરો મંજૂર કરવા દરખાસ્ત કરવામાં આવે ત્યારે આ દરખાસ્તમાં, દર્શાવેલ સ્ટાર રેઈટ અંગેના આધાર / પુરાવા રજૂ કરવા અને આ જોગવાઈ મુજબ જ ટેન્ડર પેપર્સમાં ભાવો દર્શાવેલ છે તે મતલબનું કા.ઈ.શ્રી.નું પ્રમાણપત્ર પક્ષ રજૂ કરવું. વધુમાં આ સ્ટાર રેઈટ અને અંદાજી ભાવોના, ભાવ તફાવતને કારણે ટેન્ડરની અંદાજી રકમ સંબંધે ઉંચા / નીચાની પરિસ્થિતિ પક્ષ ટેન્ડર મંજૂરીની દરખાસ્તમાં અવશ્ય કરવી.
- ૪/- આ સુચનાઓનો યુક્તપક્ષે અમલ કરવા વિનંતી છે અને આ અંગેની યુક્તી ગંભીર નોંધ લેવામાં આવશે તેની નોંધ લેવા વિનંતી છે.

( ચં.મ.ભટ્ટ )  
ઉપસચિવ (મકાનો)  
માર્ગે અને મકાન વિભાગ.

નકલ રવાના :  
સર્વે કાર્યપાલક ઈજનેરશ્રી,  
રાજ્ય વિભાગ,

**રાજ્ય સરકારના બાંધકામ માટે વપરાતા ગૌણ  
ખનીજની રોયલ્ટી ભરવા બાબત.**

ગુજરાત સરકાર  
ઉદ્યોગ અને ખાણ વિભાગ,  
ઠરાવ ક્રમાંક : એમએમઆર/૧૧૨૦૦૦/૨૦૧૩/છ  
સચિવાલય, ગાંધીનગર  
તારીખ :- ૧-૮-૨૦૦૪

**વંચાણે લીધા :-**

- (૧) ઉદ્યોગ ખાણ અને ઉર્જા વિભાગનો ઠરાવ ક્રમાંક : એમસીઆર- ૨૧૬૮-૭૩૮૦-છ તા. ૧૨/૧૨/૧૯૬૮
- (૨) ઉદ્યોગ ખાણ અને ઉર્જા વિભાગનો ઠરાવ ક્રમાંક : એમસીઆર- ૨૧૬૮-૮-૬૬૮૫-છ તા. ૧/૧/૧૯૮૭
- (૩) ઉદ્યોગ ખાણ અને ઉર્જા વિભાગનો ઠરાવ ક્રમાંક : એમસીઆર- ૨૧૮૮-(૮)૬૫-છ તા. ૨૫/૧/૧૯૮૧
- (૪) ઉદ્યોગ અને ખાણ વિભાગનો ઠરાવ ક્રમાંક : એમસીઆર-૧૦૮૭-૨૮૫૬-છ, તા. ૬/૧૧/૧૯૮૭
- (૫) માન. મુખ્યમંત્રીશ્રીના અધ્યક્ષપણા હેઠળ યોજાયેલ એમ્પ્રાવર્ડ કમીટીની તા. ૧૮/૬/૨૦૦૪ ની બેઠકની કાર્યવાહી નોંધ.

**ઠરાવ :-**

ઉદ્યોગ, ખાણ અને ઉર્જા વિભાગના સંદર્ભ - (૩) હેઠળના ઠરાવથી એવી જોગવાઈ કરવામાં આવેલ કે રાજ્ય સરકારના , પંચાયતોના અને સરદાર સરોવર નર્મોદા નિગમના બાંધવામાં આવતાં રસ્તાઓના કે સિંચાઈ વગેરેના કામો માટે જ્યારે સાદી માટી ( ઓર્ડીનરી ક્લે-અર્થ ) અને (સોફ્ટ) મુરમ વાપરવામાં આવે ત્યારે ગુજરાત ગૌણ ખનિજ નિયમ , ૧૯૬૬ મુજબ રોયલ્ટી લેવાના નિયમો લાગુ પડશે નહીં. એટલે કે આ કામો માટે કોન્ટ્રાક્ટરો પાસે સાદી માટી ( ઓર્ડીનરી ક્લે- અર્થ ) અને (સોફ્ટ) મુરમ માટે રોયલ્ટી લેવાથી થશે નહીં તથા સંદર્ભ- (૪) હેઠળના વિભાગના તા. ૬/૧૧/૮૭ ના ઠરાવથી ગુજરાત વિદ્યુતબોર્ડ દ્વારા હાથ ધરવામાં આવતાં કામો માટે પણ ઉપર મુજબ રોયલ્ટી મુકિતનો લાભ આપવામાં આવેલ.

ઉપરોક્ત જોગવાઈના કારણે રાજ્યમાં ગેરકાયદેસર રીતે આ ખનીજોનો વપરાશ થતો હોવાનું જણાયેલ છે. જેના પરિણામે રાજ્ય સરકારે રોયલ્ટીની આવક ગુમાવવી પડે છે માટે ઉપરોક્ત હુકમોની જોગવાઈની સમીક્ષા કરી તે દૂર કરવાની બાબત સરકારશ્રીની વિચારણા હેઠળ હતી. તા. ૧૮/૬/૨૦૦૪ ના રોજ માન. મુખ્યમંત્રીશ્રીના અધ્યક્ષપણા હેઠળ

યોજાયેલ એમ્પ્રાવર્ડ કમીટીની બેઠકમાં નક્કી થયા મુજબ સંદર્ભ-૩ તથા સંદર્ભ-૪ હેઠળના વિભાગના તા. ૨૫/૧/૮૧ તથા તા. ૬/૧૧/૮૭ ના ઠરાવો આથી રદ કરવામાં આવે છે.

ગુજરાતના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે.

( આર. બી. વ્યાસ )  
નાય. બ સચિવ  
ઉદ્યોગ અને ખાણ વિભાગ



ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર ક્રમાંક : ટીએનસી-૧૦-૨૦૦૨-(૧૪)-સ,  
સચિવાલય, ગાંધીનગર  
તારીખ :- ૨૭-૪-૨૦૦૫

વિષય :- રાજ્ય સરકારના બાંધકામ માટે વપરાતા ગૌણ ખનિજની રોયલ્ટી ભરવા બાબત.

સંદર્ભ :- ઉધોગ અને ખાણ વિભાગનો ઠરાવ ક્રમાંક : એમએમઆર-૧૧૨૦૦૦-૨૦૧૩-૧૭, તા.૧-૮-૨૦૦૪

**પરિપત્ર :-**

ઉધોગ, ખાણ અને ઉજાળ વિભાગના તા.૨૫-૧-૮૧ ના ઠરાવ ક્રમાંક : એમસીઆર-૨૧૮૮-(૮) -૬૫-૧૭ અન્વયે રાજ્ય સરકારના, પંચાયતના અને સરદાર સરોવર નર્મદા નિગમના બાંધવામાં આવતાં રસ્તાઓના કે સિંચાઈ વગેરેના કામો માટે જ્યારે સાદી માટી ( ઓડીનરી કલે-અથ ) અને (સોફ્ટ) મુરમ વાપરવામાં આવે ત્યારે ગુજરાત ગૌણ ખનિજ નિયમ-૧૯૬૬ મુજબ રોયલ્ટી લેવાનો નિયમ લાગુ પડશે નહીં. એટલે કે આ કામો માટે કોન્ટ્રાક્ટરો પાસે સાદી માટી ( ઓડીનરી કલે -અથ ) અને (સોફ્ટ)મુરમ માટે રોયલ્ટી લેવાની થશે નહીં તેવી જોગવાઈ કરવામાં આવેલ છે. હવે ઉપર સંદર્ભમાં દર્શાવેલ ઉધોગ અને ખાણ વિભાગના તા.૧-૮-૨૦૦૪ ના ઠરાવથી તા. ૨૫-૧-૮૧ ના ઠરાવ રદ કરવામાં આવેલ છે.

આથી હવે બી-૧ ટેન્ડર ફોર્મ માં ખંડ - ૩૬ અને બી-૨ ટેન્ડર ફોર્મમાં ખંડ-૩૫ માં નીચે મુજબ સુધારો કરવામાં આવે છે.

રાજ્ય સરકારના બાંધકામ માટે વપરાતા ગૌણ ખનિજની રોયલ્ટી બાબત.

(૧) તા.૧-૩-૮૧ ના ઠરાવ મુજબ ..... મુરમ સિવાયના

અન્ય સુધીના શબ્દો રદ કરી ફક્ત નીચે મુજબ જોગવાઈ અમલમાં રહેશે.

ગૌણ ખનિજ બાબતમાં રા.ગૌ.ખ.નિ.૧૯૬૬ અને તેના અનુસંધાનમાં વખતોવખત બહાર પાડવામાં આવેલ ઠરાવો લાગુ પડશે, અને તે મુજબ લીઝ કે પરમીટ લેવાનું અને રોયલ્ટી ભરવાની રહેશે. ( ઉધોગ અને ખાણ વિભાગ ઠરાવ ક્રમાંક એમએમઆર-૧૧-૨૦૦૦-૨૦૧૩-૧૭ તા.૧-૮-૦૪ )

( અશોક પંડ્યા )  
ઉપસચિવશ્રી,  
માર્ગ અને મકાન વિભાગ

પ્રતિ,

સર્વે અધિકારીશ્રી,

( મા.મ.વર્તુળો/ પંચાયત (મા.મ.)વર્તુળો/ એક્સપ્રેસ વે વર્તુળ / રાજ્ય માર્ગ યોજના વર્તુળ /

રાષ્ટ્રીય ધોરી માર્ગ વર્તુળો / પાટનગર યોજના વર્તુળ સહિત )

સર્વે કાર્યપાલક ઈજનેરશ્રીઓ ( ઉપરોક્ત વર્તુળો હેઠળના તમામ વિભાગો સહિત )

નકલ રવાના :-

- ઉધોગ અને ખાણ વિભાગ, સચિવાલય, ગાંધીનગર
- નર્મદા , જળસંપત્તિ , પાણી પુરવઠા અને કલ્પસર વિભાગ,સચિવાલય, ગાંધીનગર
- નિયામકશ્રી,ઈજનેરી સંશોધન સંસ્થા, વડોદરા
- નિયામકશ્રી,એન્જીનીયરીંગ સ્ટાફ કોલેજ, ગાંધીનગર
- મેનેજીંગ ડીરેક્ટરશ્રી,ગુજરાત રાજ્ય બાંધકામ નિગમ લી., ગાંધીનગર
- મેનેજીંગ ડીરેક્ટરશ્રી,ગુજરાત રાજ્ય માર્ગ વિકાસ નિગમ લી.,ગાંધીનગર
- સર્વે તાંત્રિક અધિકારીશ્રીઓ ( ના.કા.ઈ.સહિત ) મા.મ.વિભાગ,સચિવાલય,
- સર્વે પ્રોજેક્ટ શાખાઓ, મા.મ.વિ.સચિવાલય,
- સીલેક્ટ કાર્યાલ.

મશીન ક્રશ્ડ સ્ટોન એગ્રીગેટના ફલેકીનેશ  
અને ઈલોન્ગેશન ઈન્ડેક્સના સંયુક્ત ધોરણો  
અપનાવવા બાબત.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર ક્રમાંક - એસઓઆર. - ૧૦૨૦૦૬ / ૧૦૪ / સ. ૧  
સચિવાલય, ગાંધીનગર.  
તા. ૨૫/૧/૨૦૦૭

**પ્રસ્તાવના :-**

'મશીન ક્રશ્ડ સ્ટોન એગ્રીગેટ' એ બાંધકામમાં વપરાતું મુખ્ય મટીરીયલ્સ છે. આ 'મટીરીયલ્સ' માટેના ગુણવત્તાના વિવિધ ધોરણો પૈકીનો એક 'ફલેકીનેશ અને ઈલોન્ગેશન ઈન્ડેક્સ (સંયુક્ત)' છે જે મીનીસ્ટ્રી ઓફ રોડ ટ્રાન્સપોર્ટ એન્ડ હાઈવેઝ (MORT & H) દ્વારા પ્રકાશીત સ્પેશીફિકેશન ફોર રોડ એન્ડ બ્રીજ વર્કની ચોથી આવૃત્તિમાં દર્શાવ્યા અનુસાર ૩૦ % થી વધુ ન હોવો જોઈએ. જ્યારે અગાઉ મીનીસ્ટ્રી ઓફ સરકેઈસ ટ્રાન્સપોર્ટની બીજી આવૃત્તિમાં ફક્ત ફલેકીનેશ ઈન્ડેક્સનું ધોરણ વધુમાં વધુ ૩૫ % સુધીનું હતું. આમ સંશોધનો / અનુભવ તેમજ અર્થતંત્ર મશીનરીની ઉપલબ્ધીનો વ્યાપ / સરળતા તેમજ આર્થિક પાસાઓને ધ્યાને લઈને ગુણવત્તાનાં ધોરણોમાં પણ નવા સુધારા / વધારા કરવામાં આવે છે. અગાઉના ફલેકીનેશ ઈન્ડેક્સના ધોરણોમાં હવે ઈલોન્ગેશન ઈન્ડેક્સ પણ જોડી સંયુક્ત ધોરણ દાખલ કરવામાં આવેલ છે. પરંતુ હાલ ગુજરાત રાજ્યમાં આવેલ ક્રશર યુનિટો પૈકીના મોટા ભાગના યુનિટો પરંપરાગત પદ્ધતિથી કાર્યરત છે. તેમાંથી નવા સંયુક્ત ધોરણો પરિપૂર્ણ કરે તેવો ઉત્પાદિત માલ મળી શકતો નથી. જે એક વ્યવહારીક મુશ્કેલી છે. પરંપરાગત પદ્ધતિનાં ક્રશરમાં આ પ્રકારની મુશ્કેલીઓ આવે છે. તે બાબતનો ઉલ્લેખ ટેકનીકલ જર્નલમાં પ્રસિધ્ધ થતા ટેકનીકલ પેપર્સમાં પણ થયેલ છે. આથી સંયુક્ત ધોરણો મેળવવા હાલના ક્રશર યુનિટોમાં સારા એવા પ્રમાણમાં સુધારા વધારા કરવા આવશ્યક બને તેમ છે. જેમાં વધારાનું નાણાંકીય રોકાણ પણ કરવું પડે તેમજ સમય પણ વ્યતિત થાય આથી ફલેકીનેશ તેમજ ઈલોન્ગેશન ઈન્ડેક્સના સંયુક્ત ધોરણોનો અમલ કરવા (ઈજારદારોને) પૂરતો સમય આપવો પણ જરૂરી છે. તે ધ્યાને લઈ નીચે મુજબની સૂચનાઓ આપવામાં આવે છે.

મીનીસ્ટ્રી ઓફ રોડ ટ્રાન્સપોર્ટ એન્ડ હાઈવેઝ દ્વારા સ્પેશીફિકેશન ફોર રોડ એન્ડ બ્રીજ વર્કની સને ૨૦૦૧ ની ચોથી આવૃત્તિ અનુસાર મશીન ક્રશ્ડ સ્ટોન એગ્રીગેટ માટે ફલેકીનેશ તેમજ ઈલોન્ગેશન સંયુક્ત ઈન્ડેક્સની મહત્તમ ૩૦ % ની મર્યાદાનું ધોરણ અપનાવવાનું નક્કી કરવામાં આવેલ છે.

માર્ગ અને મકાન વિભાગ હસ્તક ચાલતા કામોમાં પ્રવર્તમાન સ્પેશીફિકેશન પ્રમાણે ફલેકીનેશ અને ઈલોન્ગેશનના સંયુક્ત ઈન્ડેક્સની મહત્તમ મર્યાદા ૩૦ % રાખવામાં આવે છે.

ગુજરાત રાજ્યમાં મોટા ભાગના ક્રશીંગ યુનિટો ખાનગી માલિકીના છે અને તેમાં જરૂરી યાંત્રિક ફેરફારો કરવામાં આવે તો સંયુક્ત ઈન્ડેક્સના ધારાધોરણો જળવાઈ રહે તેવો માલ મળી શકે.

ગુજરાત રાજ્યમાં ચાલતા ખાનગી ક્રશીંગ મશીનોમાં જરૂરી યાંત્રિક સુધારા વધારા તા.૩૦/૯/૦૭ સુધીમાં કરવામાં આવે તો જ તા.૧/૧૦/૦૭ પછીથી માર્ગ અને મકાન વિભાગના રસ્તાઓમાં વપરાતા એગ્રીગેટની ગુણવત્તા ધારાધોરણ મુજબની મળી રહે. આથી નીચે મુજબની સુચનાઓ આપવામાં આવે છે.

- (અ) માર્ગ અને મકાન વિભાગમાં ચાલતા કામોના ઈજારદારોએ જે તે ક્રશીંગ યુનિટોમાં જરૂરી યાંત્રિક સુધારા વધારા થઈ ગયેલ છે અને ધારા ધોરણ મુજબની ગુણવત્તાનાં એગ્રીગેટ મળી રહે છે તેવું પ્રમાણપત્ર અધિક્ષક ઈજનેરશ્રી (યાંત્રિક) અમદાવાદ મા.મ. વર્તુળ, અમદાવાદનું હોય તેની પાસેથી જ માલસમાન ખરીદ કરવાનો રહેશે. આ પ્રમાણિત થયેલ ક્રશીંગ યુનિટ સિવાયના કોઈપણ ક્રશર પાસેથી માલસમાન સપ્લાય ન થાય તેની કાળજી લેવાની રહેશે. અધિક્ષક ઈજનેરશ્રી (યાંત્રિક) દ્વારા સર્ટીફાઈડ ન થયેલ ક્રશીંગ યુનિટ પાસેથી આવેલ ધારાધોરણ વગરનો માલસમાન આઉટરાઈટ રીજેક્ટ કરવામાં આવશે.
- (બ) માર્ગ અને મકાન વિભાગના એસ.ઓ.આર. માં તથા અંદાજોમાં એગ્રીગેટના ભાવમાં જરૂરી સુધારા વધારા કરીને તા.૧/૧૦/૦૭ થી અમલમાં લાવવાના રહેશે.
- (ક) દરેક વિભાગીય કચેરીઓએ તેઓના તાબામાં જે જે ઈજારદારોની નોંધણી થયેલ છે તેઓને સદરહુ સુચનાઓ અમલ કરવા માટે લેખિત જાણ કરવાની રહેશે તથા ખાનગી ક્રશીંગ યુનિટોને પણ આની લેખિત જાણ કરવાની રહેશે. સદરહુ સુચનાના અમલ માટે ખાનગી ક્રશર યુનિટો તેમજ ઈજારદારો સાથે દરેક વિભાગીય કચેરીએ એક સંયુક્ત બેઠક કરીને સમજ આપવાની રહેશે જેથી તા.૧/૧૦/૦૭ પછી માર્ગ અને મકાન વિભાગ હસ્તક ચાલતા કોઈપણ કામોમાં ધારા ધોરણ મુજબની ગુણવત્તા સિવાયનો માલસમાન વાપરવામાં ન આવે તેની તકેદારી રાખવાની રહેશે.

ઉપરોક્ત સુચનાઓનો અમલ યુસ્તપણે કરવાનો રહેશે.

(એસ.એ.ભટ્ટ)  
ઉપસચિવ મુ.મ.  
માર્ગ અને મકાન વિભાગ.



મશીન ક્રશ્ડ સ્ટોન એગ્રીગેટના ફેલેક્રીનેશ  
અને ઈલોન્ગેશન ઈન્ડેક્સના સંયુક્ત ધોરણો  
અપનાવવા બાબત.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર ક્રમાંક - આરજીએન - ૧૦૨૦૦૬ - ૧૦૪ - સ.૧,  
સચિવાલય, ગાંધીનગર.  
તા. ૧૭/૧૦/૨૦૦૭

સંદર્ભ :- સરખા ક્રમાંકના પરિપત્ર તા.૨૫/૧/૨૦૦૭.

**પ્રસ્તાવના :-**

ગુજરાત સરકારશ્રીના માર્ગ અને મકાન વિભાગ દ્વારા સંદર્ભીત પરિપત્ર ક્રમાંક : એસ.ઓ.આર. ૧૦૨૦૦૬ / ૧૦૪ / સ.૧, તા.૨૫/૧/૨૦૦૭ થી બાંધકામમાં વપરાતા મશીન ક્રશ્ડ સ્ટોન એગ્રીગેટ માટે ફેલેક્રીનેશ તેમજ ઈલોન્ગેશન સંયુક્ત ઈન્ડેક્સની મહત્તમ ૩૦ % મર્યાદાનું ધોરણ અપનાવવાનું નક્કી થયેલ હતું. જે માટે ગુજરાત રાજ્યમાં ચાલતા ખાનગી ક્રશીંગ યુનીટોમાં જરૂરી તાંત્રિક સુધારા વધારા તા.૩૦/૯/૨૦૦૭ સુધીમાં કરવા અને તા.૧/૧/૨૦૦૭ પછી થી માર્ગ અને મકાન વિભાગના રસ્તાઓના કામ વપરાતા એગ્રીગેટ ધારા ધોરણ મુજબની ગુણવત્તા વાળો વાપરવામાં આવે તેમ જણાવેલ હતું.

ક્રશર યુનીટોમાં જરૂરી સુધારા વધારા સુચવેલ સમયગાળામાં થઈ શકેલ ન હોવાથી વારંવાર સમય મર્યાદા વધારવા માટેની રજુઆતો થયેલ હતી.

ઉપરોક્ત બાબતે સરકારશ્રી દ્વારા પુખ્ત વિચારણાને અંતે ક્રશીંગ યુનીટોમાં જરૂરી સુધારા વધારા કરવા માટેની અંતિમ તા.૩૦/૯/૨૦૦૭ ને બદલે તા.૩૧/૧૨/૦૮ કરવામાં આવેલ છે.

ઉપરોક્ત સુચનાઓનો અમલ ચુસ્તપણે કરવાનો રહેશે.

(એસ.એ. ભટ્ટ)  
ઉપસચિવશ્રી (મુ.મ.)  
માર્ગ અને મકાન વિભાગ.

**નકલ રવાના :-**

- સચિવશ્રી (મા.મ) ના . અંગત સચિવશ્રી, મા.મ. વિભાગ, સચિવાલય, ગાંધીનગર.
- સર્વે મુખ્ય ઈજનેરશ્રીઓ અને અ.સ. શ્રીઓ, મા.મ. વિભાગ, સચિવાલય, ગાંધીનગર.
- સર્વે અધિક્ષક ઈજનેરશ્રીઓ
- સર્વે તાંત્રિક અધિકારીશ્રી, મા.મ. વિભાગ, સચિવાલય, ગાંધીનગર.
- ફાઈલ ક્રમાંક :- એસ.ઓ.આર. / ૧૦૨૦૦૬ / (૧૦૪) / સ.૧ માં રાખવા સારું.
- સિલેક્ટ ફાઈલ.

Instruction on implementation of  
the building and other Construction  
workers Act 1996  
and building and other Construction  
workers Welfare Cess Act, 1996.

Government of Gujarat  
Labour & Employment Department  
G.R. No. CWA-2004-841-M3  
Sachivalaya, Gandhinagar,  
Dated : 30 January 2006.

Read : Labour & Employment Department, Gandhinagar GR.No.CWA-2004-1831-M(3) Dated : 9-12-2005.

**RESOLUTION**

Building and other construction workers are one of the largest and most vulnerable segments of the unorganized labour. Their work is characterized by by inherent risk to life and limb of the work and also by the casual nature, temporary relationship between employer and employee, uncertain working hours, lack of basic amenities and inadequate welfare facilities.

Government of India has decided to constitute. Welfare boards for such workers in every state and accordingly, the Building and other Construction Workers ( Regulation of Employment & conditions of Service ) Act, 1996 was enacted by parliament and brought into force from 19<sup>th</sup> August, 1996. implementation of the Act. Including cess collection has already commenced in Karnataka, tamil nadu and dilhi. Under the side Act. Government of Gujarat has constituted a board under section 18. The stat Government has been powers to make rules for carrying out the provisions of this Act.

Accordingly, Government of Gujarat made Gujarat Building and other Construction Workers (Regulation of Employment and condition of Service) Rules, 2003 and published these Rules vide Notification No.GHR-2003-111-CWA-2000-1869-M(3), dated 18<sup>th</sup> August, 2003. Government of Gujarat has also constituted the Gujarat Building and other Construction workers Welfare Board vide Notification No. GHR/2004/163/CWA/2004/3743-M(3), dated 18<sup>th</sup> December, 2004. Secretary ( Labour ) has been appointed as Chairman.

Government of India has also enacted the Building and other construction workers welfare cess Act. ( hereinafter called as cess Act ) and brought it in force from 19<sup>th</sup> August, 1996. the cess Act provided for the levy and collection of cess on the cost of construction incurred by the employers, for increasing the resources of the welfare board. Section 3 of the Cess Act provides that cess shall be levied and collected at a rate not less than 1 % of the cost of construction incurred by an employer. Rule 5 of the Building and other construction worker welfare cess Rules, 1998 reads as follows :-

- (1) The proceeds of the cess collected under Rule 4 shall be transferred by such Government office, public sector Undertaking, local authority. Or cess collector, to the Board along with the from of Challan prescribed (and in the head of account of the Board) under the accounting provedures of the state, by whatever name they are known.



(2) Such Government office or public sector undertaking may deduct from the cess collected or claim from the Board, as the case may be, actual collection expenses not exceeding one per cent of the total amount collected.

(3) The amount collected shall be transferred to the board within thirty days of its collection.

