

BHAVNAGAR MUNICIPAL CORPORATION

Notice Inviting On -Line Tender

Tendar Notice No.- BMC/DRAINAGE/AMRUT 2.0/DR/13/2024

Department Name	:-	Drainage Department (Bhavnagar municipal Corporation)
IFB No.	:-	BMC/DRAINAGE/AMRUT 2.0/DR/13/2024
Name of Project	:-	Atal Mission for Rejuvenation and Urban Transformation 2.0
Name of Work	:-	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.
Estimated Contract Value (INR)	:-	Rs. 8,70,34,501.17+ GST
Class of Registration required	:-	Class AA
Period of Completion (in month)	:-	16 month
Bid Call (Nos)	:-	Open (Percentage Rate Tender)
Tender Currency Type	:-	Single
Tender Currency Settings	:-	Indian Rupee (INR)
Joint Venture	:-	Not Applicable
Rebate	:-	Applicable
Amount Details		
Bid Document Fee	:-	Rs. 12,000 /- (Rs. Eighteen Thousand Only)
Bid Document Fee Payable To	:-	Commissioner, Municipal Corporation, Bhavnagar
Bid Security / EMD (INR)	:-	Rs 870345.00/- (Rupees Eight-lakh Seventy thousand Three hundred and Fouty Five rupees only)
Bid Security / EMD in favour of	:-	Commissioner, Municipal Corporation, Bhavnagar
Defect liability period	:-	Two year
EPF registration no.	:-	The bidder shall have to submit valid certificate of registration for having EPF and ESIC number.
Tender Dates		
Bid Document Downloading Start Date	:-	17.10.2024
Bid Document Downloading End Date	:-	6.11.2024
Pre Bid Meeting	:-	28.11.2024 at 12.00 Hr
Last Date & Time of Receipt of Bid (Submission Of Bid)	:-	06.11.2024
Bid Validity Period	:-	180 Days
Remarks	:-	CLASS OF REGISTRATION REQUIRED FOR BIDDER MUST BE "AA" .Cheque/Demand Draft/fdr for tender fee & Emd shall be submitted in Electronic Formate through online scanning alongwith all the supporting documents such as Registration, Bank Solvency Certificate etc. while uploading thebid. Offer of those will be opened whose EMD & Tender fee is received electronically alongwith the bids. however for the purpose of realization of Cheque/Demand Draft/FDR, 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. Engg. - Drainage,Bhavnagar Municipal Corporation during office hours between 06.11.2024 to 11.11.2024 16:00 pm. Penaltative action shall identinitiated for not submitting the supporting documents in original to E.E. by bidder. Hard copy will not be accepted and considered.Successfull Bids (Preliminary & Technical Bid), if possible will be opened on the 11.11.2024, 17:00 pm at the City Engineer's office - BMC
Bid Opening Date	:-	11.11.2024- 17:00 PM

**SPECIAL CONDITION FOR
SUBMISSION OF BG,SD,FDR:-**

For SD, FDR or Bank guarantee issued by State Bank of India will not be accepted. Bidder should submit FDR or Bank guarantee issued by other nationalized bank only.

Other Details

Officer Inviting Bids	:-	Executive Engineer, Drainage Department, Municipal Corporation, Bhavnagar
Bid Opening Authority Members in committee	:-	(1) Executive Engineer (2) City Engineer (3) Chief Accountant (4) Chief Auditor
Address	:-	Drainage Dept -9879792732

E-tendering relate instructions

- (1) Bidders can download the tender document free of cost from the website. www.nprocure.com
- (2) Bidders have to submit Technical bid as well as Price bid in Electronic for only on www.nprocure.com 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.

All bids should be digitally signed, for details regarding digital signature certificate related training involved, kindly, contact the below mentioned address.

(n) Code Solutions A Division of GNFC Ltd.

403, GNFC Infotower, Bodakdev,

Ahmedabad - 380 054 (India)

Tel. +91 79 26854511/12/13 (EXT :501,512,516,525) +91 79 26857316/17/18 (EXT :501,512,516,525)

Fax. +91 79 26857321, 40007533

E-mail : nprocure@gnvc.net

Web-site : www.nprocure.com

Toll Free : 1800-233-1010 (EXT :501,512,516,525)

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355100



Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

PROJECT FUNDED UNDER AMRUT 2.0 GRANT

VOLUME – III

EXTENT OF WORKS, TECHNICAL SPECIFICATIONS AND DATASHEET

Milestone Dates	
Online Downloading of Technical Bid & Price Bid	As Per Volume I
Pre – Bid Conference	As Per Volume I
Last Date of Online Submission of Technical Bid & Price Bid	As Per Volume I
Last Date for Physical Submission of Tender Fee, EMD and other Documents	As Per Volume I
Online Opening of the Technical Bid	As Per Volume I

CONSULTANT:

Technomen consultants
223-227 Ugati corporate park, Opp.
Pratik mall, Koba-Gandhinagar
highway, Kudasan
Gandhinagar - 382421

CLIENT:

Executive Engineer,
Bhavnagar Municipal Corporation.,
Sir Mangalsinhji Road,
Bhavnagar- 364 001
Mobile No.: **9879792732**
Fax: -0278-2428628
E-mail: **bmcdrainage@gmail.com**

Sr. No.	CONTENTS
Vol III (Part 1)	Extent of Work
Vol III (Part 2)	Item wise Specifications for Construction of Sewer Collection Network, pumping station, Pumping Main & Operation and Maintenance
Vol III (Part 3)	General & Material Specification
Vol III(Part 4)	Deleted
Vol III(Part 5)	Deleted
Vol III(Part 6)	Vendor List

VOLUME – III (Part-1)

EXTENT OF WORK

The Broad scope of work for" Title as mentioned in Notice Inviting Tender (NIT)"is as follows and shall be carried out strictly in accordance with specifications and instructions of Engineer issued from time to time.

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

The proposed scheme includes following components:

Gravity sewer network along with manholes for Upgradation of Drainage line from

1. Kansara Main (East) to trunk main of a road around the city
2. Upgradation of Drainage line at LIG, MIG Colony of Housing board in Anandnagar Area
3. Upgradation of Drainage line from Tilaknagar Chowk to triangular Garden
4. Upgradation of Drainage line from Ambawadi chowk to Shree Mangala mata chowk.
5. Upgradation of Drainage line at Dr Naravani & Vaghela mandap street
6. Upgradation of Drainage line Shivaji Circle to Shubhash nagar Shmashan these areas.
 - House connection chambers including pipe connecting manholes.
 - Ventilation shaft wherever necessary.

8.4 The salient features of the proposed sewerage system

Table 8-1-Pipe Table of Proposed Upgradation of Drainage line from Kansara Main (East) to trunk main of a road around the city

Sr No.	Diameter	Length (Rmt)	Material
1	600 mm	269.10	RCC NP4
	Total	269.10	

Table 8-2 -Manhole Table of Proposed Upgradation of Drainage line from Kansara Main (East) to trunk main of a road around the city

Sr No.	Type