Moreover, under Rule 6, every employer, within thirty days of commencement of his work of payment of cess, as the case may be, has to furnish information in form 1 to the assessing Officer. Under Rule 12, the Assessing Officer, in cases where the employer has pay the cess or has paid less cess, can impose it penalty upto the amount of cess payable.

By Government of Gujarat Notification No. GHR/2005/04/CWA/2004/841/M3, dated 3<sup>rd</sup> January, 2005, all heads of the department of the Government of Gujarat, all Executive heads of public sector undertaking and all Executive head of local Authorities ( except Gram panchayat and Nagar Panchayat) are declared as cess Collectors and Assessing Officers.

The Building and other Construction workers Welfare board has passed the necessary resolution to collect the cess with effect from 18<sup>th</sup> December, 2004.

According, the cess is payable by Government offices, public sector undertaking, local Authority or cess collector to the board in challan proscribed, in the following head / sub head :

Major Head :- 0230 – Labour and Employment

Minor Head :- 106-Fees under Contract Labour ( Regulation and abolition) Rules

Sub Head :- (04)-Income from cess levied under Gujarat Building & other Construction worker's Welfare cess Act, 1996.

Approval of the Finance Department, Government of Gujarat has been taken for meeting the expenditure to be included for the various welfare activities by the Gujarat Building & other construction workers welfare board and the opening of the accounting Head / Sub –Head in file No 2004-1831-M3 on 1<sup>st</sup> December, 2005 ( Copy of Resolution dated 9/12/2005 is enclosed)

All Government, public sector undertaking and local authorities are instruction to pay the above cess as per the Act. All Department Public sector Undertaking and local authorities are also advised to incorporate the 1 % cess in their estimates for all new works.

By order and in the name of Government of Gujarat.

(Vinod Babbar)  
Principal Secretary Government  
Labour & Employment Department

:: પરિપત્ર ::

“Demand Draft for E.M.D. & Tender fee shall be submitted in electronic format only through online (by Scanning) while uploading the bid. This submission shall mean that EMD & tender fee are received electronically. However for the purpose of realization of D.D. bidder shall send the D.D. in original through R.P.A.D. so as to reach to Executive Engineer, R&B Division, Porbandar within 7 days from the last date of uploading. Penaltiative action for not submitting D.D. in original to E.E. by bidder shall be initiated. D.D. for exemption Certificate is not necessary. However Exemption Certificate shall have to be submitted electronically through online.

Any documents in supporting of tender bid shall be submitted in electronic format only through online (by scanning etc.) & hard copy will not be accepted separately.”

“ટેન્ડર માટે બાનાની રકમ (ઈ.એમ.ડી.) તથા ટેન્ડર ફીના ડીમાન્ડ ડ્રાફ્ટ ઓન લાઈન સ્કેન કરી ઈલેક્ટ્રોનિક ફોર્મેટમાં ટેન્ડર અપલોડ કરવાના રહેશે. આ પ્રકારે રજૂ થયેલ વિગતે બાનાની રકમ અને ટેન્ડર મળ.લ ગણવાની રહેશે અને તદઅનુસાર ટેન્ડર ખોલવામાં આવશે તે અનુસાર ઈલેક્ટ્રોનિક ફોર્મેટમાં રજીસ્ટ્રેશન, બેંક સોલવંશી, બાનાની રકમ અને ટેન્ડર ફી મળેલ હોય તેની જ ઓફર ખોલવામાં આવશે. ખરેખર ચુકવણી માટે ટેન્ડર ભરનારે ડીમાન્ડ ડ્રાફ્ટ અસલમાં રજીસ્ટર્ડ પોસ્ટ એ.ડી. થી કાર્યપાલક ઈજનેરશ્રી, માર્ગ અને મકાન વિભાગ, પોરબંદર ને અપલોડીંગની છેલ્લી તારીખ થી દિવસ-૭ માં મળે તે અનુસાર રજૂ કરવાનો રહેશે. અસલમાં ડીમાન્ડ ડ્રાફ્ટ નહીં મોકલનાર સામે શિક્ષાત્મક પગલા શરૂ કરવામાં આવશે. બાના મુકિત માટે ડીમાન્ડ ડ્રાફ્ટ જરૂરી બનશે નહિ, પરંતુ બાના મુકિત પ્રમાણપત્ર ઈલેક્ટ્રોનિકલી ઓન લાઈન રજૂ કરવાનું રહેશે.”

ટેન્ડર બીડનાં માટે જરૂરી આધાર માટેના કોઈપણ ડોક્યુમેન્ટ ઓન લાઈન ઈલેક્ટ્રોનિક ફોર્મેટમાં સ્કેન કરી મોકલવાના રહેશે અને હાડ કોપી અલાયદી રીતે સ્વીકારવામાં આવશે નહિ.

ગુજરાત રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે.

સહી/-  
ઉપસચિવ  
માર્ગ અને મકાન વિભાગ

ઇ-ટેન્ડરીંગમાં ટેન્ડર ફી અને અન્ય  
ડોક્યુમેન્ટસ રજૂ કરવા અંગે.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ,  
પરિપત્ર ક્રમાંક :- પરચ - ૧૦૨૦૦૮-૫-સ (પાર્ટફાઇલ)  
સચિવાલય, ગાંધીનગર,  
તા. ૨૭-૧૧-૨૦૦૮

વંચાણે લીધા :- તા. ૧૮/૧/૦૮ નો પરિપત્ર ક્રમાંક : પરચ - ૧૦૨૦૦૮-૫-સ

પરિપત્ર :-

માર્ગ અને મકાન વિભાગમાં હાલમાં ટેન્ડરો ઇ-ટેન્ડર પદ્ધતિથી સ્વીકારવામાં આવે છે. તે અન્વયે સમાન ક્રમાંકના તા. ૧૮/૧/૦૮ના પરિપત્રમાં ટેન્ડર ફી અને બાનાની રકમ જે તે કાર્યપાલક ઇજનેરને ખરેખર ચુકવવા માટે દિન-૭માં અસલમાં રજીસ્ટર્ડ પોસ્ટ એ.ડી.થી મોકલવાની તેમજ અસલમાં ડીમાન્ડ ડ્રાફ્ટ નહિ મોકલનાર સામે શિક્ષાત્મક પગલા લેવાની જોગવાઈ હતી.

ઉપરોક્ત પરિપત્રમાં નીચે મુજબ અંશતઃ સુધારો કરી આ શરતનો સમાવેશ ટેન્ડર નોટીસ / ટેન્ડરના મુસદ્દામાં Through R.P.A.D. so as to reach to E.E. Division - Within 7 days from the last date of uploading ને બદલે to S.E. at the time of tender opening or send the same through R.P.A.D. so as to reach to E.E. Division - Within 7 days from the last date of opening." સુધારો કરવામાં આવે છે. તેમજ ખરેખર ટેન્ડર ફી તેમજ બાનાની રકમ નિયત સમયમાં ઇજારદાર ન ભરે તો ઇજારદારની નોંધણી એક વર્ષ માટે એબેન્સમાં રાખવાની કાર્યવાહી કરી ઇ-ટેન્ડરીંગ નો કોડ એક વર્ષ માટે રદ કરાશે.

ગુજરાત રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે.

(આર. કે. ચૌહાણ)  
ખાસ ફરજ પરના અધિકારી  
માર્ગ અને મકાન વિભાગ



ટેન્ડરમાં ભરેલ અસામાન્ય ઉંચા ભાવોના સંદર્ભે કામ પર પડતા ખર્ચ પર નિયંત્રણ રાખવા તથા કામની નાણાંકીય પ્રગતિ ભૌતિક પ્રગતિ સાથે સુમેળમાં રહે તે માટે જરૂરી જોગવાઈ કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ,  
પરિપત્ર ક્રમાંક :- પરચ - ૧૦૨૦૦૮-(૬૧)-સ  
તા. ૨૭-૧૧-૨૦૦૮

પરિપત્ર :-

ટેન્ડરમાં અસામાન્ય ઉંચા કે નીચા ભાવો ઇજારદારશ્રીઓ દ્વારા ઘણી વાર ભરાતા હોવાનું સરકારશ્રીના ધ્યાન પર આવેલ છે. આવા કિસ્સાઓમાં કામની નાણાંકીય પ્રગતિ અને ભૌતિક પ્રગતિનો સુમેળ ન રહેવાની સંભાવના રહેલી છે. આથી કામની ભૌતિક પ્રગતિ પ્રમાણે નાણાંકીય પ્રગતિ રહે કે જેથી સરકારશ્રી પર સમય પહેલા અયોગ્ય નાણાંકીય બોજ ન પડે તે માટે નીચે મુજબની જોગવાઈ ટેન્ડરમાં કરવાનો નિર્ણય કરવામાં આવેલ છે. આ જોગવાઈ તમામ કામોના આ પરિપત્રની તારીખ પછી મંજૂર થતાં ડી.ટી.પી. માં અચૂક પણ કરવાની રહેશે.

જોગવાઈ :-

જે કોઈ આઈટમનો ભરેલ ભાવ. તે આઈટમના ટેન્ડરમાં મુકેલ અંદાજી ભાવ કરતા ટેન્ડરમાં મુકેલ અંદાજી રકમથી સમગ્ર ટેન્ડર જેટલા ટકા ઉંચુ કે નીચુ મંજૂર થયુ હોય તે ટકાવારીથી ૧૦% થી વધુ ઉંચો રહેતો હોય તેવી આઈટમનું ચકવણું રનીંગ બિલ વદતે જે તે આઈટમના અંદાજી ભાવ + / - મંજૂર ટેન્ડરની ટકાવારી + તે આઈટમના અંદાજી ભાવની ૫% ની મર્યાદામાં કરવામાં આવશે. આ રીતે વીથહેલ્ડ રાખેલ રકમ કામ સંતોષકારક રીતે પુર્ણ થયે ફાઈનલ બિલ મંજૂર કરતી વતખે વ્યાજભારણ વગર છુટી કરવામાં આવશે.

ઉદાહરણ :-

ઉક્ત જોગવાઈની સ્પષ્ટ સમજણ માટે આ સાથે આપેલ ઉદાહરણ ધ્યાને લેવું

૧	ટેન્ડરમાં મુકેલ અંદાજી રકમ	:	રૂ. ૧૦૦/-
૨	મંજૂર થયેલ ટેન્ડરની રકમ	:	રૂ. ૧૧૦/-
૩	ટેન્ડરમાં મુકેલ અંદાજી રકમ સામે ખરેખર મંજૂર થયેલ ટેન્ડરની ટકાવારી	:	૧૦%
૪	ટેન્ડરની એક આઈટમનો ટેન્ડરમાં મુકેલ અંદાજી ભાવ	:	રૂ. ૧૦/-
૫	તે આઈટમનો ભરેલ ભાવ	:	રૂ. ૧૪/-
૬	તે આઈટમમાં ભરેલ ઉંચા ભાવની ટકાવારી	:	૪૦%
૭	તે આઈટમ માટે રનીંગ બિલ વખતે ચુકવવાપાત્ર ભાવ	:	રૂ. ૧૦/- કો. ૩ પ્રમાણ ૧૦% ઉંચા અંદાજી ભાવના ૫% રૂ. ૧૧.૫૦
૮	ફાઈનલ બિલ વખતે વ્યાજ ભારણ વગર ચુકવવાપાત્ર થતો વીથહેલ્ડ રાખેલ ભાવ.	:	રૂ. ૧૪.૦૦-૧૧.૫૦ રૂ. ૨.૫૦

જો સદર આઈટમના ભાવ રૂ. ૧૨.૦૦ કે તેથી નીચો ભરેલ હોત તો રનીંગ બિલમાં ભાવ કપાત આ જોગવાઈ મુજબ કરવાની રહેત નહીં.

(આર. કે. ચૌહાણ)  
ખાસ ફરજ પરના અધિકારી  
માર્ગ અને મકાન વિભાગ

બાંધકામના મટીરીયલ્સ તેમજ કોમ્પોનેન્ટ્સ સેમ્પલની  
ગુણવત્તા માટે પરીક્ષણ પૈકીના ૮૦% પરીક્ષણ સ્થળ  
પર તથા ૧૦% પરીક્ષણ સરકાર માન્ય લેબોરેટરી / ગેરી  
ધ્વારા તથા ૧૦% ગેરી લેબોરેટરીમાં કરાવવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર ક્રમાંક : ૫૨૪/૧૦૨૦૦૭/૨૮/સ  
સચિવાલય, ગાંધીનગર  
તારીખ : ૩૧/૧૨/૨૦૦૮

### પરિપત્ર

બાંધકામના મટીરીયલ્સ તેમજ કોમ્પોનેન્ટ્સના સેમ્પલની ગુણવત્તા માટેના પરીક્ષણ હાલ ગેરી કે સરકાર માન્ય સંસ્થા (લેબોરેટરી) મારફતે કરવામાં આવે છે. કામોની પ્રગતિની સમીક્ષા દરમિયાન ક્ષેત્રીય અધિકારીઓ તરફથી જાણવા મળેલ છે કે ઉક્ત હયાત પ્રક્રિયામાં ટેસ્ટીંગના પરિણામો વિલંબથી મળે છે, જેમાં સમય પણ ખૂબ વ્યતિત થાય છે. ઇજારદાર એસોસિએશન તરફથી આવી રજુઆતો મળે છે, આથી આ મુશ્કેલી ધ્યાને લેતા ઇજારદારશ્રી ધ્વારા જે તે કામ માટે સ્થાપવામાં આવતી લેબોરેટરીમાં સ્થળ પર જ પરીક્ષણ કરવામાં આવે તો વિલંબ નિવારી શકાય તે બાબત વિચારણા હેઠળ હતી, પુખ્ત વિચારણાના અંતે નીચે મુજબની નીતિ હાલના તબક્કે અનુસરવા નક્કી કરવામાં આવ્યું છે.

નીચે જણાવેલ પરીક્ષણોમાં પ્રવર્તમાન પધ્ધતિમાં ફેરફાર કરી ક્રીકવન્શી અનુસાર જરૂરી પરીક્ષણો પૈકી ૧૦% સરકાર માન્ય લેબોરેટરી / ગેરી તથા ૧૦% ગેરી લેબોરેટરી અને ૮૦% ફીલ્ડ લેબોરેટરી ધ્વારા કરાવવાના રહેશે. પરંતુ ગેરીમાં નીચેના દરેક પૈકી ઓછામાં ઓછું ૧(એક) પરીક્ષણ ગેરી લેબોરેટરીમાં કરવાનું રહેશે તથા ઓછામાં ઓછું એક પરીક્ષણ ગેરી / સરકાર માન્ય લેબોરેટરીમાં કરાવવાનો રહેશે. જેમાં નીચે દર્શાવેલ પરીક્ષણો સ્થળ પર કરવાના રહે છે.

એ	એગ્રીગેટ	(૧) ગ્રેડેશન (૨) ફલેક્રીનેશ અને ઈલોગેશન વેલ્યુ (૩) ઇમ્પેક્ટ વેલ્યુ (૪) વોટર એબસોર્પશન
બી	માટી	(૧) ફિલ્ડ એફડીડી અને એફએમસી (૨) સીવ એનાલીસીસ
સી	રેતી	(૧) ગ્રેડેશન
ડી	ઇટો	(૧) ડાયમેનશન અને ટોલરન્સ ટેસ્ટ (૨) વોટર એબસોર્પશન
ઇ	કોક્રીટ	(૧) નોન ડીસ્ટ્રીક્ટીવ ટેસ્ટ (એલ્ટ્રા સોનીક ટેસ્ટીંગ પધ્ધતિથી) (૨) સ્લમ્પ ટેસ્ટ (૩) કોમ્પ્રેસીવ સ્ટ્રેન્થ
એફ	બીટયુમીનસ મીક્સ	(૧) ડામરની ટકાવારી
જી	ડ્રાય મીક્ષ મટીરીયલ	(૧) ગ્રેડેશન



શરતો :-

- (૧) ઇજારદારે કામની ગુણવત્તા માટે ધારા ધોરણ પ્રમાણેની અને ઉપર જણાવેલ પરિક્ષણો માટે પ્રમાણિત થયેલ જરૂરી તમામ સાધનો સહિતની ફિલ્ડ ટેસ્ટીંગ લેબોરેટરી સ્વ ખર્ચે કામના સ્થળે યોગ્ય જગ્યા ઉપર સ્થાપવાની રહેશે. રસ્તાના કામ માટે લાગુ પડતા પ્લાન્ટના સ્થળને કામનું સ્થળ ગણી શકાય. પરંતુ કામનું સ્થળ લેબોરેટરીથી દૂર હોય તો ઇજારદારશ્રી ધ્વારા મોબાઇલ લેબોરેટરીની જરૂરી વ્યવસ્થા રાખવાની રહેશે.
- (૨) કાર્યપાલક ઇજનેરશ્રી જ્યારે સ્થળ પર તેઓનું ચેકીંગ કરવા જાય ત્યારે ટેસ્ટીંગ તેઓએ તેમની રૂબરૂમાં પણ કરાવવાનું રહેશે.
- (૩) ધારા ધોરણ પ્રમાણેના પરીક્ષણોની સંખ્યા પૈકી ૮૦% પરીક્ષણ ફિલ્ડ લેબોરેટરીમાં ઇજારદારના અધિકૃત ક્વોલીફાઇડ ઇજનેર કે જેઓને સંબંધિત કાર્યપાલક ઇજનેરશ્રીએ આઇ-કાર્ડ આપેલ હોય તેમનાં ધ્વારા ખાતાના ના.કા.ઇ./મ.ઇ./અ.મ.ઇ.ની હાજરીમાં જ કરવાના રહેશે અને પરિણામોમાં સંયુક્ત સહીઓ કરવાની રહેશે જ્યારે ૧૦% પરિક્ષણ ગેરી/સરકાર માન્ય લેબોરેટરી (ઓછામાં ઓછું એક પરીક્ષણ) અને ૧૦% ગેરી લેબોરેટરી (ઓછામાં ઓછું એક પરીક્ષણ) મારફતે કરાવવાના રહેશે.
- (૪) કુલ પરિક્ષણોના ૮૦% પરિક્ષણ એક જ સ્થળે એકજ સમયે એકજ તબક્કામાં નહીં કરતાં કામની પ્રગતિ મુજબ જે તબક્કાએ જે તે કામગીરીને અનુરૂપ જે મટીરીયલ્સ વાપરવાનું થતુ હોય તુદાનુસાર શરૂઆતના તબક્કામાં રાખવું વચ્ચેના તબક્કામાં તેમજ આખરી તબક્કામાં કરાવવાનું રહેશે. આમ છતાં આ બાબતે સ્થાનિક કક્ષાએથી ના.કા.ઇ.શ્રીએ જરૂરીયાત મુજબ તબક્કાવાર પરીક્ષણો તકતી કરવાના રહેશે.
- (૫) ગુણવત્તા નિયમન ધારા-ધોરણ પ્રમાણેના બધા જ રજીસ્ટર નિયમિત રીતે નિભાવવાના રહેશે અને તે જે તે સ્થળે લેબોરેટરીમાં ઉપલબ્ધ રહે તમ રાખવાના રહેશે.
- (૬) જો કોઈ કારણોસર ટેસ્ટીંગના સાધન અપ્રાપ્ય હોય અથવા વસાવવામાં સમય જાય તેમ હોય કે વ્યવહાર ન હોય (જેમ કે ઇલેક્ટ્રોમેટ્રિક બેરીંગ) તો આવા પરીક્ષણો ગેરી/સરકાર માન્ય સંસ્થાઓમાં કરાવી શકાશે. અને આ બાબતનો નિર્ણય સંબંધિત કા.ઇ.શ્રી / ના.કા.ઇ.શ્રીએ કરવાનો રહેશે. ગેરીમાં ન થઈ શકે તેવા ટેસ્ટ સરકાર માન્ય લેબોરેટરીમાં કરાવી શકાય.
- (૭) વિભાગના ક્ષેત્રિય તાંત્રિક સ્ટાફે ના.કા.ઇ./મ.ઇ./અ.મ.ઇ.એ તેમજ ઇજારદારના તાંત્રિક સ્ટાફ ધ્વારા ગેરીમાં પરીક્ષણ જાતે કરવાનો સંતોષકારક અનુભવ મેળવી આ બાબતનું ગેરીનું પ્રમાણપત્ર પણ મેળવવાનું રહેશે. જે તે જિલ્લા/પ્રાદેશિક સ્તરે ગેરીની લેબોરેટરીમાં કોર્પ કન્ડક્ટ કરવા માટે જરૂરી ફી જે તે વિભાગના કા.ઇ.શ્રીએ ચુકવવાની રહેશે અને આ કાર્યવાહી સમયબદ્ધ પૂર્ણ થાય તે માટે સંબંધિત અ.ઇ.શ્રીએ આ કામગીરીની વખતોવખત સમીક્ષા કરવાની રહેશે.
- (૮) આ પરિપત્રથી ઉપર જણાવેલા પરીક્ષણો પૈકી ૮૦% પરીક્ષણો ક્ષેત્રિય લેબોરેટરીમાં કરવાનો સમય તા.૧/૧/૨૦૧૦ થી કરવાનો રહેશે.
- (૯) ગેરીમાં ટેસ્ટીંગ કરાવતાં સમયે ગેરીનો ટેસ્ટીંગ ચાર્જ ત્વરીત ભરવાનો રહેશે. જેથી પરીક્ષણના પરીણામો સમયસર મેળવી શકાય.

સહી/-

(આર. કે. ચૌહાણ)

ખાસ ફરજ પરના અધિકારી (વિ.યો.)

માર્ગ અને મકાન વિભાગ

ટેન્ડર ફોર્મ બી-૨ ના કોન્ટ્રાક્ટરોની  
માર્ગદર્શન માટે સામાન્ય નિયમો  
અને સૂચનોના સૂચન નં.૧૮ માં  
સ્પષ્ટતા કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
ક્રમાંક:- ટીએનસી-૧૦-૨૦૧૩-(૦૨)-સી  
સચિવાલય, ગાંધીનગર  
તા. ૧૦-૦૫-૨૦૧૩

સંદર્ભ:- મા.મ.વિભાગના ઠરાવ નં. ટીએનસી-૧૦૯૦-(આઈબી-૨૨)-(૧૦)-સી તા.૨૪-૦૫-૧૯૯૦

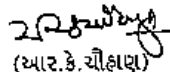
આમુખ:-

ઉપરોક્ત વિષય અન્વયે ના સંદર્ભીત ઠરાવ માં સૂચન નં.૧૮ માં "આ કામ માટે  
ટેન્ડરો રજીસ્ટર ટપાલ દ્વારા રવાના કરવામાં આવે ત્યારબાદ ટેન્ડર પર સ્વિકારવાની  
સૂચિત તારીખથી ૯૦/૧૨૦ દિવસ સુધી ઓફર ખુલ્લી રહેશે." તેમ દર્શાવેલ છે.

હવે ઉદ્યોગ અને ખાણ વિભાગના ઠરાવ નં. એસપીઓ-૧૦૨૦૦૫-૧૪૦૭-સીએચ  
તા.૨૨-૧૧-૨૦૦૬ ના સંદર્ભે કામોના ટેન્ડર Online માંગવામાં આવે છે અને ઉપરના  
સૂચન નં. ૧૮ માં "ટેન્ડર પર સ્વિકારવાની સૂચિત તારીખથી ૯૦/૧૨૦ દિવસ સુધી  
ઓફર ખુલ્લી રહેશે" તેવી જોગવાઈ ના કારણે ટેન્ડર ની વેલીડીટીમાં વિસંગતતા ઉભી  
થવા બાબતની ગુજરાત કોન્ટ્રાક્ટર એસોસિએશન ની વિવિધ સ્તરે રજુઆતો મળેલ છે.  
આ રજુઆતો પર પુખ્ત વિચારણાને અંતે આ બાબતે નીચે મુજબની સ્પષ્ટતા કરવામાં  
આવે છે.

સ્પષ્ટતા

" Online Tender System માં સીગલ કવર સીસ્ટમ વાળા ટેન્ડરોમાં ટેન્ડર વેલીડીટી નો  
સમય ટેન્ડર ઓનલાઈન ખોલ્યા તારીખથી જ્યારે ટુ કવર બીડ સીસ્ટમમાં ટેન્ડર  
વેલીડીટીનો સમય ટેકનીકલ બીડ ખોલ્યા તારીખથી ગણવાનો રહેશે."

  
(આર.કે.ચૌહાણ)  
ખાસ ફરજ પરના અધિકારી(વિ.યો.)  
માર્ગ અને મકાન વિભાગ

ટેન્ડરમાં ભરેલ અસામાન્ય ઊંચા ભાવોના સંદર્ભે કાનૂની  
પર પડતા ખર્ચ પર નિયંત્રણ રાખવા તથા કામને  
નાણાકીય પ્રગતિ સાથે સુમેળમાં રહે તે માટે જરૂર  
જોગવાઈ કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર ક્રમાંક:- પરચ-૧૦૨૦૦૮-(૬૧)-સી  
તા. ૦૩-૦૫-૨૦૧૩

વંચાણે લીધા:- પરિપત્ર ક્રમાંક:- પરચ-૧૦૨૦૦૮-(૬૧)-સી તા. ૨૭-૧૧-૨૦૦૮

સામાન્ય:-

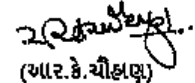
ટેન્ડર માં ઈજારદારશ્રીઓ દ્વારા ભરાતા Imbarganલ ભાવો વાળા ટેન્ડરના કિસ્સાઓમાં ઈજારદારશ્રીઓ  
દ્વારા ઊંચા ભાવની આઈટમોની કામગીરી થયા બાદ નીચા ભાવની આઈટમોની કામગીરી ન કરવામાં આવે  
તેવી પરિસ્થિતિ પર નિયંત્રણ રાખવા માટે તા. ૨૭-૧૧-૨૦૦૮ નો પરિપત્ર જરૂરી જોગવાઈ સાથે બહાર  
પાડવામાં આવેલ. આ પરિપત્ર અંગે વિવિધ સ્તરોએ થયેલ રજૂઆતોને ધ્યાને લેતાં અને તેના પર પુખ્ત  
વિચારણાના અંતે આ પરિપત્રના બીજા કક્કરાની છેલ્લી લીટી “આ રીતે વીથહેલ રાખેલ રકમ કામ  
સંતોષકારક રીતે પૂર્ણ થયે કાઈનલ બીલ મંજૂર કરતી વખતે વ્યાજભારણ વગર છૂટી કરવામાં આવશે”  
તેની જગ્યાએ નીચે મુજબનો સુધારો કરવામાં આવે છે.

સુધારો:-

“આ રીતે વીથહેલ રાખેલ રકમ અસાધારણ નીચા ભાવ ભરેલ હોય તેવી આઈટમની નાણાકીય  
પ્રગતિનાં પ્રમાણસર રનીંગ બીલમાંથી છૂટી કરવાની રહેશે. જે કિસ્સામાં અસાધારણ નીચા ભાવ ભરેલ  
કોઈપણ આઈટમ ન હોય તેવા કિસ્સામાં અસાધારણ ભાવો ભરેલ આઈટમની સામે વીથહેલ રાખેલ રકમ  
બાકી રહેતી કામગીરી થાય તેના પ્રમાણસર રનીંગ બીલમાંથી છૂટી કરવાની રહેશે.”

વધુમાં વંચાણે લીધેલ પરિપત્ર ના ઉદ્દેશ્યમાં દર્શાવેલ ક્રમાંક-૮ રદ કરવામાં આવે છે.

ઉપરોક્ત સુધારાનો અમલ આ પરિપત્રની તારીખ પછી મંજૂર થતા ડી.ટી.બી. માં અચૂકપણે  
કરવાનો રહેશે.



(આર.કે.ચૌહાણ)

ખાસ ફરજ પરના અધિકારી(વિ.ચો.)  
માર્ગ અને મકાન વિભાગ

પ્રતિ,

સર્વે અધિક્ષક ઈજનેરશ્રીઓ, મા.મ. વિભાગ (પાટનગર મોજના વર્તુળ, નેશનલ હાઈવે વર્તુળ, સહિત).  
સર્વે અધિક્ષક ઈજનેરશ્રીઓ (પંચાયત) મા.મ. વિભાગ.  
સર્વે કાર્યપાલક ઈજનેરશ્રીઓ, મા.મ. વિભાગ.  
સર્વે કાર્યપાલક ઈજનેરશ્રીઓ, (પંચાયત), મા.મ. વિભાગ.

નકલ રવાના:-

૧. અગ્ર સચિવશ્રીના અંગત મદદનીશશ્રી, મા.મ. વિભાગ, સચિવાલય, ગાંધીનગર
૨. સર્વે મુખ્ય ઈજનેર અને અ.શ્રીઓ, મા.મ. વિભાગ.
૩. સર્વે તાંત્રિક ઉપ સચિવશ્રીઓ, મા.મ. વિભાગ.
૪. ના.કા.ઈ.શ્રીઓ, મા. મ. વિભાગ.
૫. નાણાં શાખા, મા.મ. વિભાગ.
૬. ના.સે.અ, સી શાખા, મા.મ. વિભાગ., સિલેક્ટ હાઈલ.
૭. શાખા સિલેક્ટ હાઈલ -૨૦૧૩

Modification in Defect Liability  
Clause 17 A of Tenders for  
Building works

Government of Gujarat  
Roads & Buildings Department  
Circular No. PRCH-102013-207/2759/N  
Sachivalaya, Gandhinagar  
Date :- 27-05-2013

Ref :- Circular No. PRCH-102008-(2076) – N Dt. 3-12-2009

R&B Department had issued a circular as referred above where in following provision has been made for building works.

**The Defects Liability period shall be as under for original building works:**

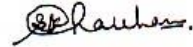
Three years of elapse of three monsoon periods following date of possession of building taken over by user agency OR Four years of elapse of four monsoon periods following the certified date of completion, Whichever is earlier.

After due considerations on the representations received at various levels from the Gujarat Contractor Associations the above clause is now modified as under

**The defects Liability period shall be as under for original building works:**

" One year or elapse of one monsoon period from the certified date of completion whichever is greater "

The other conditions in the above said circular will remain as it is.



(R.K. Chauhan)

Officer on Special Duty(S.P.)

Road & Buildings Department

To,

All , Superintending Engineers, State, Ahmedabad city, Capital, Project and Panchayat Circles, R & B Department,

All, Executive Engineers under above circles.

Copy To:

1. PA to Principal Secretary(R&B), Sachivalaya, Gandhinagar.
2. All Chief Engineers & Additional Secretaries (R&B), Sachivalaya, Gandhinagar.
3. Select File.



પરફોર્મન્સ બોન્ડ તથા જામીન અનામત પેટે બેંક  
ગેરેન્ટી મેળવવા બાબત

ગુજરાત સરકાર

માર્ગ અને મકાન વિભાગ

પરિપત્ર ક્રમાંક: ટી.એન.સી-૧૦-૨૦૧૩-૩૨(ભાગ-૧)-સ

સચિવાલય, ગાંધીનગર

તા.૧૯-૧૧-૨૦૧૩

વંચાણે લીધો પરિપત્ર ક્રમાંક:- ટી.એન.સી-૧૦૯૧/આઈબી/(૧૦)/(૧૧)/સ તા.૩૧-૩-૧૯૯૯

આમુખ:-

વંચાણે લીધેલ પરિપત્ર મુજબ હાલમાં ૧૫ લાખ કે તેથી વધુ રકમની કામો માં ઈજારદારશ્રી પાસેથી પરફોર્મન્સ બોન્ડ લેવાની જોગવાઈ છે. પરંતુ હવે મોટા ભાગના કામો ૧૫ લાખ થી વધુ રકમના હોય છે અને ચાલુ મરામતના કામો પણ હવે ૧૫ લાખ થી વધુ રકમના હોય છે. આ બાબતે કોન્ટ્રાક્ટસ એસોસિએશન તરફથી પણ પરફોર્મન્સ બોન્ડ માટે કામની રકમ ની મર્યાદા વધારવા માટેની રજુઆત કરવામાં આવેલ છે. આથી વહિવટી સરળતા અને અનુકુળતા જળવાય તે હેતુસર પરફોર્મન્સ બોન્ડ માટે કામની રકમમાં ફેરફાર કરવાનું સરકારશ્રીની વિચારણા હેઠળ હતું.

પરિપત્ર:-

પુખ્ત વિચારણાને અંતે નક્કી થયેલ છે કે હવે રૂ.૧૫ લાખ કે તેથી વધુ રકમને બદલે રૂ.૩૦ લાખ કે તેથી વધુ રકમ ના સરકારી કામોમાં ઈજારદારશ્રી પાસેથી પરફોર્મન્સ બોન્ડ લેવાના રહેશે.

આ પરિપત્ર વિભાગની સરખા ક્રમાંકની કાંઈલ પરની નોંધ પર નાણાંવિભાગની તા.૨૨-૯-૧૩ ના રોજથી મળેલ સંમતીથી બહાર પાડવામાં આવે છે.

ગુજરાત ના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે.



(આર.કે.ચૌહાણ)

ખાસ ફરજ પરના અધિકારી(ચિ.ચો.)

માર્ગ અને મકાન વિભાગ



બાંધકામના કોન્ટ્રાક્ટર પાસેથી સી.યુ.રીટી ડીપોઝીટ  
સ્વિકારવાની પ્રથામાં અંશતઃ ફેરફાર કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
ઠરાવ ક્રમાંક: ટીએનસી-૧૦-૨૦૧૩-૩-(બાગ-૨)-સી  
સચિવાલય, ગાંધીનગર  
તા.૨૦-૧૧-૨૦૧૩

વંચાશે લીધો ઠરાવ ક્રમાંક:- ટીએનસી-૧૦૮૮/આઈબી/૧૮/(૧૩) તા.૩૧-૮-૧૯૪

**આમુખ:-**

કોન્ટ્રાક્ટરોને આપવામાં આવતા કામો માં સીક્યુરીટી ડીપોઝીટ અંગેની હાલની પદ્ધતિ પ્રમાણે એગ્રીમેન્ટ સમયે ૫% પરફોર્મન્સ બોન્ડ બેંક ગેરંટી સ્વરૂપે, ૨.૫% સીક્યુરીટી ડીપોઝીટ નર્મદ બોન્ડ અથવા એન.એસ.એસ. સ્વરૂપે લેવામાં આવે છે તેમજ ૨.૫% રકમ ઈજારદારશ્રીના રનોંગ બીલમાંથી કપાત સ્વરૂપે વસુલ કરવામાં આવે છે. કોન્ટ્રાક્ટર્સ એસોસિએશન દ્વારા નાણાકીય તરલતા હેઠળ તે માટે ૨.૫% લેખે કાપવામાં આવતી સીક્યુરીટી ડીપોઝીટની રકમ બેંક ગેરંટી સામે છુટી કરવાની રજુઆત કરવામાં આવેલ હતી, જે બાબત વિચારણા હેઠળ હતી.

**ઠરાવ:-**

પુખ્ત વિચારણાને અંતે સરકારી કામોના કોન્ટ્રાક્ટ માટે સીક્યુરીટી ડીપોઝીટ સ્વિકારવાની હાલની પ્રથામાં નીચે મુજબ નો ફેરફાર કરવામાં આવે છે.

૧. હાલમાં પ્રથમ તબક્કે લેવામાં આવતી ૨.૫% સીક્યુરીટીની રકમ જે નર્મદા બોન્ડ/ એન.એસ.એસ. સ્વરૂપે લેવાની જોગવાઈ છે, તે કવે નર્મદા બોન્ડ/ એન.એસ.એસ. તેમજ શીડ્યુલ બેંકની એફ.ડી.આર. સ્વરૂપે પણ લઈ શકાયો.
૨. રનોંગ બીલમાંથી કપાત થતી ૨.૫% સીક્યુરીટી ડીપોઝીટની રકમ ઈજારદારશ્રી દ્વારા શીડ્યુલ બેંકની બેંક ગેરંટી રજુ કરેલી નીચે જણાવ્યા મુજબ રીલીઝ કરવાની રહેશે.

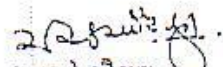
ક્રમ	નાણાકીય પ્રગતિ	રનોંગ બીલમાંથી ૨.૫% લેખે સીક્યુરીટી ડીપોઝીટ પેટે કાપવામાં આવેલ રકમ માંથી છુટી કરવા પાત્ર રકમ	બેંક ગેરંટીની રકમ
૧	ટેન્ડરની રકમના ૨૫%	રનોંગ બીલમાંથી કાપવામાં આવેલ રકમ અથવા કામની અંદાજિત કિંમતના ૦.૬૨૫%, બેમાંથી જે ઓછી રકમ હોય તે	રીલીઝ કરવામાં આવેલ રકમ જે લી
૨	ટેન્ડરની રકમના ૫૦%	રનોંગ બીલમાંથી કાપવામાં આવેલ રકમ અથવા કામની અંદાજિત કિંમતના ૧.૨૫%, બેમાંથી જે ઓછી રકમ હોય તે	રીલીઝ કરવામાં આવેલ રકમ જે લી
૩	ટેન્ડરની રકમના ૭૫%	રનોંગ બીલમાંથી કાપવામાં આવેલ રકમ અથવા કામની અંદાજિત કિંમતના ૧.૮૭૫%, બેમાંથી જે ઓછી રકમ હોય તે	રીલીઝ કરવામાં આવેલ રકમ જે લી

ઉપરોક્ત બેંક ગેરંટીની મુદત કામ પુર્ણ થવાની ખરેખર તારીખથી છ(છ)-માસ વધુ સમયની લેવાની રહેશે તથા ઈજારદારશ્રી પાસેથી બાંહેધરીપત્ર મેળવવાનો રહેશે કે, જો કામ પુર્ણ કરવાની સમયમર્યાદામાં વધારો થશે તો વધારેલ સમયમર્યાદાની તારીખથી ૬ માસ વધુ સમયમર્યાદા વાળી બેંક ગેરંટી નેઓશ્રી દ્વારા પુરી પાડવામાં આવશે.

કામ પુર્ણ થાય ત્યાં સુધી ઈજારદારશ્રી પાસેથી લેવાની થતી ૧૦% સીક્યુરીટી ડીપોઝીટનું પ્રમાણ કોઈપણ સ્વરૂપે જળવાઈ રહે તેની અચૂક કાળજી રાખવાની રહેશે.

આ ઠરાવ વિભાગનો સરખા ક્રમાંકની ફાઇલ પરની નોંધ પર નાણાવિભાગની તા.૬-૧૦-૧૩ ના રોજગી મળેલ સંમતીથી બહાર પાડવામાં આવે છે.

ગુજરાત ના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે.

  
(આર.કે.ચૌહાણ)  
પાસ ફરજ પરના અધિકારી(વિ.યો.)  
માર્ગ અને મકાન વિભાગ






સ્પષ્ટતા કરતા જણાવવાનું કે, ટેન્ડર કલોઝ નં. પલ્ડેની મુળ જોગવાઈ જે પ્રથમ ત્રણ પંક્તિમાં જણાવેલ છે તેમાં સ્પષ્ટ જણાવેલ છે કે, ".....SHALL BE ADJUSTED FOR INCREASE OR DECREASE IN THE RATES OF THESE MATERIALS AS UNDER" આમ આ કલોઝની આ જોગવાઈ હેઠળ જ આગળની કાર્યવાહી તે પ્રમાણે કરવાની થાય છે.

આમ, ઉપરોક્ત બાબતે સર્વે કાર્યપાલક ઈજનેરશ્રી તેમજ એકાઉન્ટન્ટશ્રીઓનું ધ્યાન દોરવું જરૂરી છે અને આવા વસુલાતપાત્ર કિસ્સામાં વસુલાત કરવામાં આવે તે બાબતે ધ્યાન આપવા તાકીદ કરવામાં આવે છે. જો આમ કરવામાં ચુક થશે તો સંબંધિત નાયબ કાર્યપાલક ઈજનેરશ્રી, કાર્યપાલક ઈજનેરશ્રી, વિભાગીય હિસાબનીશ / અધિકારીની સીધી જવાબદારી રહેશે.

સદર બાબતે સર્વે અધિક્ષક ઈજનેરશ્રીઓને સુચના આપવામાં આવે છે કે, તેઓના હસ્તકના વિભાગોમાંથી ના પ્રકારના કામો જુદા તારવી તેમાં વસુલાત કરવામાં આવી છે કે નહીં તે બાબતે યોગ્ય ચકાસણી કરી લેવી અને જો વસુલાત કરવામાં ના આવી હોય તો તે અંગે ત્વરિત જરૂરી વસુલાત કરવા જરૂરી સુચના સંબંધિત કાર્યપાલક ઈજનેરશ્રીને આપવી.

  
(અનં.જી. પરમાર)  
ખાસ ફરજ પરના અધિકારી (વિ.યો.)  
માર્ગ અને મકાન વિભાગ

S.E. RAJKOT  
R & B Circle No. II

INW: 306  
DATE: 3/3

મકાનો તથા પુલોના આર.સી.સી. કામોમાં લોખંડના સળીયાના માપો લખવા તથા ચૂકવણામાં લેપ લેન્થ ની લંબાઈ ગણતરીમાં નહીં લવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
સચિવાલય, ગાંધીનગર  
પરિપત્ર ક્રમાંક:- PDW-10-2017-01-C  
તા.૧૫-૦૨-૨૦૧૭

પરિપત્ર:-

મકાન, રસ્તા અને પુલોના કામોમાં આર.સી.સી. આઇટમોમાં સમાવિષ્ટ સ્ટીલ રેઇનફોર્સમેન્ટના માપો લખવા અને ચૂકવણા દરમિયાન લેપની લંબાઈ ગણતરીમાં લેવામાં આવે છે. રેઇનફોર્સમેન્ટમાં લેપની વધુ સંખ્યાને પ્રોત્સાહન ન આપતા સળંગ રેઇનફોર્સમેન્ટ (સળીયા) જ મહદઅંશે વપરાય એ તાંત્રિક રીતે વધુ યોગ્ય છે.

MORT&H સ્પેશીફિકેશનના પ્રવર્તમાન ધારાધોરણ મુજબ રેઇનફોર્સ (સળીયા)ના ચૂકવણામાં લેપની લંબાઈના માપો ગણતરીમાં લેવામાં આવતા નથી. (Section 1608)

MORT&H સ્પેશીફિકેશનના પ્રવર્તમાન ધારાધોરણ મુજબ માર્ગ અને મકાન વિભાગ હેઠળ મકાન, રસ્તા અને પુલના રેઇનફોર્સ (સળીયા)ના સ્પેશીફિકેશનમાં Mode of Measurement & Payment માં હવે પછી નીચે મુજબના ફેરફાર કરવા આથી સુચના આપવામાં આવે છે.

EXISTING ITEM	PROPOSED AMENDMENT (As per MORT&H Specification Item No.1608)
<p><u>મકાનના સ્પેશીફિકેશન</u></p> <p>5.4.10 Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.</p> <p>5.4.11 High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.</p> <p>3.2 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place lap joints, such</p>	<p><u>મકાનના સ્પેશીફિકેશન</u></p> <p>5.4.10 Providing an Mild Steel reinforcement for R.C.C. work including bending binding and placing in position etc. complete up to floor two level.</p> <p>5.4.11 High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.</p> <p>3.2 Reinforcement shall be measured in length including hooks, if any, separately for differencet diameters as actually used in work, excluding overlaps. From the length so</p>

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<p>joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per M-18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.</p>	<p>measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.</p>
<p><b><u>EXISTING ITEM</u></b></p>	<p><b><u>PROPOSED AMENDMENT</u></b> (As per MORT&amp;H Specification Item No.1608)</p>
<p><u>रस्ताला स्पेशलीकरण</u> Item No. 39 : Providing steel reinforcement. a) Providing and placing in position mild steel bar reinforcement including cutting, bending, hooking and tying complete as per details. b) High yield strength deformed bars reinforcement. (10) Reinforcement shall be measured in length separately for different diameters as actually used in the work, from the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS : 1732 even though steel is supplied to the contractor by the Department on actual wieghment. Length shall ilcude hooks at ends. Wastege and annealed steel wire for binding shall not be measured and cost of thes items shall be deemed to be</p>	<p><u>रस्ताला स्पेशलीकरण</u> Item No. 39 : Providing steel reinforcement. a) Providing and placing in position mild steel bar reinforcement including cutting, bending, hooking and tying complete as per details. b) High yield strength deformed bars reinforcement. (10) Reinforcement shall be measured in length including hooks, if any, separately for differerent diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or</p>



③

included in the rates for reinforcement.	<i>other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.</i>
<p><u>પુલના સ્પેશીફિકેશન</u> <b>Item: 21</b> –Providing (A) Mild Steel Reinforcement (B) High Yield Strength Deformed bars, reinforcements. (10) Reinforcement shall be measured in length including overlaps, separately for different diameter, as actually used in the work, where welding or coupling is restored to, in place of lap-joints, such joints shall be measured for payment as the equivalent length of over lap as per design requirement. From the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS 1732 even though steel is supplied to the contractor by the Department on actual weighment. Length shall include hooks at ends. Wastage and annealed steel wire for binding shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.</p>	<p><u>પુલના સ્પેશીફિકેશન</u> <b>Item: 21</b> –Providing (A) Mild Steel Reinforcement (B) High Yield Strength Deformed bars, reinforcements. (10) Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.</p>

*aydum*  
(એન. જી. પરમાર)  
ખાસ ફરજ પરના અધિકારી(વિ.યો.)  
માર્ગ અને મકાન વિભાગ

જિલ્લા મુખ્ય મંત્રી  
ગાંધી માર્ગ ભરૂચ જિલ્લો  
ભરૂચ

માર્ગ અને મકાન વિભાગના કામોમાં ડીફેક્ટ  
લાયેબીલીટી પીરીયડમાં ફેરફાર કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
ઠરાવ ક્રમાંક: ટીએનસી/૧૦/૨૦૧૬/કલોઝ-૧૭ એ/સુધારો/(૧)/સ  
સરદાર ભવન, બ્લોક નં.૧૪  
સચિવાલય, ગાંધીનગર  
તા.૧૨/૦૫/૨૦૧૬

સંદર્ભ:- માર્ગ અને મકાન વિભાગના કામો માટે નિયત કરેલ ટેન્ડર ફોર્મ બી-૧ અને બી-૨ ના કલોઝ-૧૭ એ માંની  
જોગવાઈ

આમુખ:-

ગુજરાત સરકાર માર્ગ અને મકાન વિભાગ દ્વારા હાથ ધરવામાં આવતા કામો માટે નિયત કરેલ ટેન્ડર ફોર્મ  
બી-૧ અને બી-૨ નો ઉપયોગ કરવામાં આવે છે. આ કામોમાં ડીફેક્ટ લાયેબીલીટી પીરીયડ માટે નિયત કરેલ ટેન્ડર  
ફોર્મ બી-૧ અને બી-૨ ના કલોઝ-૧૭ એ મુજબની કાર્યવાહી કરવામાં આવે છે. આ ડીફેક્ટ લાયેબીલીટી પીરીયડની  
જોગવાઈઓમાં ફેરફાર કરવાની બાબત સરકારશ્રીની સક્રિય વિચારણા હેઠળ હતી.

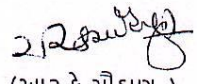
ઠરાવ:-

ઉપરોક્ત બાબતે પુખ્ત વિચારણાના અંતે માર્ગ અને મકાન વિભાગના કામો માટે નિયત કરેલ ટેન્ડર ફોર્મ  
બી-૧ અને બી-૨ માંના ડીફેક્ટ લાયેબીલીટી પીરીયડ અંગેના કલોઝ-૧૭ એ માંની જોગવાઈઓમાં નીચે મુજબનો  
ફેરફાર કરવામાં આવે છે.

Clause	Existing Provision	Modified Provision
17 A (b)	For all works costing more than Rs.50,000/- and up to Rs.1 crore (amount put to tender), period shall be <b>6 months</b> from the certified date of completion or one monsoon, whichever is later.	For all works costing more than Rs.50,000/- and up to Rs.1 crore (amount put to tender), period shall be <b>12 months</b> from the certified date of completion or one monsoon, whichever is later.
17 A (c)	For major projects costing more than <b>Rs. 1 crore</b> , period shall be <b>12 months</b> from the certified date of completion which should include one monsoon	For major projects costing more than <b>Rs. 1 crore, (amount put to tender)</b> , period shall be <b>36 months (thirty six)</b> from the certified date of completion or three monsoons, whichever is later.

ઉપરોક્ત ઠરાવ સરખા ક્રમાંકની ફાઇલ પરની નોંધમાં માનનીય મંત્રીશ્રી (મા.મ.)ની તા.૧૦/૦૫/૨૦૧૬ના  
રોજ મંજૂરી મેળવી બહાર પાડવામાં આવેલ છે. આ ઠરાવના ઇસ્યુ તારીખથી ઉપરોક્ત સુધારેલ જોગવાઈઓનો  
ચુસ્તપણે અમલ કરવાનો રહેશે.

ગુજરાતના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે,

  
(આર.કે.ચૌહાણ )  
ખાસ ફરજ પરના અધિકારી (વિ.ચો. )  
માર્ગ અને મકાન વિભાગ  
ગાંધીનગર



**INVITATION OF TENDER ON PERCENTAGE  
RATE (B-1) TENDER CONTRACT FORM**

Government of Gujarat  
Road & Buildings Department  
**No.TNC-1088-D-347-(7)-C**  
Schivalaya, Gandhinagar  
Date:- 11/07/2017

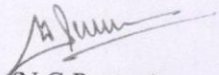
**Reference:-**

1. R & B Department Resolution No.CON-1269-PAC-(52)-C, Dated 05/06/1985
2. R & B Department Resolution No.TNC-1088-D-347-(7)-C dated 22/04/1988
3. R & B Department Resolution No. TNC-1088-D-347-(7)-C dated 05/08/1988
4. R & B Department Resolution No. TNC-1088-D-347-(7)-C dated 15/12/2003

**RESOLUTION**

1. The question of raising monetary limit for B-1 tender form from Rs.50.00 lakhs (Rupees Fifty Lakhs only) was under consideration of Government. Government is pleased to order that the monetary limit of Rs.50.00 lakhs (Rupees Fifty Lakhs only) for B-1 tender form (fixed under aforesaid G.R. dated 15/12/2003) is hereby enhanced to Rs.12.00 Crore (Rupees Twelve Crore only) for Road works, and Rs.10.00 Crore (Rupees Ten Crore only) for Bridge and Building works. This enhanced monetary limit shall be applicable to the tenders to be invited hereafter with the strict application of a condition that tenders for the works amount put to tender upto Rs.12.00 Crore (Rupees Twelve Crore only) for Road works, and Rs.10.00 Crore (Rupees Ten Crore only) for Bridge and Building works should invariably be invited on B-1 tender form only.
2. Other safeguards and instructions in the G.Rs. mentioned in reference should be strictly followed.
3. These orders are issued with the concurrence of Finance Department dated 27/06/2017 on this Department's file No. TNC-102013-731236-04-C

By order and in the name of the Governor of Gujarat,

  
(N.G.Parmar)  
Officer on Special Duty (S.P)  
R&B Department  
Gandhinagar



ટેન્ડરમાં જથ્થાવધારા તથા  
જથ્થાવધારાના ભાવના માપદંડમાં  
સુધારણા કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
બ્લોક નં.૧૪/૨, સરદાર ભવન,  
સચિવાલય, ગાંધીનગર  
ઠરાવ ક્રમાંક: TNC-10-2017-01-C  
તા.૧૧/૦૭/૨૦૧૭

**ઠરાવ**

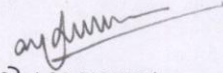
ટેન્ડરમાં જથ્થાવધારા તથા જથ્થાવધારાના ભાવના માપદંડ બાબતે બી-૧ અને બી-૨ ટેન્ડરના કલોઝ-૧૪.૨ માં જણાવ્યા મુજબ જથ્થાવધારા માટે ૩૦ ટકા સુધીનો જથ્થો ટેન્ડરના ભાવથી અને ૩૦ ટકાથી વધુ જથ્થામાં વધારો હોય તો જે તે વર્ષમાં કામગીરી કરેલ હોય તે વર્ષના એસ.ઓ.આર.થી કરવાની જોગવાઈ છે.

સદરજુ જોગવાઈમાં સુધારણા કરવા બાબતે સરકારશ્રીમાં ઘણા લાંબા સમયથી વિચારણા હેઠળ હતું. જે અન્વયે નીચે મુજબનો સુધારો કરવામાં આવે છે.

EXISTING CLAUSE	AMENDMENT
<b>Form B-1 Clause- 14.2</b> <b>Form B-2 Clause- 14.2</b> Except that when the quantity of any item exceeds the quantity as in the tender by more than 30% the contractor will be paid for the quantity in excess of 30% at the rate entered in the SOR of the year during which the excess in quantity is first executed and for the material consumed in excess quantity the rate for the material to be charged would be basic rate taken into account for fixing the rate for the SOR above instead of the rate stipulated in Schedule-A.	<b>Form B-1 Clause- 14.2</b> <b>Form B-2 Clause- 14.2</b> Except that when the quantity of any item exceeds the quantity as in the tender by more than 10% the contractor will be paid for the quantity in excess of 10% at the rate entered in the SOR of the year during which the excess in quantity is first executed or tender rate whichever is less.

ઉપરોક્ત તમામ સુચનાનો અમલ ચુસ્તપણે તાત્કાલિક અસરથી કરવાનો રહેશે.

ગુજરાત રાજ્યના રાજ્યપાલશ્રીના હુકમથી અને તેમના નામે,

  
(એન.જી.પરમાર)  
ખાસ ફરજ પરના અધિકારી (વિ.ચો. )  
માર્ગ અને મકાન વિભાગ  
ગાંધીનગર

**STANDARDS FOR CEMENT  
CONSUMPTION FOR DIFFERENT  
ITEMS OF WORK**

**Government of Gujarat**  
Roads & Building Department,  
Circular No. PRC/10/2017/Cement Consumption/16/C  
14, Sardar Bhavan, 2nd Floor,  
Sachivalaya, Gandhinagar  
Date:- 11/05/2017

**Read:-** Government of Gujarat, Road & Building Department, Sachivalaya, Gandhinagar Circular  
No. SOR/1085/7/H(1) dated 08/12/1986.

**CIRCULAR**

The uniform rate of cement consumption for various item was prepared and circulated vide  
No. SOR/1085/7/H(1) dated 08/12/1986.

At the outset, current practice of estimating cement consumption in concrete item of  
various Building, Bridge and Road project is based on above circular. However, it is generally  
observed that the cement consumption derived by actual mix design is lower than the standard  
cement consumption. Some of provision of the said circular become obsolete due to subsequent  
revisions in the relevant IS code and IRC code. The maximum cement consumption as per IS :  
456-2000 and IRC : 112-2011 is 450 Kg./m<sup>3</sup>. Also cement industry and aggregate crushing  
industry have involved better quality of cement and aggregate over the years which have far  
reaching impact on mix design of the present day concrete.


Mix design report of GERI reflecting entire Gujarat region have been considered in  
averaging the cement consumption in various grade of design mix concrete. To minimize the  
difference between standard cement consumption of cement and actual consumption derived by  
mix design by GERI and the cement consumption as per provision of IS and IRC code falling  
cement consumption is proposed for estimation purpose.

Looking the above facts, the cement consumption mentioned in circular vide No.  
SOR/1085/7/H(1) dated 08/12/1986 is required to modify as per below:



EXISTING ITEM			AMENDMENT		
Item	Unit	Quantity of cement to be used per unit quantity of work in Kg	Item	Unit	Quantity of cement to be used per unit quantity of work in Kg
Building, Road & Bridge Items					
Providing & casting in situ ordinary cement concrete M75 for PCC work	Cu.m.	160	Providing & casting in situ ordinary cement concrete M7.5 for PCC work	Cu.m.	160
Providing & casting in situ ordinary cement concrete M100 for PCC work	Cu.m.	220	Providing & casting in situ ordinary cement concrete M10 for PCC work	Cu.m.	220
Providing & casting in situ ordinary cement concrete M150 for PCC work	Cu.m.	320	Providing & casting in situ ordinary cement concrete M15 for PCC work	Cu.m.	290
Providing and casting situ control cement concrete M200 for RCC work	Cu.m.	400	Providing and casting situ control cement concrete M20 for RCC work	Cu.m.	360
Providing and casting situ control cement concrete M250 for RCC work	Cu.m.	450	Providing and casting situ control cement concrete M25 for RCC work	Cu.m.	380
Providing and casting situ control cement concrete M350 for RCC work	Cu.m.	500	Providing and casting situ control cement concrete M35 for RCC work	Cu.m.	425
Providing and casting situ control cement concrete M400 for RCC work	Cu.m.	525	Providing and casting situ control cement concrete M40 for RCC work	Cu.m.	440
Providing and casting situ control cement concrete M450 for RCC work	Cu.m.	540	Providing and casting situ control cement concrete M45 for RCC work	Cu.m.	450
New Item					
			Providing and casting situ control cement concrete M30 for RCC work	Cu.m.	410

The cement consumption of other than above concrete item and other details mentioned in circular vide No. SOR/1085/7/H(1) dated 08/12/1986 will be remain same.

  
(N.G. Parmar)  
Officer on Special Duty (S.P.)  
R&B Department  
Gandhinagar

To,

- 1) The Personal Secretary, Office of the Secretary, Road & Building Department, Sachivalaya, Gandhinagar
- 2) The Personal Secretary, Office of the Secretary, Narmada, Water Resources, Water Supply and Kalpsar Department, Sachivalaya, Gandhinagar
- 3) The Personal Secretary, Office of the Principal Secretary, Health & Family Welfare Department, Sachivalaya, Gandhinagar
- 4) The Personal Secretary, Office of the Additional Chief Secretary, Urban Development and Urban Housing Department, Sachivalaya, Gandhinagar
- 5) The Personal Secretary, Office of the Principal Secretary, Panchayat, Rural Housing and Rural Development Department, Sachivalaya, Gandhinagar
- 6) Accountant General, Rajkot/Ahmedabad
- 7) All the Chief Engineers, Road & Building Department, Sachivalaya, Gandhinagar
- 8) All the Chief Engineers, Narmada, Water Resources, Water Supply and Kalpsar Department, Sachivalaya, Gandhinagar
- 9) The Managing Director, Gujarat State Road Development Corporation, Nirman Bhavan, Gandhinagar
- 10) The Chief Engineer & Director, Staff Training College, Gandhinagar
- 11) The Director, Gujarat Engineering Research Institute (GERI), Vadodara
- 12) The Under Secretary, Gujarat Vigilance Commission, Vigilance Bhavan, Gandhinagar
- 13) All the Superintending Engineers, Road & Building Department (State, Panchayat, National Highway, Capital Project Circle, Electric Circle)
- 14) All the Executive Engineers, (as above circles)
- 15) All Technical Officers, Road & Building Department, Sachivalaya, Gandhinagar
- 16) All Technical Branches, Road & Building Department, Sachivalaya, Gandhinagar
- 17) President, Gujarat Contractors Association, Gajjana Hall, Law Garden, Law College Road, Ahmedabad
- 18) Branch Select file-20/7

રસ્તા, પુલો અને મકાનોની ગુણવત્તા  
ચકાસણી માટેના નિયતપત્રકોનો ઉપયોગ  
ઇન્સ્પેક્શન નોંધ માટે કરવા બાબત

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
બ્લોક નં.૧૪/૨, સરદાર ભવન,  
સચિવાલય, ગાંધીનગર  
ક્રમાંક: PRC-10-2017-31-C  
તા.૨૬/૦૫/૨૦૧૭

### પરિપત્ર

માર્ગ અને મકાન વિભાગના રસ્તા, પુલ અને મકાનના કામો ઇજારદારશ્રી મારફત કરાવવામાં આવે છે. આ કામોની ગુણવત્તા ચકાસણી કરવાનું કામ ગુણવત્તા નિયમન (મા.મ.) વિભાગ દ્વારા કરવામાં આવે છે. કામોની ચકાસણી માટે ગુણવત્તા નિયમન (મા.મ.) વિભાગ હેઠળ ગુજરાત રાજ્યમાં કુલ-૬ (છ) કાર્યપાલક ઇજનેરશ્રીઓની નિમણુંક કરવામાં આવેલ છે. કામોની ગુણવત્તા ચકાસણી કરી તેનો સ્થળસ્થિતિ મુજબનો ઇન્સ્પેક્શન રીપોર્ટ કાર્યપાલક ઇજનેરશ્રી દ્વારા તૈયાર કરી જે તે સંબંધિત કાર્યપાલક ઇજનેરશ્રીને પૂર્તતા અર્થે સાદર કરવામાં આવે છે અને એની જાણ જે તે વિભાગના સંબંધિત અધિક્ષક ઇજનેરશ્રી અને મુખ્ય ઇજનેરશ્રીને કરવામાં આવે છે. ગુણવત્તા નિયમનના કાર્યપાલક ઇજનેરશ્રીઓ દ્વારા રજુ કરવામાં આવતા ઇન્સ્પેક્શન રીપોર્ટની વિગતોમાં એકસરખા ફોર્મેટ વિભાગ દ્વારા નિયત કરેલ ન હોવાથી એકસૂત્રતા રહેતી નથી.

મુખ્ય ઇજનેરશ્રીઓની કમિટીમાં નક્કી થયા મુજબ ઇન્સ્પેક્શન રીપોર્ટમાં એકસૂત્રતા રહે અને પી.એમ.જી.એસ.વાય.માં “ગ્રેડ સિસ્ટમ” વાળો રીપોર્ટ સાદર કરવામાં આવે છે એ પદ્ધતિએ ઇન્સ્પેક્શન રીપોર્ટનું ફોર્મેટ બનાવવા જણાવવામાં આવેલ હતું. માર્ગ અને મકાન વિભાગના રસ્તા, પુલ અને મકાન માટેના ગુણવત્તા ચકાસણી કરવા માટેના ઇન્સ્પેક્શન રીપોર્ટના ફોર્મેટ ગ્રેડ સિસ્ટમવાળા આ સાથે તૈયાર કરવામાં આવેલ છે. હવે પછી ગુણવત્તા વિભાગના મુખ્ય ઇજનેરશ્રી, અધિક્ષક ઇજનેરશ્રી, કાર્યપાલક ઇજનેરશ્રી, સંબંધિત અધિક્ષક ઇજનેરશ્રી તથા જે કોઈ પણ અધિકારીશ્રી ગુણવત્તા ચકાસણીની કામગીરી કરે તેમણે આ ફોર્મેટનો ઇન્સ્પેક્શન રીપોર્ટ માટે ઉપયોગ કરવાનો રહેશે.

કામની ચકાસણી કર્યા બાદ કામનો એકંદરે ગ્રેડ “S (Satisfactory), SRI (Satisfactory but require improvement) કે U (Unsatisfactory)” આપવાનો રહેશે.

(૧) જો ગુણવત્તા ચકાસણીમાં કામનો એકંદરે ગ્રેડ “S” મળશે તો એ કામ Satisfactory કક્ષાનું હોય કોઈ પૂર્તતા કરવાની રહેતી નથી.

(૨) જો ગુણવત્તા ચકાસણીમાં કામની એકંદરે ગ્રેડ "SRI" (Satisfactory but require improvement) મળશે તો જે તે આઉટમમાં "SRI/U" ગ્રેડ મળેલ છે એ આઉટમની સુધારણા ટેન્ડરમાં જણાવેલ સ્પેશીકીકેશન મુજબ કરી એનો "ATR" (Action Taken Report) સંબંધિત કાર્યપાલક ઇજનેરશ્રીએ તૈયાર કરી જે તે ગુણવત્તા નિયમન વિભાગના કાર્યપાલક ઇજનેરશ્રીની કરીથી સ્થળ મુલાકાત કરાવશે અને ગુણવત્તા નિયમન વિભાગના કાર્યપાલક ઇજનેરશ્રી પૂર્તતા સાથે સહમત હોય તો અહેવાલ અધિક્ષક ઇજનેરશ્રી, ગુણવત્તા નિયમન વિભાગને સાદર કરશે. અધિક્ષક ઇજનેરશ્રી, ગુણવત્તા નિયમન વિભાગ પૂર્તતા અહેવાલ યોગ્ય હશે તો રીગ્રેડ એટલે "SRI/U" માંથી "S" માટે ભલામણ કરશે. ત્યારબાદ સદરહુ પૂર્તતા અહેવાલ સંબંધિત અધિક્ષક ઇજનેરશ્રી મારફત સંબંધિત મુખ્ય ઇજનેરશ્રીને સાદર કરવાનો રહેશે. સંબંધિત મુખ્ય ઇજનેરશ્રીએ સદરહુ "ATR" મુખ્ય ઇજનેરશ્રી ગુણવત્તા નિયમન વિભાગને પૂર્તતા ગ્રાહ્ય રાખી "S" ગ્રેડીંગ આપવા માટે ભલામણસહ સાદર કરવાનો રહેશે. ગુણવત્તા નિયમન વિભાગમાંથી પૂર્તતા ગ્રાહ્ય રાખી "S" ગ્રેડીંગનું પ્રમાણપત્ર મળ્યા બાદ જ આ આઉટમનું બાકીનું ચૂકવણું કરવાનું રહેશે.

(૩) ગુણવત્તા ચકાસણીમાં કામની એકંદરે ગ્રેડ "U" (unsatisfactory) મળશે તો જે તે આઉટમમાં "SRI/U" મળેલ છે એ આઉટમમાં સુધારણા અથવા Reconstruction (આઉટમ કરીદો કરવી) ટેન્ડરમાં જણાવેલ સ્પેશીકીકેશન મુજબ કરી એનો "ATR" સંબંધિત કાર્યપાલક ઇજનેરશ્રીએ તૈયાર કરી જે તે ગુણવત્તા નિયમન વિભાગના કાર્યપાલક ઇજનેરશ્રીની કરીથી સ્થળ મુલાકાત કરાવશે અને ગુણવત્તા નિયમન વિભાગના કાર્યપાલક ઇજનેરશ્રી પૂર્તતા સાથે સહમત હોય તો અહેવાલ અધિક્ષક ઇજનેરશ્રી, ગુણવત્તા નિયમન વિભાગને સાદર કરશે. અધિક્ષક ઇજનેરશ્રી, ગુણવત્તા નિયમન વિભાગ પૂર્તતા અહેવાલ યોગ્ય હશે તો રીગ્રેડ એટલે "SRI/U" માંથી "S" માટે ભલામણ કરશે. ત્યારબાદ સદરહુ પૂર્તતા અહેવાલ સંબંધિત અધિક્ષક ઇજનેરશ્રી મારફત સંબંધિત મુખ્ય ઇજનેરશ્રીને સાદર કરવાનો રહેશે. સંબંધિત મુખ્ય ઇજનેરશ્રીએ સદરહુ "ATR" મુખ્ય ઇજનેરશ્રી, ગુણવત્તા નિયમન વિભાગને પૂર્તતા ગ્રાહ્ય રાખી "S" ગ્રેડીંગ આપવા માટે ભલામણસહ સાદર કરવાનો રહેશે. ગુણવત્તા નિયમન વિભાગમાંથી પૂર્તતા ગ્રાહ્ય રાખી "S" ગ્રેડીંગનું પ્રમાણપત્ર મળ્યા બાદ જ સમગ્ર કામનું બાકીનું ચૂકવણું કરવાનું રહેશે.

ડિપ્રોટેક્ટ સુચનાની આમલ પૂર્ણપણે નોંધાયેલ અસરથી કરવાનો રહેશે.

વિ.કે.સી.

(૧) રસ્તા, ખૂલ અને મકાનના કામોની ગુણવત્તા

ચકાસણી માટેના નિયત પત્રકો

(૨) એ.ટી.આર.નું નિયત પત્રક

(એન.જી.પરમાર)

બા.સ. ફરજ પરના અધિકારી (વિ.યો.)

માર્ગ અને મકાન વિભાગ

ગાંધીનગર

# **BHAVNAGAR MUNICIPAL CORPORATION**



**-: BID DOCUMENTS FOR :-**

**PROPOSED DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED  
ON PANCH SHAKTI THEME AT-VIJAYRAJNAGAR, BHAVNAGAR.**

**SPECIFICATIONS FOR OPERATION AND MAINTENCE**

**EXECUTIVE ENGINEER  
Building Department  
Bhavnagar Municipal Corporation  
Mangalsinhji Road,  
Bhavnagar – 364 001**



## **SPECIFICATION FOR OPERATION AND MAINTENANCE**

### **SECTION-A: CONDITIONS FOR OPERATION AND MAINTENANCE I - ADMINISTRATIVE PROVISIONS**

#### **MATERIAL, TOOLS AND TEST EQUIPMENTS:**

All materials required for the O&M of the project shall be new and of best quality and suitable for the purpose intended. These shall be got approved from the Engineer in charge before use.

#### **ELECTRICITY SUPPLY:**

Contractor shall keep good liaison with concerned Electric Authority for power supply. In case of increase or electric power failure (break down/shut down) it shall be the responsibility of the agency to inform all the concerns as well as to contact concerned authorities to restore the power supply.

#### **WORK ORDER BOOK:**

A bound half sheet size work order book shall be provided by the contractor and handed over to the person for maintaining at the work site. This shall be a permanent record. The contractor or his Resident engineer shall sign against instructions & orders recorded by the Engineer in charge or his representative for the maintenance work. He may take out a copy thereof if necessary. He shall take prompt action as per the instruction/orders of the owner and necessary compliances shall be recorded against each instruction / order.

#### **ACCIDENT ON THE WORKS:**

The contractor shall be fully responsible for any accident that may occur to the labour on his work on duty and report the same to the Engineer in charge and concerned Govt. Labour department authority and shall pay all necessary compensation as per rules. Contractor shall also be fully responsible for any loss to any individual or public property occurred due to him or his workers negligence under the scope of this contract.

**USE OF SITE:**

The contractor shall not unreasonably occupy the site with materials and equipment. The contractor shall not use land for any private purpose.

**COMPLIANCE:**

The contractor shall be bound by all ordinance acts, codes, rules, regulations and orders of which in any way affects conduct of works, or workmen engaged for the work. The contractor shall be responsible for any violation of any govt. rules & regulations. It shall be the responsibility of the contractor against any claim or liability arising from violation of above.

**HANDLING OF CHEMICALS:**

Safety and facilities to the staff for handling of chemicals and equipment's is an important consideration. Handling of chemicals needs special attention. Following instructions are for guidance of the contractor and observing them strictly at his cost.

**ACCOMODATION FORSTAFF:**

Contractor shall provide necessary accommodation to their labours & engineers at his own cost.

**TRANSPORTATION:**

Contractor shall have to make his own arrangements for conveyance of his staff at his cost. No facility will be provided by the owner

**MEDICAL:**

Contractor shall provide medical facility to his staff at his cost.

**CONTRACTOR'S STAFF & THEIR CONDUCT ETC, NATIONALITY & ADDRESS:**

All employees shall be Indian Nationality and it shall be contractor's responsibility to give temporary and permanent address. Convicted or penalized person shall not be employed. Identity card must be issued to each employee of contractor.

**SALARY TO EMPLOYEES:**

Contractor shall strictly follow labour laws and shall also ensure regular monthly

salary payment to his staff. The owner will not take any liability of any of his employees appointed for operation and maintenance under this contract. Contractor shall submit monthly certificate for full payment to his staff on or before 10th of every Month. Owner reserves the right to conform the contents of the certificate from contractor's employee for their last pay. The owner will not be responsible for any delayed payment/compensation / overtime or any other claims by employees of contractor during the tender period and even after the tender period.

**IDENTIFICATION DRESS CODE WITH BADGE WITH IDENTITYCARD:**

Contractor shall have to provide special dress code with identification badge with name plate strip to be displayed on front pocket to each staff as approved by Engineer in charge along with Identity Card etc.

**HOLIDAYS AND LEAVE:**

Holidays and leaves shall be given to staff as per relevant labour rules. During holidays / casual leave/earned leaves etc. and contractor shall arrange for the substitute. The owner shall not make any separate payment of overtime for these substitutes provided by the contractor during above periods.

**CONDUCT:**

All employees of the contractor shall follow the instruction of Engineer in charge. If any employee misbehaves with Engineer in charge, he / she shall be immediately removed from duty and substitute for that shall be employed by the contractor. If contractor fails to do so, penalty of Rs. 200/- (Rupees Two hundred only) per day per such case will be levied, this amount shall be recovered from the bill or any due amount of agency. All employees of the contractor shall follow the instruction of Engineer in charge. If any employee misbehaves with Engineer in charge, he / she shall be immediately removed from duty and substitute for that shall be employed by the contractor. If contractor fails to do so, penalty of Rs. 200/- (Rupees Two hundred only) per day per such case will be levied, this amount shall be recovered from the bill or any due amount of agency

**VISITORS:**

Visitors are expected to visit as this is a public project. It is expected required staff and Engineers be present and follow the directives of Engineer in charge.

## **SCHEDULE 1**

### **OPERATION AND MAINTENANCE SERVICES:**

The Contractor shall be required to perform the following services under these Conditions:

The Contractor shall be responsible for preventive and corrective maintenance of civil, **LANDSCAPING**, hydraulic, mechanical, electrical and computing equipment as well as miscellaneous equipment.

The Contractor shall be responsible for carrying out regular servicing and lubrication of rotary machines, complying with maintenance instructions as defined in the Operation and Maintenance Manual, and ensuring that electromechanical equipment and motors operate correctly at all times.

The Contractor shall ensure that measurement systems operate correctly at all times. The Contractor is responsible for the maintenance of the landscaped areas inside the Employer plant fences.

The Contractor shall be responsible for maintenance of all civil structures.

The Contractor will operate and maintain in a state of continuous operational readiness all plant and systems to meet the flow requirements. It shall remain the Contractor's responsibility to ensure that plant systems are at all times able to operate to the maximum capacity of the installed duty plant.

For the duration of the O & M period, the Contractor will be responsible for the supply and control of lubricants, spare parts and consumable materials excluding electrical power, necessary for the continuous operation of the works.

The Contractor will manage the consumables and utilities services to ensure their most economic consumption and to minimize wastage.

The quantities of all the unutilized spare parts and consumable materials will be fully handed-over to the Employer at the end of the O&M period.

The store's inventory, the issuing and recording of spare parts will be the responsibility of the Contractor. The Contractor is also responsible for providing spare parts and material required for the operation and maintenance during the operation period, and shall bear the cost for the same, including the cost of storing and safeguarding.

The Contractor will make all necessary arrangements to ensure the continuous supply of spare parts and material for the works and the rate of supply of these materials shall be in such quantities and amounts as would ensure uninterrupted operation. All the furniture and administrative office equipment etc. required shall be furnished by the Contractor. Costs of operating administrative office and supplies shall be borne by the Contractor.

The Contractor shall take out subscriptions for standard telephone lines. Running cost for the telephone sets will be borne by the Contractor.

Cost of operation and maintenance and housekeeping of Project area including domestic water supply and drainage, roads, gardens, electrical installations, etc. will be borne by the contractor.

The Contractor will provide staff personnel for the full term of O & M as per requirements.

**PERIODICAL MAINTENANCE SCHEDULE:**

The contractor shall carry out periodically maintenance as per maintenance schedule approved by the Engineer in charge. Periodically maintenance shall also include daily observation and cleaning of equipment. Contractor has to do painting to Every Civil Structures, pumping machineries, manifolds, Valves etc. as directed by Executive Engineer at every two years. I.e. **once at the end of contract period.**



## **SCHEDULE - 2**

### **FORTNIGHTLY REPORT:**

In addition to any other reports required by the Contract, the Contractor shall prepare and deliver to Board, twice every month, a report (the Fortnightly Report) in English and Gujarati that includes,

The format of the report shall be prepared in consultation of EIC and be approved by him which shall include the following activity

- (a) A summary of monthly activity;
- (b) A human resources report, including,
  - (i) Number and categories of Operations Staff; and
  - (ii) Duty list, attendance and activities carried out;
- (c) A report on technical and operational data, including,
  - (i) Volumes of water recycled/ filtered;
  - (ii) Chemical consumption;
  - (iii) Energy consumption; and
  - (iv) Maintenance activities.
- (d) A report on water quality, including,
  - (i) Raw water quality; and
  - (ii) Treated and pool water quality;
- (e) A report on the Contractor's performance with respect to the Performance Standards;
- (f) Any other item to monitor

The Contractor shall deliver the FORTNIGHTLY Reports to concern department no later than 5 days after the end of the month to which the fortnightly Report applies.

Monthly Billing can be raised up to 5th of next month including details of the monthly activity as per maintenance schedule to Executive Engineer.

### **HALF YERLY REPORT:**

At every SIX month the agency shall prepare a report of the total activity plus the checking report of all the machinery, plants, electric and instrumentation work for the performance.

## **SCHEDULE – 3**

### **INSURANCES:**

Insurance against Injury to Persons and Damage to Property the Contractor shall insure against each liability for any loss, damage, death or bodily injury which may occur to any physical property (mechanical, electrical, automation work excluding pipe line, other civil work, and storage) or to any person which may arise out of the Contractor's performance of his obligations under these Conditions during the O & M Period. This insurance shall be for a limit of per occurrence of not less than the amount, with no limit on the number of occurrences.

### **INSURANCEFOR CONTRACTER'S PERSONNEL:**

The Contractor shall effect and maintain insurance against liability for arising from injury, sickness, disease or death of any person employed by the Contractor or any other of the Contractor's Personnel. The Employer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claims to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

Contractor shall have to take insurance for Electro - Mechanical Works, & filter plant. This General Insurance for the work will be in the name of Bhavnagar Municipal Corporation. The insurance for skilled, semi- skilled and unskilled labour is compulsory. The same should be taken by agency as per labour act laws in force.

## SECTION - "B"

### SPECIAL TERMS AND CONDITIONS:

#### (PART - 1)

##### 1.0 TECHNICAL CONDITIONS:

- 1) The project is a public project where the visitors are visiting to use the facility. The contractor shall carry out each and every Operation maintenance and repairing work
- 2) The bidders should strictly note that rate will be fixed and firm. No escalation will be given during the maintenance period.
- 3) Necessary WATER is supplied & justifiable electric bill shall be paid by the department.
- 4) All other required material for O&M work shall be brought by the contractor at his own cost including loading, unloading and carting and the same material shall get approval from the Engineer-in-charge before use in the work.
- 5) The cost is including all type of taxes, freight, loading, unloading, carting labour charges payment to labour including insurance, P.F. and all other liabilities for the staff engaged for the O&M work.
- 6) All replace material shall be return to department store by the contractor at his own cost.
- 7) In each and **every running bill the 1%** of gross amount of bill shall be deducted for want of annual maintenance of civil work, which will be released after satisfactory maintenance of civil work carried out by the contractor.
- 8) By any reasons if system will remain under defunct conditions this will not affect the O & M Payment.
- 9) The contractor shall have to make necessary arrangement for the safety & security of the project works / structures / assets / pipe line / machineries / equipment's etc. Contractor may take service of Retired Army Man, Retd. CISF/GSF PSI or security agencies etc.

- 10) The contractor has to register complaint in the form of FIR to the concerned police station if any illegal activity is found in premises.
- 11) The contractor shall calibrate / service all flow meters & instrumentation installed at plant works etc. as & when required and shall maintained the register for the same. He shall ensure that all the flow meters are always in working condition.
- 12) The responsibility for any legal problem accident etc. shall rest with the contractor.
- 13) The contractor shall make necessary arrangement for insurance of the staff engaged for the period of O&M of the scheme at his own cost.
- 14) The contractor shall observe the provisions of Minimum Wages Act strictly necessary labour license shall be obtained by the contractor at his own cost.
- 15) After completion of the maintenance period, contractor shall hand over all the assets of the project in condition acceptable to the owner.
- 16) The operation and maintenance of all the works included in this tender as per details given should be carried out by contractor at his own cost.
- 17) All the required electrical goods like CFL, bulb, tube light, chock, starter, fuse, wire, etc. Required for operation and maintenance shall be procuredby contractor at his own cost and lighting arrangement should be kept in good condition.
- 18) During the period of contract, a person other than responsible representative of contractor or persons employed by him should not enter into the premises of the works site. Every care should be taken by contractor to prevent such type of unauthorized entry or interruption in the premises or surrounding the property of BMC.
- 19) At any time during the visit of Engineer in charge or his representative if it is observed that the operation and maintenance is not carried out properly and contractor is responsible for it recovery will be made at double rate of contract for that particular day or contract will be terminated.
- 20) Prescribed registers as maintained by agency during the period of operation and maintenance period shall be submitted to the department.

- 21) Proper care is to be taken by contractor to keep neat and clean. Every component of work sites and maintenance of all the components shall be done by contractor.
- 22) Servicing of all the valves cleaning of all civil works and maintenance shall be carried out regularly by contractor and entered into the concerned registers.
- 23) The contractor has to make all the arrangements required for the proper operation, maintenance and safety of all the works included in this contract at his own cost during the whole contract period.
- 24) List of all the assets will be handed over to contractor for O&M purpose & same has to return to Department with good conditions as soon as the project is taken over by department for further O&M period to any other party.
- 25) Any damage / breakage found from mischievous element found in the system, the contractor should lodge police case immediately under intimation to concern Dy. Executive Engineer/Executive Engineer.
- 26) Material consumption register in prescribed format should be maintained by the contractor. During the visit of Engineer - in - charge if required it should be produced.
  - a) Electric bill for running the plant and premises will be paid by agency in prescribed time limit given in bill and same amount will be reimbursed by department on the receipt of payment of bill. Penalty if any for delay will have to be paid by contractor to GEB at his own cost. No reimbursement for the penalty amount will be paid to contractor by the department. Telephone bills will have to be paid by the bidder. No reimbursement shall be made.
  - b) Electric / Mechanical / Battery operated flow meter has to be maintained by successful bidder. In case of failure of batteries, same has to be replaced by successful bidder at his own cost.
  - c) The qualification and capability of the Contractor's personnel shall be appropriate for the task they are assigned to perform. The staff provided shall be fully trained in the operation of the area development work before being given responsibility for



operating any part of the plant. If in the opinion of the Engineer, any member of the Contractors staff is considered to be insufficiently skilled or otherwise inappropriate for the task he is required to perform, he shall be replaced by the Contractor with a person with the appropriate skills and experience for the task, to the approval of the Engineer. The Contractor will be required to submit to the Employer the Schedule of 'Manpower' and 'Organization Chart'.

- d) The Curriculum Vitae (CV) /Resumes of the Contractors' supervisory personnel shall be submitted to the Engineer for acceptance at least 7 days before the anticipated commencement of the O & M, period. Any change of personnel shall be promptly informed to the Engineer within a day's time.

27) Contractor will submit one photograph of each personnel, with his resume, permanent address, etc. and department will issue identity cards to each personnel. Any replacement in Employment by Contractor shall have to be reported in 24 hours to Dy. Executive Engineer/Executive Engineer concerned)

28) The Contractor shall be responsible for safety on Site during the O & M of the Works by the Contractor.

- (a) The Contractor's duties with respect to Safety shall include the following:

- i) Utilize safety awareness procedures in every element of operation and maintenance.
- ii) Give emphasis to site including:
  - \* Safe working and safety procedures as per rules and regulations of Governments regarding use of protective clothing, gloves, boots and helmet etc.
  - \* Cleanliness of the plants as a whole.
  - \* Awareness of hazardous conditions and accident reporting and necessary compliance.
  - \* Safe practice in Pumping Stations.

- 29) a) The maintenance service provided by the Contractor for the period specified in the Contract shall ensure the continuous operation of the pool water Plant Station and that the breakdown or deterioration in performance, under normal operating conditions, of any items, of Plant and equipment and component-parts thereof is kept to a minimum.
- b) The Contractor shall adhere to the manufacturers' recommendations with respect to equipment maintenance, the type and grades of lubricants to be used. Frequency of lubrication, adjustments to be made regularly and recommended spares to be held in store.

30) The Contractor shall be responsible for:

- a) The maintenance of electrical, ventilation and plumbing and drainage installations.
- b) General Building Maintenance and housekeeping
- c) Site maintenance including the upkeep of landscaped areas.
- d) Sumps & pipelines maintenance & repairs.

The building services and housekeeping maintenance shall be undertaken on all building and services installation.

The Contractor shall ensure that all unwanted or redundant items are removed from the building and sites. Depending on their condition such items shall either be placed into storage or disposed of site.

31) The Contractor is also responsible for providing spare parts and material required for the operation and maintenance during the operation period, including the cost of storing and safe guarding. The contractor shall have to procure the required spares from original manufacture or authorized dealer at his cost.

32) a) The Employer reserves the right to arrange the visits of VIP's dignitaries, public representatives and other persons of Social or Political repute, any organization as and when necessary, to the any component of the scheme. The Contractor shall offer full cooperation to the BMC on the occasions of such visits.

b) Inspection register will have to be maintained, wherein

inspection officers will note their instructions duly dated signature. Successful bidder has to follow the instructions strictly.

- 33) On the date of Contract Completion or if the Contract is terminated, all the installations, works and equipment placed under the Contractor's responsibility shall be handed over to the Employer, at no cost, in good working order. The Employer may perform any inspections, tests or expert appraisals he shall consider necessary with a view to checking That the property is in good working order and will certify to that effect to the Contractor while taking over.
- 34) In the event of any dispute or difference arising, the Jurisdiction of the court shall be Bhavnagar (Gujarat) only.
- 35) In case of natural calamity like floods & earthquake, special care shall be taken at project premises the department should be immediately informed regarding the same
- 36) The prevailing labour laws & the laws passed time to time shall be binding to the contractor, contractor shall have no right to file suit under labour/ industrial act against BMC.
- 37) If the operating & the maintenance staff are found to be involved in any un-official activity or offensive activity, he shall be discharged by the Engineer-in-charge. If any un-official activity is found to be carried out in the premises of the dept., the agency will have to stop working & his bank guarantee will not be refunded.
- 38) The staff engaged for the O & M should not have any bad habits should be well behaved. They should not have any type of addition like drinking which is harm full & causing obstruction to work.

**PERIODICAL MAINTENANCE SCHEDULE:**

The contractor shall carry out periodically maintenance as per maintenance schedule submitted by the contractor and approved by the Engineer in charge.

Contractor has to do painting to Every Civil Structures, pumping machineries, manifolds, Valves etc. as directed by Executive Engineer at every two years.

**Other clauses for monitoring performance:**

- 1) Payment shall be made only after receipt of necessary FORTNIGHTLY report duly certified by Engineer in charge or his authorized representative. Contractor shall strictly take care for maintaining Power Factor as per G.E.B. / Energy department norms. If any penalty is imposed in any electric power consumption bill, the same shall be deducted from the amount payable to the contractor as per contract.
- 2) If contractors fail to employ the minimum staff or if staff remains absent, penalty will be imposed at double the rate (salary of absent employee) or the minimum wage to be paid as per Govt. Rules whichever is higher.
- 3) The owner shall review the performance of the contractor periodically. If performance is not found satisfactory, the owner shall give notice to the contractor. The contractor has to comply / reply to the satisfaction of the City Engineer. After such notice, if contractor fails to comply satisfactorily, owner may terminate the contract. The Commissioner shall be the final authority to take the decision regarding any dispute.
- 4) The item includes all major and minor repairs for machineries and replacement of spare, fuses, etc. cleaning of electrical components and keeping them neat and tidy. However major repair requiring special attentions / services are also included in the scope of this contract.
- 5) Item also includes cutting of grass/ removing shrubs, and maintaining the lawn and plantation area including soil, manure, pesticide etc. including watering as per requirement as per instructions of Engineer- in - charge.
- 6) History sheet regarding the replacement material and equipment's should be maintained by the contractor as per the prescribed form and offered for inspection as and when demanded. Abstract of the same shall be submitted along with monthly PR.

## **PART – 2**

### **TERMS AND CONDITIONS FOR PAYMENT, MODE OF PAYMENT:**

- 1.0 The agency entitles to avail monthly bill subject to the compliance and performance as per maintenance schedule. The O&M cost shall be paid in equal monthly instalment.
- 2.0 The agency has to submit his bill along with the two FORTNIGHTLY reports approved by the EIC and the documentary proof of CPF / ESIS contribution within one month from date of work order otherwise an amount of Rs.5000/- per month will be recovered for two months, or otherwise contract will be terminated and all the liabilities shall be borne by the contractor. The amount due if any shall be recovered from the deposit of contractor.





## બાંધકામ વિભાગ

ટેન્ડર નંબર:—


## બાંધકામ વિભાગ

### પસંતેજ રેઈટ ટેન્ડર

**કામનું કામ :- PROPOSED DOG HOME SHELTER & ANIMAL  
VACCINATION CENTRE AT NARI ROAD, KUMBHARWADA,  
BHAVNAGAR, DIST. BHAVNAGAR**



- ૧) ટેન્ડર માં જણાવેલી આઈટમ સિવાય બીજી આઈટમ કરવી પડે તો આનાકાની વગર કરી આપવું મારે કબુલ છે. અને તેના ભાવ શ્રી કમિશનર સાહેબ ઠરાવે તે લેવા મારે કબુલ મંજૂર છે.
- ૨) સદરહુ કામ લેટર ઓફ એસેપ્ટેન્સ ( L.O.A. ) મળ્યા તારીખ થી ૩૦ – (ત્રીસ) માસ ની મુદત માં કામ પૂર્ણ કરી આપવા બંધાઉં છું.
- ૩) સદરહુ કામના ટેન્ડર ની શરતો તથા સ્પેશીફિકેશન વિગતો વિગેરે બરોબર સમજી અમોએ આ ટેન્ડર ભર્યું છે. એટલે કે તે મુજબ કાંઈપણ વાંધા વગર કામ કરી આપવા બંધાઉં છું અને આ બાબત ની પુરતી સમજૂતી મળ્યા ની ખાતરી ટેન્ડર તથા સ્પેશીફિકેશનમાં અમોએ સહી કરી આપી છે. તે અમારે કબુલ મંજૂર રહી છે.
- ૪) ઉપરોક્ત ભાવે આ કામ કરવા મને વર્ક/ઓર્ડર આપવામાં આવશે તો હું આ કામ કરવા બંધાઉં છું. અને જો કોઈ સંજોગોમાં હું આ કામ ન કરું તો મહાનગરપાલિકામાં આ કામ માટેની ભરપાઈ કરેલ તમામ પ્રકારની તમામ ડીપોઝીટની રકમ ફોરફીટ કરવા મહાનગરપાલિકા હકકદાર રહેશે અને મ્યુ. કોર્પો. અમોને બ્લેક લીસ્ટ કરવા હકકદાર રહેશે.
- ૫) ટેન્ડર ખોલવાની તારીખ થી છ માસ સુધીમાં મને વર્ક—ઓર્ડર આપવામાં આવશે તો હું ભરેલ ભાવે મહાનગરપાલિકાના સ્પેશીફિકેશન મુજબ આ કામ કરી આપવા હું બંધાઉં છું.
- ૬) મહાનગરપાલિકા ના પ્રવર્તમાન નિયત, ધારા—ધોરણ અનુસાર, કોન્ટ્રાક્ટરે પોતાના ખર્ચે જરૂરી સ્ટેમ્પ પેપર લાવી ધોરણસરનું લખાણ સાથે ડીપોઝીટ—એગ્રીમેન્ટ કરવાના રહેશે. જે અંગેની જરૂરી માહિતી મ્યુ.કોર્પો.ના બિલ્ડીંગ વિભાગે થી રૂબરૂ મેળવવાની રહેશે.
- ૭) સદરહુ કામ ટેન્ડર પ્રમાણે તથા હવે પછી વધારે વિગતવાર કામ બતાવવામાં આવે તે પ્રમાણે તેમની પસંદગી મુજબ બરાબર મજબુત અને સારી કારીગરીમાં લાઈન લેવલમાં કરવાનું રહેશે.
- ૮) સદરહુ કામના આઈટમો માં ફેરફાર અથવા કોઈ જથ્થામાં વધારો ઘટાડો કરવો પડે તો તેમ કરવાને કાર્યપાલક ઈજનેર સાહેબ મુખત્યાર છે અને તે પ્રમાણે કોન્ટ્રાક્ટરે કંઈ વાંધો લેવાશે નહીં. અગર એવો ફેરફાર અગર વધારો ઘટાડો ધોરણસર મંજૂર થાય ત્યારે તે પ્રમાણે થયેલ કામનું માપ ભરેલા ભાવ મુજબ મજરે આપવામાં આવશે. અગર જરૂર જણાશે તો તેમનો ભાવ શ્રી કમિશનર સાહેબ મુકરર કરશે અને તે ઠરાવ છેવટનો ગણાશે.
- ૯) શ્રી કોન્ટ્રાક્ટર કોઈ કામ પેટા કોન્ટ્રાક્ટરની પાસે થી કરાવાશે નહીં. પરંતુ તે કામ હોશીયાર કારીગરોને રોજે રાખી કોન્ટ્રાક્ટરે કરાવવું પડશે.



- ૧૦) અગત્યના કામનો કોઈપણ ભાગ ટેન્ડરમાં રહી ગઈ હોય તો પણ તે કોન્ટ્રાક્ટ માં કરેલ છે. તેમ સમજી બીજા કામની માફક તે મજબુત રીતે સારી કારીગરી થી કરી આપવું અને તેવાનો ભાવ ઠરાવેલા ભાવ પ્રમાણે આપવામાં આવશે.
- ૧૧) તમામ કામ ઉપર લખેલી મુદત પ્રમાણે અગર તે અગાઉ પસંદગી ને પાત્ર ઠરે તેવી રીતે બરોબર પુરુ કરવું. ઉપર લખેલી મુદત ઉપરાંત વધારે દિવસ થાય તો પેનલ્ટી પેટે જેટલા દિવસ વધારે થાય તેટલા દરેક દિવસ ના ટેન્ડર રકમ ના ૦.૧ ટકા મુજબ રકમ કોન્ટ્રાક્ટર મજકર આપશે પરંતુ બીજુ વધારે કામ કરાવવું પડે તેવા કામ માટે અરજી કર્યે થી શ્રી કમિશનર સાહેબ મુળ કામ અને મુદત ઉપર સુરત રાખી યોગ્ય મુદત વધારી શકાશે આપશે. તથા મુળ કામના ૧૦% સુધી મહત્તમ રકમ કપાણ કરવામાં આવશે.
- ૧૨) સદરહુ કામમાં વાપરવાનો સામાન ખરાબ માલુમ પડશે તો તે નાપાસ કરવાને શ્રી કાર્યપાલક ઈજનેર મુખત્યાર છે. તેવો સામાન કામના સ્થળ ઉપર થી દુર કરવાની રૂબરૂ સુચના અથવા ૨૪ કલાકની નોટીસ મળ્યે થી કોન્ટ્રાક્ટર તે દુર કરશે અને દુર નહી કરે તો કોન્ટ્રાક્ટરને ખર્ચે દુર કરાવી શકાશે અને તેનો ખર્ચતથા જવાબદારી કોન્ટ્રાક્ટરના શીરે રહેશે અને તે કોન્ટ્રાક્ટરના બીલમાંથી કાપી લેવા હકકદાર રહેશે.
- ૧૩) સદરહુ કામમાં શ્રી કાર્યપાલક ઈજનેરને જે કંઈ ખરાબ અગર નબળુ માલુમ પડશે તે તુરત નાપાસ કરવામાં આવશે. તેમજ શ્રી કાર્યપાલક ઈજનેર ત્યાં ન હોય તો તે કામ ખાતે નિમાયેલ અ.મ.ઈ. કે ટા.કી. તે કામ અટકાવી શ્રી કમિશનર સાહેબનો તે બાબત હુકમ મેળવશે. કોન્ટ્રાક્ટરે સારો માલ સામાન વાપરવા વગેરે બાબતો માટે તે કામ ઉપર નિમાયેલા અ.મ.ઈ. કે ટાઈમ કીપરના હુકમ પ્રમાણે કામ કરવાનું રહેશે.
- ૧૪) સદરહુ કામ મુદતસર પુરુ થાય તેવી ઝડપથી અને શ્રી કાર્યપાલક ઈજનેર ની પસંદગી મુજબ ચાલતુ જણાશે નહીં તો તે કોન્ટ્રાક્ટરનું કામ બંધ પાડી દેશે અને રદ ગણાશે અને ત્યારબાદ બીજા માણસ અથવા માણસો થી એ કામ પુરુ કરાવવાને અને જોઈતો સામાન મેળવવાને શ્રી કમિશનર સાહેબ તુરત કુલ મુખત્યાર છે અને તેમ કરવામાં જે ખર્ચ થયેલ હશે તે કોન્ટ્રાક્ટરની તેની જામીનગીરીમાંથી અથવા તેના પૈસા જમા હોય તેમાંથી શ્રી કમિશનર સાહેબ વસુલ કરશે. (અમલ કરતા કલમ નં.: ૧૨ નો બાધ આવશે નહીં)
- ૧૫) સદરહુ કામ પુરુ થતાં સુધીને માટે જઈતા તમામ સાધનો ઓજાર, રાય વિગેરે સામાન્ય કોન્ટ્રાક્ટરે પોતાના તરફથી પુરો પાડવો. ઉપરાંત દરેક જાતના સામાન કે રાય શ્રી કાર્યપાલક ઈજનેર ની પરવાનગી વગર કામના સ્થળ ઉપર થી ઉઠાવી લઈ જવા નહીં.
- ૧૬) કોન્ટ્રાક્ટરે સદરહુ કામ કરવા ઉપર માણસો અથવા માણસ રાખેલા હશે તેમના કોઈની ગેરમાહિતી અગર ગેરચાલ માલુમ પડશે તો તેઓ ને રજા આપવાને શ્રી કાર્યપાલક ઈજનેર કુલ મુખત્યાર છે. ત્યારબાદ સદરહુ માણસ અથવા માણસો ને શ્રી કમિશનર સાહેબની પરવાનગી સિવાય પાછા કામ ઉપર રાખી શકાશે નહીં.
- ૧૭) સદરહુ કામમાં કોઈ ભાગને અથવા સામાનને ગફલતે લઈને અગર હરકોઈ કારણથી નુકશાન થાય તો કોન્ટ્રાક્ટરને શીરે છે અને તે દુરસ્ત કરવા વિગેરે માટેનો ખર્ચ થાય તે પોતાના તરફ થી કરશે.
- ૧૮) આ કામનો કોન્ટ્રાક્ટર દેવાળું કાઢશે અગર શ્રી કમિશનર સાહેબ / શ્રી કાર્યપાલક ઈજનેરની પસંદગી પ્રમાણે કામ પુરુ કરવાને ના કહે અથવા વિલંબ કરે તો પંદર દિવસની લેખીત નોટીસ આપી તે કોન્ટ્રાક્ટરને (કલમ ૧૫ નો અમલ કરી) રદ કરવા માટે મ્યુ.કોર્પો. મુખત્યાર છે.
- ૧૯) કોઈ બાબત ઉપર કંઈ તકરાર પડે તો તે બાબત ઉપર શ્રી કમિશનર સાહેબ જે ઠરાવ કરે તે છેવટનો ગણાશે.
- ૨૦) કોન્ટ્રાક્ટરે સદરહુ કામ ઉપર રાખેલ મજુરો વિગેરે ને બરાબર રીતે નાણાની ચુકવણી કર્યા બાબત શ્રી કમિશનર સાહેબ ને ખાતરી કરાવી આપવી પડશે. તેમ નહીં થયાનું જાહેર થશે તો કોન્ટ્રાક્ટરને નાણા મળવામાં અટકાયત કરવામાં આવશે.
- ૨૧) કોન્ટ્રાક્ટર પોતાના બીલના નાણા લેવાનું મુખત્યારનામું શ્રી કમિશનર સાહેબ ની મંજૂરી થી આપશે તો પણ જોખમદારી તો કોન્ટ્રાક્ટરને શીરે જ રહેશે અને આપેલું મુખત્યારનામું પાછળ થી શ્રી કમિશનર સાહેબ ની મંજૂરી સિવાય રદ કરાવી કે ફેરવી શકાશે નહીં.
- ૨૨) આ કોન્ટ્રાક્ટ અમો કોન્ટ્રાક્ટ રાખ્યા બાદ સામાનનાં અગર મજુરીના જે કંઈ ભાવો વધઘટ થાય તેને અંગે જો અમે કોઈ જાતની ભાવ વધારી આપવાની માંગણી કરીએ તો તે અમારી રદ બાતલ છે.
- ૨૩) જે તે કામનો ડીફેક્ટ લાયેબીલીટી પીરીયડ આ કામ પૂર્ણ થયાની તારીખ થી ૦૪ વર્ષ નો રહેશે. કોઈપણ પ્રકારની નુકશાની, સેટલમેન્ટ, લીકેજ તથા અન્ય પ્રકારની ખામી આ ડીફેક્ટ લાયેબીલીટી પીરીયડના સમયગાળા દરમિયાન જોવામાં આવશે તો ભાવનગર મહાનગરપાલિકા ની મૌખિક અથવા ટેલિફોનિક અથવા લેખિત કોઈપણ સુચના મળ્યે થી કોન્ટ્રાક્ટરે પોતાના ખર્ચે ટુંકા સમય ગાળામાં વ્યવસ્થિત રીપેર કરી સારુ કરી આપવાનું રહેશે. જો ભાવનગર મહાનગરપાલિકા ની સુચનાઓ મુજબની આઈટમો મુજબ કોન્ટ્રાક્ટર નુકશાનીઓ સુધારવામાં નિષ્ફળ જશે તો ભાવનગર મહાનગરપાલિકા – સદર કામ કોન્ટ્રાક્ટરના ખર્ચે અને જોખમે અન્ય પાસે રીપેર કરાવી અને થયેલા ખર્ચ ની રકમ વસુલ કરવામાં આવશે.
- ૨૪) સિક્યોરીટી ડીપોઝીટની રકમ કોન્ટ્રાક્ટર હસ્તક નું આખરી કામ પૂર્ણ થયા બાદ ડીફેક્ટ લાયેબીલીટી પીરીયડ પૂર્ણ થયા બાદ તથા ડીફેક્ટ લાયેબીલીટી પીરીયડના સમયગાળા દરમિયાન ધ્યાન માં આવેલ કોઈપણ પ્રકાર ની નુકશાની, સેટલમેન્ટ, લીકેજ તથા અન્ય પ્રકાર ની ખામી વ્યવસ્થિત રીપેર કરી સારુ કરી આપ્યા બાદ માંગણી કર્યેથી પરત કરવામાં આવશે.
- ૨૫) કામની સાઈટ ઉપર જે કાંઈ અકસ્માત કે અનીચ્છીય બનાવ બને તે અંગેની બધી જવાબદારી કોન્ટ્રાક્ટરની રહે છે.
- ૨૬) કોન્ટ્રાક્ટરે પ્રવર્તમાન તમામ મજુર કાયદાઓની જોગવાઈઓ મુજબ અમલ કરવાનો રહેશે.



- ૨૭) કામ અને મટીરીયલ્સનું સ્પેશીફિકેશન, જો બીજી કોઈ રીતે દર્શાવવામાં ન આવ્યું હોય તો તે કામ ની આઈટમ અને મટીરીયલ્સ ના પ્રવર્તમાન રીલેવન્ટ આઈ.એસ. સ્પેશીફિકેશન અનુસાર નું ગણવાનું છે.
- ૨૮) કોઈપણ કારણ બતાવ્યા સિવાય આ ટેન્ડર અથવા તેની કોઈપણ આઈટમ ના એક કરતા વધુ ભાગ કરીને અન્ય કોન્ટ્રાક્ટર અથવા એજન્સી ને કામ આપી શકશે.
- ૨૯) બાંધકામ સાર્ટટ પર કામ કરતા સમયે કોઈપણના જાન-માલને હાની થાય તો તેની સંપૂર્ણ જવાબદારી કોન્ટ્રાક્ટરની રહેશે. આમ ન બને તે માટે કોન્ટ્રાક્ટરે સ્વખર્ચે જરૂરી યોગ્ય પુર્વ પગલાઓ લઈ તમામ જરૂરી યોગ્ય પુરતી વ્યવસ્થા કરવાની રહેશે.
- ૩૦) કોન્ટ્રાક્ટરના અનુસંધાનમાં કે તે સિવાયના અથવા કામ કરવાની બાબત માં ઉપસ્થિત થતા તમામ પ્રકારના વાંધાઓ, કોઈપણ પ્રકાર ના મતભેદો કે તકરારો, તે તમામ ને સાંભળવા અને તેનું સમાધાન મ્યુનિ કમિશનર ભાવનગર ધ્વારા કરવામાં આવશે. મ્યુનિ કમિશનર ભાવનગર, કેવળ એક માત્ર લવાઈ રહેશે અને તેના ધ્વારા લેવામાં આવેલ નિર્ણય બંને પક્ષ કોન્ટ્રાક્ટર અને ભાવનગર મહાનગરપાલિકા ને બંધનકર્તા રહેશે. સમય તે આ કોન્ટ્રાક્ટનું મુળ હાર્દ છે.
- ૩૧) આપવામાં આવે તે સ્ટ્રક્ચરલ ડીઝાઈન, માપ સાર્ટઝ, નકશાઓ, પ્લાન, એલીવેશન, સેક્શન મુજબ તમામ કામ કરી આપવાનું છે.
- ૩૨) આ કામ માટે નિયત થતાં કોન્ટ્રાક્ટર / એજન્સી, આ કામ માટે ભાવનગર મહાનગરપાલિકાને સીધા જ જવાબદાર છે. અને ભાવનગર મહાનગરપાલિકા તરફ થી સંપૂર્ણ બાંધકામની ગુણવત્તા, જથ્થો, નકશામાં ફેરફાર, સ્પેશીફિકેશન અને બાંધકામ કરવા માટેની સાનુકૂળતા, પાણીનો છંટકાવ (ક્યોરીંગ) અને રોજ રોજના કામ ના સુપરવિઝન બાબત, વખતો વખતના ઓડર્સ મેળવશે.
- ૩૩) કોન્ટ્રાક્ટર ના મજૂર અને કર્મચારીઓ માટે રહેઠાણની જરૂરી વ્યવસ્થા કોન્ટ્રાક્ટરે સ્વખર્ચે અને જોખમે કરવાની રહેશે.
- ૩૪) આ કામ માટે કોન્ટ્રાક્ટરે સ્વ ખર્ચે અને જોખમે જરૂરી તમામ પ્રકારના પુરતા પ્રમાણમાં સાધનો, સરંજામ, અને સ્કેફોલ્ડીંગ તથા બાંધકામ મશીનરી ની વ્યવસ્થા કરવાની છે. તથા સમય મર્યાદામાં કામ પુરુ કરવા માટે તમામ મશીનરી ને સારી કન્ડીશન માં મેઈન્ટેન કરવાની છે. તમામ મટીરીયલ્સ, સાધનો, સ્કેફોલ્ડસ, અને સામગ્રી બાંધકામ સાર્ટટ સ્થળે લાવ્યા પછી ભાવનગર મહાનગરપાલિકા ની મંજૂરી સિવાય હટાવવાની નથી.
- ૩૫) સેલ્સ ટેક્ષ, ઈન્કમ ટેક્ષ, રોયલ્ટી અથવા અન્ય લાગુ પડતા ટેક્સીઝ અથવા ઈ.એસ.ઈ. પ્રિમીયમ વિગેરે જો કોઈ લાગુ પડતા હોય તો, તે તમામ કોન્ટ્રાક્ટ ધ્વારા ભરપાઈ કરવાના રહેશે. અને ભાવનગર મહાનગરપાલિકા આ અંગે નો કોઈ દાવો સાંભળશે નહિં.**
- ૩૬) કોન્ટ્રાક્ટર બાંધકામ ના લેવલ તથા બાંધકામની ગુણવત્તા અંગેની વ્યવસ્થા ગોઠવશે. તેમજ કોન્ટ્રાક્ટર તેની ચોક્કસાઈ માટે સંપૂર્ણ જવાબદાર ગણાશે. કોન્ટ્રાક્ટર ધ્વારા કામ ની લાઈન લેવલ તથા કામ શરુ કરવાના પ્રાથમિક તબક્કા માટે જરૂરી તમામ સાધનો તથા સ્ટાફ ની વ્યવસ્થા કરશે તથા આ માટે કોઈ અલગ નાંણા ભાવનગર મહાનગરપાલિકા ધ્વારા ચુકવવામાં આવશે નહીં. સાર્ટટ કલયરીંગ માટે પણ કોઈ અલગ નાંણા ભાવનગર મહાનગરપાલિકા ધ્વારા ચુકવવામાં આવશે નહિં.
- ૩૭) બાંધકામ માટે વાપરવાનું થતું તમામ પ્રકાર નું મટીરીયલ સારી ગુણવત્તા વાળું તથા પ્રસ્તુત પ્રવર્તમાન આઈ.એસ. સ્ટાન્ડર્ડ અનુસારનું અને ભાવનગર મહાનગરપાલિકા ધ્વારા પાસ કરાયેલું હોય તેવું જ ઉપયોગ માં લેવાનું છે.
- ૩૮) થયેલા કામ અનુસાર ની કોઈ આઈટમ માટે રનીંગ બીલ ધ્વારા રકમ ચુકવણી થવાથી તે કામ અને આઈટમ માન્ય રખાયેલ છે. તેવું માની લેવાનું તથા કામ ની ગુણવત્તા સુધારવાની કોન્ટ્રાક્ટર ની જવાબદારી માંથી કોઈપણ રીતે મુક્તી આપતું નથી.
- ૩૯) કોઈપણ કામ જેનો ઉપરોક્ત સ્પેશીફિકેશન માં સમાવેશ થયેલ ન હોય તે કામ બોમ્બે પી. ડબલ્યુ.ડી હેન્ડ બુક અનુસાર કરવાનું છે. અગર તો કમિશનર ફરમાવે તે પ્રમાણે કરવાનું છે.
- ૪૦) કામ કરવાના કલાકો અને દિવસના સવારના ૮.૦૦ થી ૧૮.૦૦ કલાક સુધી પ્રમાણે કામ ચાલુ રાખવાનું છે. તેમજ જાહેર રજાના દિવસોમાં સી.સી. વર્ક કરવાનું રહેશે નહીં અને જો એક્સ્ટ્રા સમયમાં કઈપણ કામ કરવાનું ચાલુ રાખવાનું હશે તો તે માટે પ્રથમ સંબંધીત સત્તાની લેખિત મંજૂરી મેળવ્યા બાદ કામ ચાલુ રાખવા દેવામાં આવશે.
- ૪૧) કામ પૂર્ણ થયે સાર્ટટ તદ્દન કલીયર કરી આપવાની છે. જેની લેખીતમાં હકીકત જાહેરમાં કરવાની રહેશે.
- ૪૨) કામ પર સૂચના લેવા માટે કોન્ટ્રાક્ટરે પોતે જાતે કાયમ હાજર રહેવું પડશે. અથવા કોઈ જવાબદાર ટેકનીકલી ક્વોલીફાઈડ માણસે કાયમ હાજર રહેવું પડશે. અને તેવો માણસ ફરમાન અનુસારકામ નહીં કરે તો તેને કામ પરથી રજા આપવામાં આવશે. કોન્ટ્રાક્ટર તરફથી રોકવામાં આવેલ આ માણસને આપવામાં આવેલ સુચના કોન્ટ્રાક્ટર ને આપ્યા બરાબર ગણાશે.
- ૪૩) સંબંધીત સત્તાના લેખીત હુકમ અને પહેલેથી ભાવ નક્કી કરાવ્યા સિવાય કોઈપણ પ્રકારનું "એક્સ્ટ્રા કામ" કરવાનું નથી.
- ૪૪) ચાલુ કામે વખતો વખત સરકારશ્રીના માર્ગ અને મકાન વિભાગના નિયમો અનુસાર સિમેન્ટ મોર્ટાર, સિમેન્ટ કોન્ક્રીટ, લોખંડ, ચણતરકામ, તથા સુચવવામાં આવે તે તમામના અત્રેની હાજરીમાં નમુનાઓ લઈ ગેરી અથવા સરકારી કોલેજ અથવા સુચવવામાં આવે તે લેબોરેટરીમાં કોન્ટ્રાક્ટરે સ્વખર્ચે ટેસ્ટીંગ કરાવી ટેસ્ટીંગ રીપોર્ટસ રજુ કરવાનો રહેશે. તેમજ સુચના મુજબ ના સ્ટેજ વાઈઝ ફોટોગ્રાફ પાડી હાઈ કોપી એક સેટ તથા સોફ્ટ કોપી માં આપવા ના રહેશે.



- ૪૫) કામ ઉપરની સુચનાઓ, સ્પેસીફિકેશન સાથે અસંમત હશે તો પણ તે સુચનાઓ કામ સંતોષકારક રીતે પુરૂ કરવા માટે આપવામાં આવેલ ગણાશે. જો કોઈ કામ સ્પેસીફિકેશનના ભાવાર્થ થી બહાર હોવાનું જણાય તો તુરતજ તે માટે તેમણે સંબંધિત સત્તાને લેખીત ખબર આપી દેવાની છે. તે માટે ભાવ ઠરાવી લેવાનો છે. નહીં તો પાછળથી એકસ્ટ્રા કામ માટે નો દાવો બીલકુલ ચાલશે નહીં.
- ૪૬) કામનો પ્રોગ્રેસ દરમિયાન નકશામાં ફેરફાર કરવો કે કામમાં વધારો ઘટાડો કરવા, એકસ્ટ્રા આઈટમ કરવા સંબંધિત સત્તા મુખત્યાર છે. અને કોન્ટ્રાક્ટર તે પ્રમાણે કરી આપવા માટે બંધાયેલા છે. જે માટે કોઈ કલેઈમ કે વાંધા અરજી ચાલશે નહીં.
- ૪૭) કામની લાઈન દોરી, લેવલ માટે તમામ સગવડતાઓ (મેખ, ખીલા, ચુકો, દોરી, ઓળંભા, મેજર ટેપ, કાટખૂણા, ચૂનો વિગેરે) કોન્ટ્રાક્ટરે આપવાની છે. દરેક મટીરીયલ્સ સારી રીતે રહે તે માટે તથા મટીરીયલ્સના સ્ટોરેજ કામ માટે જોઈતા તમામ "શેડ" કોન્ટ્રાક્ટરે સ્વખર્ચે યોગ્ય રીતે બાંધી આપવાના છે.
- ૪૮) રેતી, ચુનો, મેટલ, પથ્થર, સિમેન્ટ, કોન્ક્રીટ, લોખંડ, મોઝેકટાઈલ્સ વિગેરે કોઈપણ ચીજ નો ટેસ્ટ કરવા જરૂર જણાશે તો તે માટે નો ખર્ચ કોન્ટ્રાક્ટરને શીરે રહેશે. અને ટેસ્ટનું પરિણામ કહેવામાં આવે તે લેબોરેટરીમાં પાસ કરાવ્યા બાદ વપરાશે. સ્પેસીફિકેશન પ્રમાણેની ફરજો તથા સંતોષકારક કામ બાબત તમામ જવાબદારીમાંથી મુક્ત થઈ શકતા નથી.
- ૪૯) ખરાબ કામ કે નબળુ મટીરીયલ્સ કાઢી નાખી ઉપાડી લઈ જવા અથવા તેની દુરસ્તી કરી આપવા માટે ડીફેક્ટ લાયેબીલીટી પીરીયડ પુરો થતાં સુધી કોન્ટ્રાક્ટર જવાબદાર રહેશે.
- ૫૦) સદરહું કામ માટે જે પ્રકારનું મજૂરી કામ કરવાનું હોય તે પ્રકારના કામ માટે સારા માં સારા કારીગરો / રોજમદારો રાખી કામ કરવાનું છે. નબળા કારીગરો ને કામ ઉપરથી તુરતજ રજા આપવામાં આવશે.
- ૫૧) તમામ ઈંટ, ચુનો અને સિમેન્ટ ના કામ ને જરૂર જણાયે સૂચના અપાયે થી બરાબર વીસ દીવસ સુધી પાણીનો છંટકાવ કરવાનો છે. તે માટે પુરતા પ્રમાણમાં પાણી મળી રહે તે રીતે યોગ્ય પાણીની વ્યવસ્થા પોતાના સ્વખર્ચે અને જોખમે કરવાની છે. અને પાઈપ કીખી, પંપ વિગેરે આ કામ માટે ખાસ મજૂરો રોકી ને પાણીનો છાંટવા પુરતો બંદોબસ્ત કોન્ટ્રાક્ટરે પોતાના સ્વખર્ચે અને જોખમે કરવાનો છે. તેમા જરા પણ ક્યાશ હશે તો કોન્ટ્રાક્ટરના ખર્ચે અને જોખમે વિભાગ દ્વારા બંદોબસ્ત કરાવી લેવામાં આવશે જે માટે નોટીસ પણ આપવામાં આવશે નહીં.
- ૫૨) તમામ રેતી નદીમાં ચાળેલી હશે તો પણ ૬ મીમી ચાળણા માંથી ચાળવી પડશે. અને ઉપરની સાઈઝ કાઢી નાખવી પડશે. પ્લાસ્ટર કામ માટે ૩ મીમી ચાળણા માંથી ચાળેલી ઝીણી રેતી વાપરવાની છે. તમામ રેતી ચોકખા પાણી થી સારી રીતે ધોઈ ને વાપરવાની છે. ચાલુ કામે જ્યારે જ્યારે કામના ઈન્સ્પેક્શન માટે માપ લેવા અગર બીજી કોઈ તપાસ માટે તમામ સ્થળે પહોંચી શકાય તે માટે પુરતા સાધનો જેવા કે નીસરણી, પાટીયા વિગેરે તમામની પુરતી વ્યવસ્થા કોન્ટ્રાક્ટરે કરવાની છે. અને જરૂર પડે નીસરણી ફેરવવા અગર બીજી મુકવા વિગેરે સુચના પ્રમાણે બંદોબસ્ત કરવાનો છે. તેમ નહીં કરવામાં આવે તો તેવો બંદોબસ્ત કોન્ટ્રાક્ટરના ખર્ચે કરાવી લેવામાં આવશે.
- ૫૩) કોન્ટ્રાક્ટર / ટેન્ડર ભરનારે સવાલ વાળી બાંધકામની સાઈટની સ્થળ સ્થિતિ ની મુલાકાત લઈ જરૂરી અભ્યાસ કરી લેવો.
- ૫૪) કોન્ટ્રાક્ટર / ટેન્ડર ભરનારે તેઓની અનુકુળતા અનુસાર આ પોઈટમાંથી સાઈટ(સ્થળે) જરૂરી અન્ય સ્થળોએ જરૂરી વિજળી અને યોગ્ય પાણીની વિતરણ વ્યવસ્થા સ્વ ખર્ચે અને જોખમે પોતાની રીતે ગોઠવવાની રહેશે. આ બંને સુવિધાના થતો વપરાશના ચાર્જીસ કોન્ટ્રાક્ટર / ટેન્ડર ભરનારે ભરપાઈ કરી આપવાના રહેશે.
- ૫૫) કોન્ટ્રાક્ટમાં આવરી લેવામાં આવેલું તમામ કામ, કોન્ટ્રાક્ટર/ટેન્ડર ભરનારે સ્વયં બાંધવાનું/અમલ કરવાનો છે. ભાવનગર મહાનગરપાલીકાની લેખિત સંમતી મેળવ્યા સિવાય, કોન્ટ્રાક્ટર/ ટેન્ડર ભરનારે આ કોન્ટ્રાક્ટ અથવા તે પૈકીનો કોઈ ભાગ, સીધો અથવા આડકતરી રીતે અન્ય ના નામે ટ્રાન્સફર કે પેટા ફાળવણી કરવાની નથી.
- ૫૬) કોઈપણ કારણ બતાવ્યા સિવાય આ ટેન્ડર અથવા તેની કોઈપણ આઈટમના એક કરતાં વધુ ભાગ કરીને અન્ય કોન્ટ્રાક્ટર અથવા એજન્સી ને કામ આપી શકશે.
- ૫૭) ટેન્ડરની ચકાસણી સમયે, જરૂરી કલેરીફિકેશન તથા નેગોસીએશન રૂબરૂ હાજર રહી કરી આપવાનું છે.
- ૫૮) ભાવનગર મહાનગરપાલીકાની સક્ષમ સત્તા ને કોઈપણ કારણ બતાવ્યા સિવાય કોઈપણ ટેન્ડર સ્વિકારવા અથવા રદ કરવા અંગેનો અધિકાર અબાધિત રહેશે. અને લોએસ્ટ ભાવનુ ટેન્ડર સ્વિકારવા માટે પણ બંધનકર્તા નથી.
- ૫૯) કરેલ કામના વચગાળાના બીલની રકમ ત્રીસ દિવસે એકવાર ઓછામાં ઓછી મંજૂર રકમના ૧૫ % ની રહેશે.
- ૬૦) કોઈપણ પ્રકારનું એડવાન્સ પેમેન્ટ કરવામાં આવશે નહીં.
- ૬૧) એસ્ટીમેટેડ (ટેન્ડર) ની કોઈપણ આઈટમની કવોન્ટીટીના કોઈપણ વેરીએશન સબબ કોઈપણ પ્રકારનો ભાવવધારો આપવામાં આવશે નહીં.
- ૬૨) કોઈપણ પ્રકારના માલ સામાન, મટીરીયલ્સ વગેરેનો કોઈપણ પ્રકારનો ભાવ વધારો આપવામાં આવશે નહીં.
- ૬૩) કોઈપણ પ્રકારની વ્યાજની રકમની માંગણી કરી શકાશે નહીં.
- ૬૪) સામાન્ય રીતે આઈટમોના માપો લેવાની રીત પ્રસ્તૂત આઈ.એસ. કોડ અનુસરની રહેશે. તમામ આઈટમોનું માપ ફાઈનલ વર્કીંગ ડ્રોઈંગ મુજબ અથવા સ્થળ પર ખરેખર થયેલા કામ મુજબ બન્ને માંથી જે ઓછું હોય તે ગણતરીમાં લેવાનું છે.



## Bhavnagar Municipal Corporation



- ૬૫) સરકારશ્રી નાં વખતો વખત નાં બહાર પાડવા માં આવેલ મજૂર કામદારોનાં કાયદાઓનું ચુસ્ત પણે કોન્ટ્રાક્ટરશ્રી દ્વારા અમલ કરવાનું રહે છે.
- ૬૬) ટેન્ડરમા જણાવેલ બાંધકામોના સ્થળો પૈકી કોઈપણ બાંધકામનુ સ્થળ ફેરફાર કરવાનુ થાય તો કાર્યપાલક ઈજનેરશ્રી દ્વારા સુચવવામા આવે તે સ્થળે કોઈ પણ પ્રકારના વાંધા સુચન લીધા વગર બાંધકામ કરી આપવાનુ રહે છે.
- ૬૭) ટેન્ડરમા જણાવેલ બાંધકામોની યુનીટ સંખ્યામાં વધારો કે ઘટાટો કરવાનો થાય તો તે મુજબ અમલ કરવાનો રહેશે. અને જે સુચના આપવામા તેટલા યુનીટનુ બાંધકામ કરી આપવાનુ રહેશે.
- ૬૮) એજન્સી દ્વારા કામ શરૂ કરતા પહેલા સ્થળ સ્થિતિ મુજબના ફોટા ગ્રાફ રજુ કરવાના રહેશે અને ત્યારબાદ જ કામગીરી શરૂ કરવાની રહેશે. વખતો વખત ટેન્ડર માં સમાવેશ થતી આઈટમો ની કામગીરી ના ફોટા ગ્રાફ રજુ કરવાના રહેશે.
- ૬૯) આ તમામ ભાવમાં જી.એસ.ટી.નો સમાવેશ કરવામાં આવેલ નથી. સરકારશ્રીના નિયમાનુસાર અલગથી જી.એસ.ટી ચુકવવામાં આવશે. વધુમાં એજન્સીને સરકારશ્રીના નિયમનુસાર જી.એસ.ટી.નું ચુકવણું કરવાનું રહેશે.
- ૭૦) સ્થળે એચ.ટી વીજ લાઈન પસાર થતી હોય તો આ માટે વીજ પ્રોટેક્શન અંગેની તમામ વ્યવસ્થા કોન્ટ્રાક્ટરે સ્વખર્ચે કરવાની રહેશે. તેમજ કોઈ અકસ્માત કે જાનહાની થાય તો તે અંગેની તમામ જવાબદારી કોન્ટ્રાક્ટરની રહેશે.
- ૭૧) હાલના વેન્ડર લીસ્ટ અને ભવિષ્યમાં જે તે સમયે જયારે ભાવનગર મહાનગરપાલિકા અને સક્ષમ સત્તા વેન્ડરમાં ફેરફાર કરશે તે અઘતન વેન્ડર લીસ્ટ માન્ય ગણીને કોન્ટ્રાક્ટરશ્રીએ સાઈટ પર માન્ય મટીરીયલ વપરાશમાં લેવાનું રહેશે તે બાબતે વધારાના ભાવ તફાવત ખર્ચ ચુકવવામાં નહિ આવે.
- ૭૨) કામ શરૂ કરતા પુર્વે કામની વિગતો દર્શાવતુ બોર્ડ કામ પુર્ણ થતા સુધી કોન્ટ્રાક્ટરે સ્વખર્ચે લગાડી રાખવાનુ રહેશે અન્યથા કોઈ પણ સમયે બોર્ડ લાગેલુ માલુમ નહી પડશે ત્યારે રૂપિયા ૫૦૦૦/- ની પેનલ્ટી લાગુ પડશે.
- ૭૩) ટેન્ડર/એજન્સીએ ટેન્ડર ડોક્યુમેન્ટ સાથે ESIC કોડ/રજીસ્ટ્રેશન ફરજિયાત રજુ કરવાનુ રહેશે, ESIC કોડ/રજીસ્ટ્રેશન સિવાયનુ ટેન્ડર માન્ય ગણાશે નહી.
- ૭૪) કોન્ટ્રાક્ટરશ્રીએ બાંધકામ માં OPC ૫૩ ગ્રેડ સિમેન્ટ જ વાપરવાની રહેશે.

❖ ઉપરોક્ત તમામ શરતો નં- ૧ થી ૭૪ અમો એ વાંચી, વંચાવી, સમજી, વિચારીને ટેન્ડરમાં ભાવો ભરેલ છે. જે મને / અમને કબુલ મંજૂર છે અને તે મુજબ અમો કામ કરવા બંધાઈએ છીએ.

કોન્ટ્રાક્ટરની સહી \_\_\_\_\_.

કોન્ટ્રાક્ટરનું નામ \_\_\_\_\_.

કોન્ટ્રાક્ટરનો સિક્કો

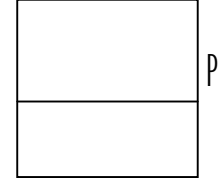
તારીખ





AFWSFD IJEFU

8g0Z GAZov



AFWSFD IJEFU

5; 18H ZI. 8 8g0Z

કામનું કામ. :- **PROPOSED DEVELOPMENT OF TRAFFIC ISLAND CIRCLE  
BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR,  
BHAVNAGAR**



! f 8g0Z DAFH6FJ, L VF. 8D I; JFI ALHL VF. 8D SZJL 50[ TM VFGFSGL JUZ SZL VF5J] DFZ[SA], KP VG[ TGf EFJ ZL  
SIDxGZ ; FC[A 9ZFJ[T], [F DFZ[SA], DHZ KP

Zf ; NZC]SFD , BZ VMO VF; 18g; ( L.O.A. ) D?IF TFZLB YL 6 v s 1 d f DF: GL DNT DAFSD 56"SZL VF5JF AWfp  
KP

#f ; NZC]SFDGF 8g0Z GL XZTM TYF : 5XLOLSXG IJUTM IJUZI AZIMAZ ; DHL VDIM[ VF 8g0Z E I] KP VB, [S[ T] DHA  
SA 56 JWF JUZ SFD SZL VF5JF AWfp K] VG[ VF AFAT GL 5ZTL ; DHJTL D?IF GL BFTZL 8g0Z TYF : 5XLOLSXG DFI  
VDIM[ ; CL SZL VF5L KP T[ VDFZ[SA], DHZ ZCL KP

\$f p5ZIMST EFJ[ VF SFD SZJF DG[JS] VMOZ VF5JF DAF VFJX[ TM C] VF SFD SZJF AWfp KP VG[ HM SM. ; HMUMDAC] VF SFD  
G SZ] TM DCFGUZ5FI, SFDFA VF SFD DF8GL EZ5F. SZ] TDFD 5SFZ GL TDFD 0L5Mh18 GL ZSD OMZOL8 SZJF  
DCFGUZ5FI, SF CSSNFZ ZCXP[ VG [H P] SM5M VDMG[a, § , L:8 SZJF CSSNFZ ZCXP

5f 8g0Z BM, JFGL TFZLB YL K DF; ; JLD RAG[JS] VMOZ VF5JF DAF VFJX[ TM C] EZ], EFJ[ DCFGUZ5FI, SF GF : 5XLOLSXG  
DHA VF SFD SZL VF5JF C] AWfp KP

&f DCFGUZ5FI, SF GF 5J\* TDFG IGI T4WFZ v WMZ6 VG; FZ4 S1g8fS8Z] 5MTFG BR[ HZYL : 8p5 5fZ , FJL WMZ6; Z G]  
, BF6 ; FY[ 0L5Mh18 v VJ] Dg8 SZJFG ZCXP[ H[ VUGL HZYL DFICTId I PSM5M GF IA<0LU IJEFU[ YL ~A~ D/ JJFGL  
ZCXP

\*f ; NZC]SFD 8g0Z 5pF6[ TYF CJ[ 5KI[ JWFZ] IJUTJFZ SFD ATEJJF DAF VFJ[ T] 5pF6[ TPGL 5; NUL DHA AZFAZ DHAJT  
VG[ ; FZL SFZLUZLDA, F. G , [ , DAFSZJFG] ZCXP



## Bhavnagar Municipal Corporation



- (f ; NZC] SFDGF VF. 8DM DA OZOFZ VYJF SM. HyYFDA JWFZM 38FOM SZJM 50[ TM TD SZJFG[ SFI'5F, S . HGZ ; FCA DBtIFZ K[VG[T]5pF6[Sm8S8Z[SV JFWM, JFX[GCLR VUZ VJm OZOFZ VUZ JWFZM W8OM WMZ6; Z DHZ YFI tIFZ[T] 5pF6[YI], SFDG[DF5 EZ], F EFJ DHA DHZ[Vf5JFDA VFJXP VUZ H-Z H6FX[ TM TDGM EFJ zL SIDxGZ ; FCA D\$ZZ SZX[VG[T]9ZFJ KJ8GM U6FXP
- ) f zL Sm8S8Z SM. SFD 5pF Sm8S8ZGL 5F; [YL SZJFX[GCLR 5ZT]T[SFD CMXN FZ SFZLUZMG[ZMH[ZFBL Sm8S8Z[SZJ] 50XP
- ! \_f VUtiGF SFDGMSM. 56 EFU 8jOZDAZCL U. CMI TM 56 T[Sm8S8 DfASZ], KP TD ; DHL ALHF SFDGL DFOS T[DHAJT ZLT]; FZL SFZLUZL YL SZL VF5J[VG[T]JFGM EFJ 9ZFJ, F EFJ 5pF6[Vf5JFDA VFJXP
- ! ! f TDFD SFD p5Z , B[ L DNT 5pF6[VUZ T[VUFp 5; NUL G[5F+ 9Z[TJL ZLT[AZMAZ 5Z] SZJp p5Z , B[ L DNT p5ZFT JWFZ[INJ; YFI TM 5G<8L 5B[H8, F INJ; JWFZ[YFI TB, F NZS INJ; GF 8jOZ ZSD GF P! 8SF DHA ZSD Sm8S8Z DHSZ VF5X[5ZT]ALH]JWFZ[SFD SZJ]50[TJF SFD DF8[VZHL SI[YL zL SIDxGZ ; FCA DJ/ SFD VG[DNT p5Z ; JT ZFBL IMUJ DNT JWFZL XSFX[Vf5XP તથા મુળ કામના ૧૦% સુધી મહત્તમ રકમ કપાણ કરવામી આવશે.
- ! Zf ; NZC] SFD DfJF5ZJFGM ; FDFG BZFA DF, D 50X[ TM T[GF5F; SZJFG[ zL SFI'5F, S . HGZ DBtIFZ KP TJM ; FDFG SFDGF :Y/ p5Z YL NZ SZJGL ~A~ ; JRGF VYJF Z\$ S, FSG L GMBL; D?I[YL Sm8S8Z T[NZ SZX[VG[NZ GCL SZ[ TM Sm8S8ZG[ BR[ NZ SZJL XSFX[ VG[ TGM BR[YF HJFANFZL Sm8S8ZGF XLZ[ ZC[X[ VG[ TSm8S8ZGF AL, DFYL SF5L , JFCSSNFZ ZCXP
- ! #f ; NZC] SFD Df zL SFI'5F, S . HGZ G[H[SV BZFA VUZ GA/] DF, D 50X[T] TZT GF5F; SZJF Df VFJXP TDH zL SFI'5F, S . HGZ tIFG CMI TM T[SFD BFT[IGDFI], VPDP. P S[8PSP T[SFD V8SFJL zL SIDxGZ ; FCA GM T[AfAT CSD DJ/JXP Sm8S8Z]; FZM DF, ; FDFG JF5ZJF JUZ[AfATM DF8[T]SFD p5Z IGDFI], F VPDP. P S[8F. D SL5ZGF CSD 5pF6[ SFD SZJFG[ZCXP
- ! \$f ; NZC] SFD DNT; Z 5Z] YFI TJL h05YL VG[zL SFI'5F, S . HGZ GL 5; NUL DHA RF, T[H6FX[GCL TM T[Sm8S8ZG] SFD AW 5FOL NX[VG[ZN U6FX[VG[tIFZAFN ALHF DF6; VYJF DF6; M YL V[SFD 5Z] SZJFJFG[VG[HIM TM ; FDFG DJ/JJFG[zL SIDxGZ ; FCA TZT SJ, DBtIFZ K[VG[TD SZJFDAH[BR"YI], CX[T]Sm8S8ZGL TGL HFDLGULZLDFYL VYJF TGF 5[ F HDF CMI TDFYL zL SIDxGZ ; FCA J; ], SZXP sVD, SZTF S, D GRo ! Z GMARW VFJX[GCLF
- ! 5f ; NZC] SFD 5Z] YTA; JMG[DF8[H. TF TDFD ; FwGM VMHFZ4 ZFR IJUJZ]; FDFG Sm8S8Z[5MTFGF TZOYL 5ZM 5F0JMP p5ZFT NZS HFTGF ; FDFG SJZFR zL SFI'5F, S . HGZ GL 5ZJFGUL JUZ SFDGF :Y/ p5Z YL p9FJL , . HJF GCLR
- ! &f Sm8S8Z]; NZC] SFD SZJF p5Z DF6; M VYJF DF6; ZFB[ F CX[TDGF SM. GL UZDFICTL VUZ UZRF, DF, D 50X[ TM T[M MG[ZHF VF5JFG[zL SFI'5F, S . HGZ SJ, DBtIFZ KP tIFZAFN ; NZC] DF6; VYJF DF6; M G[zL SIDxGZ ; FCA GL 5ZJFGUL I; JFI 5FKF SFD p5Z ZFBL XSFX[GCLR
- ! \*f ; NZC] SFD Df SM. EFUG[VYJF ; FDFGG[UO, T], . G[VUZ CZSM. SFZ6 YL G\$XFG YFI TM Sm8S8ZG[XLZ[K[VG[T] NZ: T SZJF IJUJZ[DF8GM BR"YFI T[5MTFGF TZO YL SZXP
- ! (f VF SFDGM Sm8S8Z NJF/]SF-X[VUZ zL SIDxGZ ; FCA q zL SFI'5F, S . HGZ GL 5; NUL 5pF6[SFD 5Z]SZJFG[GF SC[ VYJF IJ, XA SZ[ TM 5NZ INJ; GL , BLT GMBL; VF5L T[Sm8S8ZG[sS, D ! 5 GM VD, SZLF ZN SZJF DF8[dI]PSM5MP DBtIFZ KP
- !) f SM. AfAT p5Z SV TSZFZ 50[ TM T[AfAT p5Z zL SIDxGZ ; FCA H[9ZFJ SZ[T]KJ8GM U6FXP



## Bhavnagar Municipal Corporation



Z\_f Slt8S8Z; NZC]SFD p5Z ZFB, DHZMIJUJ[GIAZFAZ ZLT[G6FGL R\$J6L SIF"AFAT zL SIDxGZ ; FCJA G[BFTZL SZFJL VF5JL 50XP TD GCLVYIFG]HFCZ YX[TM Slt8S8ZG[GF6F D/JFDAV8SFI T SZJFDAVFJXP

Z! f Slt8S8Z 5MTFGF AL, GF GF6F , JFG]DBtI FZGFD]zL SIDxGZ ; FCJA GL DHZL YL VF5X[TM 56 HMBDNFZL TM Slt8S8ZG[ XLZ[H ZC[X]VG[VF5J, J DBtI FZGFD]5FK/ YL zL SIDxGZ ; FCJA GL DHZL I; JFI ZN SZFJL S[OZJL XSFX[GCLR

ZZf VF Slt8S8 VDM Slt8S8 ZfbIF AFN ; FDFGGFVUZ DHZLGF H[SI EFJMJWn8 YFI TG[VU[HM VD[SM. HFTGL EFJ JWFZL VF5JFGL DFU6L SZLV[TM T[VDFZL ZN AFT, KP

Z#f H[T]SFDGM 0L0S8 , FI AL, L8L 5LZL I 0 VF SFD 5J"YIFGL TFZLB YL Z\$V DF; GM ZCXP SM. 56 5SFZ GL G\$XFGI4 ; B, Dg84 , LSH TYF Vgl 5SFZ GL BFDL VF 0L0S8 , FI AL, L8L 5LZL I 0GF ; DI UF/F NZIDI FG HMFDA VFJX[ TM EFJGUZ DCFGUZ5FI, SF GL DFBS VYJF 8I, OMGS VYJF , IBT SM. 56 ; RGF D?I[ YL Slt8S8Z] 5MTFGF BR[8SF ; DI UF/FDAJ I JI:YT ZL5Z SZL ; FZ]SZL VF5JFG]ZCXP HM EFJGUZ DCFGUZ5FI, SF GL ; RGFVM D]HAGL VF. 8DM DHA Slt8S8Z G\$XFGIVM ; JWFJFDAIG00/ HX[TM EFJGUZ DCFGUZ5FI, SF v ; NZ SFD Slt8S8ZGF BR[VG[HMBD] Vgl 5F; [ZL5Z SZFJL VG[YI, F BR"GL ZSD J; , SZJFDAVFJXP

Z\$f I; SIMZL8L 0L5Mh8L GL ZSD Slt8S8Z C:TS G]VFBZL SFD 5J"YIF AFN 0L0S8 , FI AL, L8L 5LZL I 0 5J"YIF AFN TYF 0L0S8 , FI AL, L8L 5LZL I 0GF ; DI UF/F NZIDI FG wIFG DAVFJ, SM. 56 5SFZ GL G\$XFGI4 ; B, Dg84 , LSH TYF Vgl 5SFZ GL BFDL j I JI:YT ZL5Z SZL ; FZ]SZL VF%I F AFN DFU6L SI [YI 5ZT SZJFDAVFJXP

Z5f SFDGL ; F. 8 p5Z H[SA VS:DFT S[VGLrKLI AGFJ AG[T[VUJGL AML HJFANFZL Slt8S8ZGL ZC[KP

Z&f Slt8S8Z[5JTDfG TDfD DHZ SFIFNFMGL HMUJF. VM DHA VD, SZJFGMZCXP

Z\*f SFD VG[D8LZLI<; GJ:5XL0LSXG4 HMAHL SM. ZLT[NXFJJFDAF VFjI]CMI TM T[SFD GL VF. 8DVG[D8LZLI<; GF 5JTDfG ZL, Jg8 VF. P V; P:5XL0LSXG VG; FZ G]U6JF G] KP

Z(f SM. 56 SFZ6 ATEjIF I; JFI VF 8j0Z VYJF TGL SM. 56 VF. 8D GF V\$ SZTF JW]EFU SZLG[Vgl Slt8S8Z VYJF VHg; L G[SFD VF5L XSXP

Z)f AFWSD ; F. 8 5Z SFD SZTF ; DI[SM. 56GF HFGvDF, G[CfGL YFI TM TGL ; 5J"HJFANFZL Slt8S8ZGL ZCXP VFD G AG[T[DF8[Slt8S8Z]:JBR[HZZL I MuI 5J"5U, FVM, . TDfD HZZL I MuI 5ZTL j I J:YF SZJFGL ZCXP

#\_f Slt8S8ZGF VG; WFGDAS[TI; JFI GF VYJF SFD SZJFGL AFAT DAp5I:YT YTF TDfD 5SFZGF JWFVVM SM. 56 5SFZ GF DTE[NM S[TSZFZM T[TDfD G; FE/JF VG[TG]; DFWFG dI]G SIDxGZ EFJGUZ wJZF SZJFDAVFJXPdI]G SIDxGZ EFJGUZ4 SJ/ V\$ DF+ , JFN ZC[X] VG[ TGf wJZF , JFDA VFJ, IG6" AGI 5IF Slt8S8Z VG[ EFJGUZ DCFGUZ5FI, SF G[AWGSTF"ZCXP ; DI T[VF Slt8S8G]D/ CFN"KP

#! f VF5JFDAVFJ[T]:8SRZ, 0Lhf. G4 DF5 ; F. h4 GSXFVM %, FG4 V, LJXG4 ; \$XG DHA TDfD SFD SZL VF5JFG]KP

#Zf VF SFD DF8[IGI T YTF Slt8S8Z q VHg; I4 VF SFD DF8[EFJGUZ DCFGUZ5FI, SFG; LWF H HJFANFZ KP VG[EFJGUZ DCFGUZ5FI, SF TZO YL ; 5J"AFWSD GL U6JtT4 HyYM GSXF DA OZOFZ4 :5XL0LSXG VG[ AFWSD SZJF DF8GL ; FGS]/T4 5F6LGMK8SFJ sSIMZLUF VG[ZMH ZMHGF SFD GF ; 5ZIJhG AFAT4 JBTMJBTGF VMD; "D/JXP

##f Slt8S8Z GF DHZ VG[SDRFZLVM DF8[ZCPF6GL HZZL j I J:YF Slt8S8Z]:JBR[VG[HMBD]SZJFGL ZCXP

#\$f VF SFD DF8[Slt8S8Z]:J BR[VG[HMBD] HZZL TDfD 5SFZGF 5ZTF 5P6DA ; FwGM ; ZHFD4 VG[ :SDMk0Lwh TYF AFWSD DXLGZL GL j I J:YF SZJFGL KP TYF ; DI DI FNFDASFD 5Z]SZJF DF8[TDfD DXLGZL G; FZL SgOLXG DAD] g8G



## Bhavnagar Municipal Corporation



- SZJFGL KP TDFD D8LZLI <; 4 ; FWGM :SPM<0; 4 VG[; FDU[ AFWSFD ; F. 8 :Y/[ , fJIF 5KL EFJGUZ DCFGUZ5FI, SF GL DHZLI ; JFI C8FJJFGL GYIP
- #5f : k; 8[1F4 . gSD 8[1F4 ZMI <8L VYJF VgI , FU] 50TF 8S; Lh VYJF . PV[; P. P 15[DLI D IUUZ[ HM SM. , FU] 50TF CMI TMA T[ TDFD SMg8FS8 wJFZF EZ5F. SZJFGF ZCXP VG[ EFJGUZ DCFGUZ5FI, SF VF VU[GM SM. NFJM ; FE/X[GICP
- #&f SMg8FS8Z AFWSFD GF , J, TYF AFWSFD GL U6JtTF VU[GL jI J:YF UM9JXP TPDH SMg8FS8Z TGL RMSS; F. DF8[; 56" HJFANFZ U6FXP SMg8FS8Z wJFZF SFD GL , F. G , J, TYF SFD XZ[SZJFGF 5FYIDS TASSF DF8[HZZL TDFD ; FWGM TYF :8FO GL jI J:YF SZX[TYF VF DF8[SM V, U GF6F EFJGUZ DCFGUZ5FI, SF wJFZF R5JJFDFVFX[GICP ; F. 8 S, I ZLU DF8[56 SM V, U GF6F EFJGUZ DCFGUZ5FI, SF wJFZF R5JJFDFVFX[GICP
- #\*f AFWSFD DF8[ JF5ZJFG[ YT] TDFD 5SFZ G[ D8LZLI , ; FZL U6JtTF JF/ TYF 5[ TJT 5J"TDGF VF. PV[; P :8fg00h" VG[ FZG[VG[EFJGUZ DCFGUZ5FI, SF wJFZF 5F; SZFI, JCM T[ JH p5IMU DFI, JFG[KP
- #(f YI[ F SFD VG[ FZ GL SM VF. 8D DF8[ZGLU AL, wJFZF ZSD R5J6L YJFYL T[ SFD VG[ VF. 8D DfgI ZBFI[ , KP TJ] DFGI , JFG[ TYF SFD GL U6JtTF ; JFZJFGL SMg8FS8Z GL HJFANFZL DFI SM. 56 ZLT[D5TL VF5TJGYIP
- #)f SM. 56 SFD HGMP5ZMST :5XLOLSXG DFI; DFJX YI[ , G CMI T[ SFD AMIA[ 5LP 0A<I POL Cj0 AS VG[ FZ SZJFG[KP VUZ TMSIDxGZ OZDFJ[T] 5DF6[SZJFG[KP
- \$\_f SFD SZJFGF S, FSM VG[INJ; GF ; JFZGF )P\_\_ YL ! (P\_\_ S, FS ; JM 5DF6[ SFD RF, J ZFBJFG[KP TPDH HFCZ ZHF GF INJ; M DFI; LP LP JS"SZJFG[ ZCXP[GCL VG[ HM VS:8F ; DI DFI S. 56 SFD SZJFG[ RF, J ZFBJFG[ CX[ TM T[ DF8[ 5YD ; AWLT ; tTF GL , JBT DHZL D[ jI F AFN SFD RF, J ZFBJF NFJFDFVFXXP
- \$! f SFD 56[YI[ ; F. 8 TNG S, LI Z SZL VF5JFGL KPHGL , JBT DACSLST HFCZ DASZJFGL ZCXP
- \$Zf SFD 5Z ; RGF , JF DF8[SMg8FS8Z] 5MT[ HFT[ SFI D CFHZ ZCJ] 50XP VYJF SM. HJFANFZ 8SGLS, L SJM, LOF. 0 DF6; [ SFI D CFHZ ZCJ] 50XP VG[ TJM DF6; OZDFG VG[ FZSFD GCL SZ[ TM TG[ SFD 5ZYL ZHF VF5JFDFVFXXP SMg8FS8Z TZOYL ZMSJFDFVFI, VF DF6; G[ VF5JFDFVFI, ; RGF SMg8FSZ G[ VF%I F AZFAZ U6FXP
- \$#f ; AWLT ; tTFG , JBT C5D VG[5C[ YL EFJ GSSL SZJFI F ; JFI SM. 56 5SFZG[ccVS:8F SFDcc SZJFG[ GYIP
- \$\$f RF, J SFD[ JBTM JBT ; ZSFZLGF DFI" VG[ DSFG IJEFUGF IGI DM VG[ FZ I; Dg8 DM8FZ4 I; Dg8 SM[S]84 , MB04 R6TZSFD4 TYF ; RJJFDFVFI[T] TDFDGF V+GL CFHZLDA GDGFVM , . UZL VYJF ; ZSEZL SM, H VYJF ; RJJFDFVFI[T], AMZBLDA SMg8FS8Z : JBR[8[ 8LU SZFJL 8[ 8LU ZL5MB; ZH[SZJFGM ZCXP TPDH ; RGF DHA GF :8H JF. h OM8MUFO 5FOL CF0[SM5L VS ; B TYF ; MD8 SM5L DFI VF5JF GF ZCXP
- \$5f SFD p5ZGL ; RGFVM :5[ LOLSXG ; FY[V; DT CXM TM 56 T[ ; RGFVM SFD ; TMSFZS ZLT[5]- SZJF DF8[ VF5JFDFVFI, U6FXP HM SM. SFD :5[ LOLSXGGF EFJFY"YL ACfZ CMFG[H6FI TM TZTH T[ DF8[TD6[; AWLT ; tTFG, JBT BAZ VF5L NFJGL KP T[DF8[EFJ 9ZFJL , JFGM KP GCL TM 5FK/YL VS:8F SFD DF8[GM NFJMAL, SJ, RF, X[GICP
- \$&f SFDGM 5MU[ NZIDI FG GSXFDFVFOZF SZJM[SFD DFIJWFZM 38FOM SZJF4 VS:8F VF. 8D SZJF ; AWLT ; tTF D[BTI FZ KP VG[SMg8FS8Z T[5DF6[SZL VF5JF DF8[AWFI, F KP H[DF8[SM. S, I D SJFWF VZHL RF, X[GICP
- \$\*f SFDGL , F. G NMZ4 , J, DF8[ TDFD ; UJOTFVM s DB4 BL, F4 R5SM NMZ4 VM/E4 DHZ 8F54 SF8B]F4 R5GM IUUZ[ SMg8FS8Z] VF5JFGL KP NZS D8LZLI <; ; FZL ZLT[ZC[T] DF8[ TYF D8LZLI <; GF :8MZH SFD DF8[HM. TF TDFD ccXDec SMg8FS8Z : JBR[IMU I ZLT[ AFM VF5JFGF KP



## Bhavnagar Municipal Corporation



- \$ (f Z[TL4 RGM D8, 4 5tYZ4 I; D84S8S84, MB04DMhS8f. <: IJUZ[SM. 56 RLH GM8: 8 SZJF H~Z H6FX[TM T]DF8[GM BR" S88S8ZG[XLZ[ZCXP VG[8: 8G]5I26FD SCJFDF VJ[T], AMZBZLDA 5F; SZJIF AFN J5ZFXP :5f LOLSXG 5DF6GL OZHM TYF; TMFSZS SFD AFAT TDFD HJFANFZLDFYL D\$T Y. XSTF GYIP
- \$)f BZFA SFD S[GA/]D8LZL I<; SF-L GFB L p5f0L , . HJF VYJF TGL N: TL SZL VF5JF DF8[OL0S8 , FIAL, L8L 5LZL I 0 5ZMYTF; JWL S88S8Z HJFANFZ ZCXP
- 5\_f ; NZC) SFD DF8[H[5SFZG] DHZL SFD SZJFG] CMI T[5SFZGF SFD DF8[; FZF DA; FZF SFZLUZM q ZMHDNFZM ZFBL SFD SZJFG]Kp GA/F SFZLUZM G[SFD p5ZYL TZTH ZHF VF5JFDF VJXP
- 5! f TDFD . 84 RGM VG[I; D88 GF SFD G[H~Z H6FI[; RGF V5FI[YL AZFAZ JL; NLJ; ; JWL 5F6LGM K8SFJ SZJFGM Kp T] DF8[ 5ZTF 5DF6DA 5F6L D/L ZC[T]ZLT[ I M I 5F6LGL j I J: YF 5MTFGF : JBR[VG[HMBD[SZJFGL Kp VG[5F. 5 SLAL4 55 IJUZ[ VF SFD DF8[Bf; DHZM ZMSL G[5F6LGM K8JF 5ZTM ANMA: T S88S8Z[5MTFGF : JBR[VG[HMBD[SZJFGM Kp TDF HZF 56 SRFX CX[TM S88S8Z GF BR[VG[HMBD[IJEFU wJZF ANMA: T SZFJL , JFDF VJX[H[DF8[GM BL; 56 VF5JFDF VJX[GCLP
- 5ZF TDFD Z[TL GNLDARF/] L CX[TM 56 & DIDL RF/6F DFYL RF/JL 50XP VG[p5ZGL ; F. h SF-L GFB JL 50XP %, F: 8Z SFD DF8[ # DIDL RF/6F DFYL RF/] L hL6L Z[TL JF5ZJFGL Kp TDFDZ[TLRMSBF5F6L YL ; FZL ZLT[WM. G[JF5ZJFGL Kp RF, ]SFD[H I FZ[H I FZ[SFDGF . g: 5SXG DF8[DF5 , JF VUZ ALHL SM. T5F; DF8[TDFD : Y/[5CMRL XSFI T[DF8[5ZTF ; FWGM HJF S[GL; Z6L4 5F8L I F IJUZ[TDFDGL 5ZTL j I J: YF S88S8Z[ SZJFGL Kp VG[H~Z 50[GL; Z6L 0ZJJF VUZ ALHL D\$JF IJUZ[; RGF 5DF6[ANMA: T SZJFGM Kp TD GCL SZJFDF VJ[TM T]M ANMA: T S88S8ZGF BR[SFJL , JFDF VJXP
- 5#f S88S8Zq880Z EZGFZ[; JF, JF/L AFWSFDGL ; F. 8GL : Y/ I: YTL GL D], FSFT , . H~ZL Velf; SZL , JWP
- 5\$f S88S8Z q 880Z EZGFZ[TVMGL VGS]/TF VG[; FZ VF 5M. 8DFYL ; F. 8s: Y/f H~ZL Vgl : Y/WM[ H~ZL IJH/L VG[ I M I 5F6LGL IJZ6 j I J: YF : J BR[VG[HMBD[5MTFGL ZLT[UM9JJFGL ZCXP VF AG[; J]nFGF YTM J5ZFXGF RFHL; S88S8Zq880Z EZGFZ[EZ5F. SZL VF5JFGF ZCXP
- 55f S88S8DA VFJZL , JFDF VJF], J TDFD SFD4 S88S8Zq880Z EZGFZ[ : JI\ AFWJFG] qVD, SZJFGM Kp EFJGUZ DCFGUZ5F, L\$FGL , JBT ; DTL D[/j I F I; JFI4 S88S8Zq 880Z EZGFZ[ VF S88S8 VYJF T[5SLGM SM. EFU4 ; LWM VYJF VF0STZL ZLT[Vgl GF GFD[88; OZ S[58F 0F/J6L SZJFGL GYIP
- 5&f SM. 56 SFZ6 ATFj I F I; JFI VF 880Z VYJF TGL SM. 56 VF. 8DGF VS SZTAJW] EFU SZLG[Vgl S88S8Z VYJF VHg; L G[SFD VF5L XSXP
- 5\*f 880ZGL RSF; 6L ; DI H~ZL S, ZLOLSXG TYF GJUM; LVXG ~A~ CFHZ ZCL SZL VF5JFG]Kp





## Bhavnagar Municipal Corporation



5(f) EFJGUZ DCFGUZ5F, L5FGL ; 1FD ; TF G[SM. 56 SFZ6 ATfj I F I; JFI SM. 56 8f0Z I: JSFZJF VYJF ZN SZJF VUJGM  
VIWSFZ VAFIWT ZCXP VG, MW: 8 EFJG]8f0Z I: JSFZJF DF8]56 AWGSTF"GYLP

5)f SZ, SFDGF JRUF/FGF AL, GL ZSD +L; INJ; [VSJFZ VMKFDVVMKL DHZ ZSDGF ! 5 @ GL ZCXP

&\_f SM. 56 5SFZG]VPJfg; 5Df8 SZJFDFVFX[GCLP

&! f VF:8LDfD s8f0Zf GL SM. 56 VF. 8DGL SJM8L8LGF SM. 56 JZLVXG ; AA SM. 56 5SFZGM EFJJWFZM VF5JFDF  
VFJX[GCLP

&Zf SM. 56 5SFZGF DF, ; FDFG4 D8LZLI <; JUZGM SM. 56 5SFZGM EFJ JWFZM VF5JFDFVFX[GCLP

&#f SM. 56 5SFZGL jI FHGL ZSDGL DFU6L SZL XSFX[GCLP

&\$f ; FDFgI ZLT[ VF. 8DMGF DF5M , [FGL ZLT 5: TT VF. PV: P SMO VG; ZGL ZCXP TDFD VF. 8DMG)DF5 OF. G, JSU  
OM. U DHA VYJF :Y/ 5Z BZBZ YI, F SFD DHA AgG[DFYL H[VMK]CMI T[U6+LDA, [FG]KP

&5f ; ZSFZzL GAFBMT JBT GAFACFZ 5F0JF DAVFJ, DHZ SFDNFZMGASFI NF VM G)R; T 56[ SM8fS8ZzL NJZF VD,  
SZJFG]ZC[KP

&&f 8f0ZDF H6FJ, AFWSFDM GF :Y/M 5SL SM. 56 AFWSFDG] :Y/ 0Z0FZ SZJFG] YFI TM SFI 5F, S . HGZzL WJZF  
; RJJFDF VFJ[T]:Y/[SM. 56 5SFZGF JWF ; RG , LWF JUZ AFWSFD SZL VF5JFG]ZC[KP

&\*f 8f0ZDF H6FJ, AFWSFDMGL IGL8 ; bI FDF JWFZM S[38f8M SZJFGM YFI TM T[DHA VD, SZJFGM ZCXP VG[H; RG  
VF5JFDF T8, F IGL8G]AFWSFD SZL VF5JFG]ZCXP

&(f એજન્સી દ્વારા કામ શરૂ કરતા પહેલા સ્થળ સ્થિતી મુજબના ફોટા ગ્રાફ રજુ કરવાના રહેશે અને ત્યારબાદ જ કામગીરી શરૂ કરવાની  
રહેશે. વખતો વખત ટેન્ડર માં સમાવેશ થતી આઈટમો ની કામગીરી ના ફોટા ગ્રાફ રજુ કરવાના રહેશે.

&)f આ તમામ ભાવમાં જી.એસ.ટી.નો સમાવેશ કરવામાં આવેલ નથી. સરકારશ્રીના નિયમાનુસાર અલગથી જી.એસ.ટી ચુકવવામાં  
આવશે. વધુમાં એજન્સીને સરકારશ્રીના નિયમનુસાર જી.એસ.ટી.નું ચુકવણું કરવાનું રહેશે.

\*\_f સ્થળે VRP8L JIH , F. G 5; FZ Yતી હોય તો VF DF8] JIH 5]8fSXG VUJL TDFD jI J: YF SM8fS8Z]: JBR[SFZJGL ZCXP  
TDH SM. VS: DFT S[HFGCFGL YFI TM T[ VUJL TDFD HJFANFZL SM8fS8ZGL ZCXP

\*!) હાલના વેન્ડર લીસ્ટ અને ભવિષ્યમાં જે તે સમયે જ્યારે ભાવનગર મહાનગરપાલિકા અને સક્ષમ સત્તા વેન્ડરમાં ફેરફાર કરશે તે  
અધતન વેન્ડર લીસ્ટ માન્ય ગણીને કોન્ટ્રાક્ટરશ્રીએ સાર્ટટ પર માન્ય મટીરીયલ વપરાશમાં લેવાનું રહેશે તે બાબતે વધારાના ભાવ  
તફાવત ખર્ચ ચુકવવામાં નહિ આવે.



## Bhavnagar Municipal Corporation



\*Z) SFD X~ SZTF 5J[SFDGL IJUTMNXFJT]AMD"SFD 5j6"YTF ; WL Sng8FS8Z[:JBR[, UfOL ZFBJFG]ZC[X[VgI Yf SMI. 56 ; DI[  
AMD", FU[, JDF, D GCL 50X[tIFZ]~I5IF 5\_\_\_\_qv GL 5G<8L , FU]50XP

\*#) ટેન્ડર/એજન્સીએ ટેન્ડર ડોક્યુમેન્ટ સાથે ESIC કોડ/રજીસ્ટ્રેશન ફરજિયાત રજુ કરવાનું રહેશે, ESIC કોડ/રજીસ્ટ્રેશન સિવાયનું ટેન્ડર  
માન્ય ગણાશે નહીં.

૭૪) કોન્ટ્રાક્ટરશ્રીએ બાંધકામ માં OPC પત્ર ગ્રેડ સિમેન્ટ વાપરવાની રહેશે.

❖ p5ZMST TDFD XZTM GV ! YL \*\$ VDM V[JFR4JRFJL4; DHL4JRFZLG[8g0ZDA EFJM EZ[, K[H[ DG[q  
VDG[ SA[, DHZ K[VG[T[D]HA VDM SFD SZJF AWF. V[KLVP

Sng8FS8ZGL ; CL P

Sng8FS8ZG]GFD P

Sng8FS8ZGM I: SSM

TFZLB

## Consolidated Tender Details

[Home](#) > **Consolidated Tender Details**

Tender Id: 121418

[View BOQ/Item Details](#)

Organization Name	Bhavnagar Municipal Corporation
Location	Bhavnagar
Department	Urban Development and Urban Housing Department
Sub Department	Bhavnagar Municipal Corporation
IFB/Tender Notice No	BUILDING / E-7/ 2024-25
Tender Creation Date	23-10-2024 18:29
Tender Type	Open
Tender Title/Name of Project	SJMMSVY
Description of Material/Name of Work	PROPOSED DEVELOPMENT OF TRAFFIC ISLAND CIRCLE BASED ON PANCH SHAKTI THEME AT VIJAYRAJNAGAR, BHAVNAGAR
Sector Category	Urban Development
Form of Contract	Works
Product Category	Civil Works - Buildings
Tender Category	WORKS
Estimated Cost Value	6203871.00 INR (Sixty Two Lacs Zero Three Thousand Eight hundred Seventy One )
Is ECV Visible to Supplier?	Yes
Tender Currency Type	Single
Tender Currency Setting	Indian Rupee
Period of Completion/Delivery Period	9 Months

Procurement Type	Works
Consortium / Joint Venture	N/A
Rebate	N/A
Alternate decrypter	N/A

## Calender Details

Bid Document Download Start Date	24-10-2024 10:30
Bid Document Download End Date	13-11-2024 18:00
Bid Submission Start Date	24-10-2024 10:30
Bid Submission Closing Date	13-11-2024 18:00
Tender NIT View Date	23-10-2024 19:10
Remarks	<p>CLASS OF REGISTRATION REQUIRED FOR BIDDER MUST BE "D" Class &amp; Above. Demand Draft for tender fee &amp; Emd shall be submitted in Electronic Formate through online scanning alongwith all the supporting documents such as Registration, Bank Solvency Certificate etc. while uploading the bid. Offer of those will be opened whose EMD &amp; Tender fee is received electronically alongwith the bids. However for the purpose of realization of Demand Draft, bidder shall send them in original alongwith all the required documents mentioned in the tender documents through RPAD/Speed post/Reg AD so as they reach to the office of Exe. Engr. - Building Dept. Bhavnagar Municipal Corporation during office hours between- Date-13-11-2024 to 20-11-2024- 18:00 pm. Penaltive action shall be initiated for not submitting the supporting documents in original to E.E. by bidder. Hard copy will not be accepted and considered. Successful Bids (Preliminary &amp; Technical Bid) if necessary</p>

	eliminary & technical Bid), if possible will be opened on the 21-11 - 2024, 17:30 pm at the City Engineer's office -BMC
Pre-Bid Meeting Mode	Offline
Pre-Bid Meeting Opening Date	28-10-2024 11:00
Bid validity	120

## Amount Details

Bidding Processing Fee ( OFFLINE)	2832.00 INR(Two thousand Eight hundred Thirty Two )
Bidding Processing Fee Payable to	Commissioner, Municipal Corporation, Bhavnagar
Bidding Processing Fee Payable at	Commissioner, Municipal Corporation, Bhavnagar
Bid Security/EMD/Proposal Security INR(OFFLINE)	62039.00 INR (Sixty Two Thousand zero Thirty Nine )
Bid Security/EMD/Proposal Security INR Payable to	Commissioner, Municipal Corporation, Bhavnagar
Bid Security/EMD/Proposal Security INR Payable at	Commissioner, Municipal Corporation, Bhavnagar
Exempted Fee	No

## Other Details

Officer Inviting Bids	Executive Engineer,Building Department, Bhavnagar Municipal Corporation,Bhavnagar.
Bid Opening Authority	Tender Committee
Address	Executive Engineer, Building Department,Municipal Corporation,Sir Mangalsinhji Road,Bhavnagar.
Contact Details	8128207404/9724513409



## General Terms & Conditions

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### General Terms and Conditions

- (1) Bidders can download the tender document free of cost from the website.
- (2) Bidders have to submit Technical bid as well as Price bid in Electronic format only on nprocure website till the Last Date & time for submission.
- (3) Offers in physical form will not be accepted in any case.
- (4) Free vendor training camp will be organized every Saturday between 4.00 to 5.00 P.M. at (n)code solutions-A Division of GNFC Ltd., Bidders are requested to take benefit of the same.

Bidders who wish to participate in online tenders will have to procure / should have legally valid Digital Certificate as per Information Technology Act-2000 (Class-III) using which they can sign their electronic bids. Bidders can procure the same from any of the license certifying Authority of India or can contract (n)code solutions- A division of GNFC Ltd, who are licensed Certifying Authority by Govt. of India.

In case bidders need any clarifications or if training required to participate in online tenders, they can contact (n)Procure Support team:-

(n)code Solutions-IT division of GNFC Ltd.,  
(n)Procure Cell  
501, GNFC Infotower, S.G. Road,  
Bodakdev, Ahmedabad – 380054 (Gujarat)

#### +Contact Details

Phone

+91-79-40007517, 40007514, 40007515.

E-mail : nprocure@ncode.in

TOLL FREE NUMBER: 73590 21663

Other Terms & Conditions as per detailed tender documents

## Tender Documents



Sr No	Document Name	Document Definition	Document Size
1	03_Anti_Blacklisting_No_Litigations_Affidavit (1).pdf	03_Anti_Blacklisting_No_Litigations_Affidavit (1).pdf	8.11 KB
2	05_specification index (2).pdf	05_specification index (2).pdf	495.36 KB
3	06_Building_Work_Specificati on_Booklet (1).pdf	06_Building_Work_Specificati on_Booklet (1).pdf	1,008.74 KB
4	07_Electric_Work_Specificati on_Booklet (2).pdf	07_Electric_Work_Specificati on_Booklet (2).pdf	1,452.39 KB
5	10_drawings (1)_merged.pdf	10_drawings (1)_merged.pdf	2,667.69 KB
6	09_Make_List (2).pdf	09_Make_List (2).pdf	1,171.22 KB
7	12 GARDEN LAYOUT PLAN. pdf	12 GARDEN LAYOUT PLAN. pdf	503.46 KB
8	11.pdf	11.pdf	2,667.69 KB
9	12 Paripatra.pdf	12 Paripatra.pdf	5,003.82 KB
10	13_operation and maintenec e manual.pdf	13_operation and maintenec e manual.pdf	164.38 KB
11	17. OTHER TENDER CONDI TIONS.pdf	17. OTHER TENDER CONDI TIONS.pdf	211.52 KB
12	VIJAYRAJNAGAR CIRCLE.p df	VIJAYRAJNAGAR CIRCLE.p df	3,502.66 KB
13	GARDEN LAYOUT PLAN1.p df	GARDEN LAYOUT PLAN1.p df	503.46 KB
14	01_NOTICE INVITEING TEN DER.pdf	01_NOTICE INVITEING TEN DER.pdf	183.65 KB
15	02_B1 FORM.pdf	02_B1 FORM.pdf	312.08 KB
16	04_SCHEDULE_B.pdf	04_SCHEDULE_B.pdf	60.14 KB
17	18 TENDER CONDITION.pdf	18 TENDER CONDITION.pdf	187.45 KB
18	10_H and L_Work_Specificati on_Booklet.pdf	10_H and L_Work_Specificati on_Booklet.pdf	4,822.43 KB

## Tender Stages

	Evaluation	Minimum	Evaluation
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Stage Name	Date	Forms for Submission	Dependency
Preliminary Stage	21-11-2024 16:50	0	
Commercial Stage	21-11-2024 17:30	0	Preliminary Stage

## 1. Preliminary Stage

Form Id	Form Name	Form Mode	Submission Type	Mandatory	Action
5	Tender Fee Form	Library-Standard	Single	Yes	
6	Emd Fee Form	Library-Standard	Single	Yes	

## Documents required for Stage - Preliminary Stage

Sr No	Document Name	Mandatory
1	[1] D.D. of Tender Fee	Yes
2	[2] D.D. of EMD	Yes
3	[3] Bank Solvency 20 Percent Estimated Cost Of Current Calendar Year of 2023	Yes
4	[4] Registered Certificate	Yes
5	[5] Pan Card Number	Yes
6	[6] G.S.T. Number	Yes
7	(7) The bidder shall have to submit valid certificate of registration for having EPF number and ESIC number.	Yes
8	[7] Other Required Document As per tender.	Yes

## 2. Commercial Stage

Form Id	Form Name	Form Mode	Submission Type	Mandatory	Action
4	Percentage Rate	Library-Secured	Single	Yes	

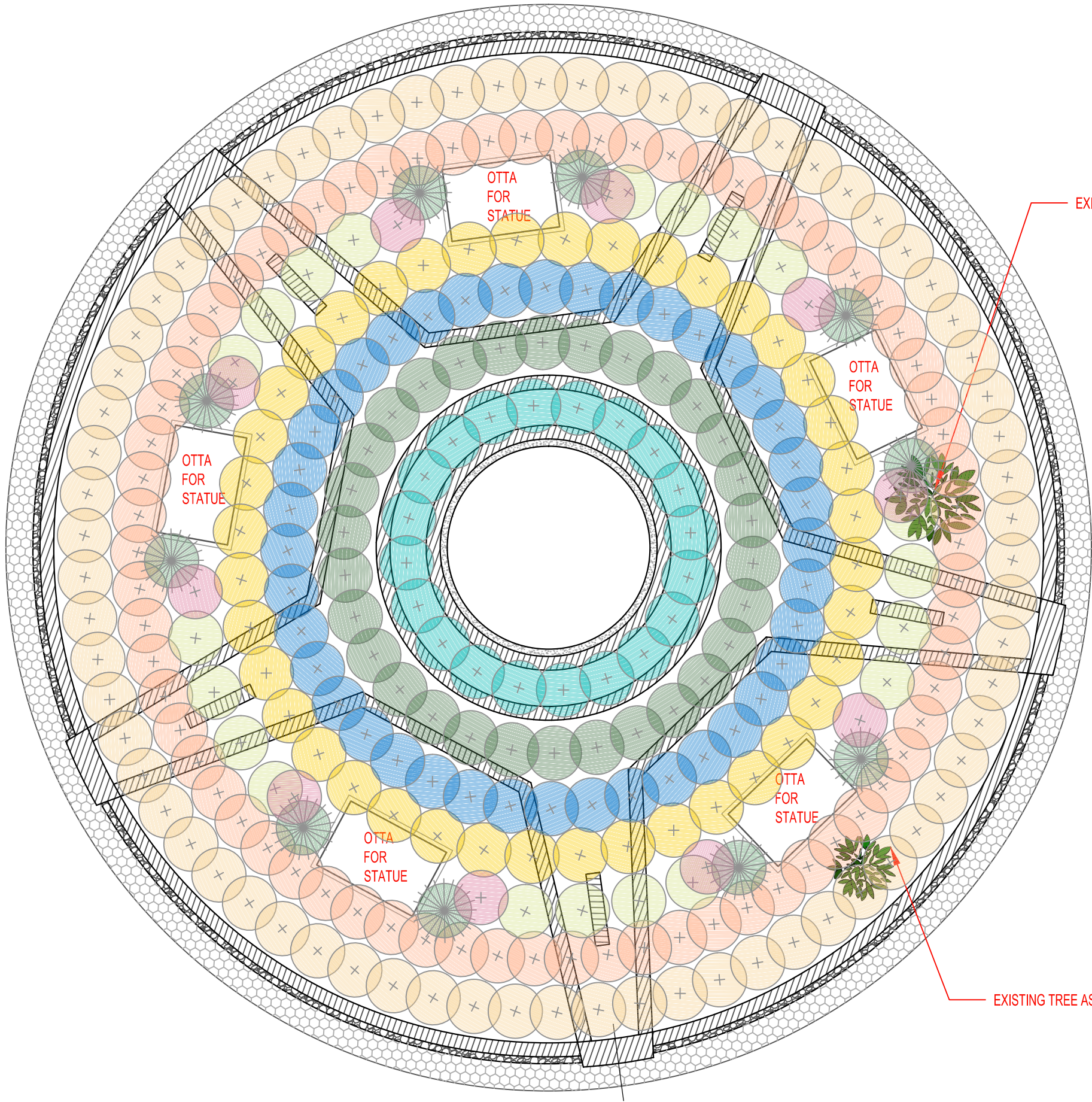
## Evaluation Committee

Stage	Opening	Decryptor		Stage
		Primary Decryptor	Alternate Decryptor	
Preliminary Stage	Bharat M Advani (bmcbmadvani)	<a href="#">Bharat M Advani(bmcbmadvani)</a>	N/A	Bharat M Advani (bmcbmadvani)
Commercial Stage	Bharat M Advani (bmcbmadvani)	<a href="#">Bharat M Advani(bmcbmadvani)</a>	N/A	Bharat M Advani (bmcbmadvani)

Legends	
Icon	Description
	View



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-  TECOMA (ORANGE) DRAFT
-  TECOMA (YELLOW) DRAFT
-  TECOMA (RED) DRAFT
-  GREEN VICHA PALM
-  FOUNTAIN GRASS (SILVER)
-  EXORA (WHITE) DRAFT
-  EXORA (PINK) DRAFT
-  EXORA (RED) DRAFT
-  FOUNTAIN GRASS (PURPLE)

- NOTES :
1. ALL DIMENSIONS ARE IN MILLIMETERS
  2. DO NOT SCALE DRAWING
  3. FOLLOW FIGURED DIMENSIONS ONLY
  4. REFER DETAIL DRAWINGS WHEREVER RELEVANT
  5. THIS DRAWING SUPERSEDES ALL DRAWINGS

ISSUED FOR  
TENDER ONLY.

PRINTS ISSUED :			DIGITAL	PHYSICAL
P1	09-09-24	ISSUED FOR TENDER	×	✓

OWNER : BHAVNAGAR MUNICIPAL CORPORATION

PROJECT : DEVELOPMENT OF VIJAYRAJNAGAR  
CIRCLE



ARCHITECT : SURYARAJ.SINH. N. GOHIL  
suryaraj.architect@gmail.com

GARDEN LANDSCAPE LAYOUT PLAN

TENDER DRAWING	DRAWING NO.  AR_LD_01
DATE : 09 - 09 - 2024	
SCALE : N.T.S	
SHEET : A3	
DRAWN BY : DH	
CHECKED BY : S.N.G	



## PLANTATION PALETTE FOR VIJAYRAJ NAGAR CIRCLE (BHAVNAGAR)



- **TECOMA (ORANGE) DRAFT**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



- **TECOMA (RED) DRAFT**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



- **TECOMA (YELLOW) DRAFT**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



- **FOUNTAIN GRASS (SILVER)**
- **BAG SIZE - 6X6**
- **HEIGHT - 1.5 FEET**



## PLANTATION PALETTE FOR VIJAYRAJ NAGAR CIRCLE (BHAVNAGAR)



- **FOUNTAIN GRASS PURPLE**
- **BAG SIZE - 6X6**
- **HEIGHT - 1.5 FEET**



- **EXORA (PINK)**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



- **GOLDEN MAYURPANKH**
- **BAG SIZE - 18X18**
- **HEIGHT - 2 FEET**



- **EXORA (RED)**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



## PLANTATION PALETTE FOR VIJAYRAJ NAGAR CIRCLE (BHAVNAGAR)



- **EXORA (WHITE)**
- **BAG SIZE - 6X8**
- **HEIGHT - 1 FEET**



- **GREEN VICHA PALM**
- **BAG SIZE - 24 X 24**
- **HEIGHT - 6 FEET**



- **CURTAIN VINE**
- **BAG SIZE - 5X6**
- **HEIGHT - 2 FEET**

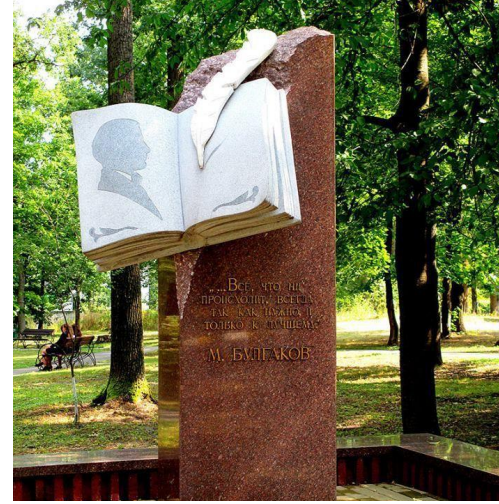


- **MALPINGHIA (LADY)**
- **BAG SIZE - 24 X 24**
- **HEIGHT - 6 FEET**

## STATUE & FOUNTAIN PALETTE FOR VIJAYRAJ NAGAR CIRCLE (BHAVNAGAR)



- JAL SHAKTI
- TWO POTS WITH WATER DROP
- HEIGHT - 4' 6" WITH 6" BASE



- GYAN SHAKTI
- STONE WITH BOOK EFFECT
- HEIGHT - 4' 6" WITH 6" BASE



- URJA SHAKTI
- HUMAN FIGURE
- HEIGHT - 4' 6" WITH 6" BASE



- RAKSHA SHAKTI
- SOLDIERS
- HEIGHT - 4' 6" WITH 6" BASE



## STATUE & FOUNTAIN PALETTE FOR VIJAYRAJ NAGAR CIRCLE (BHAVNAGAR)



- JANA SHAKTI
- HUMANS WITH SYMBOLS
- HEIGHT - 4' 6" WITH 6" BASE

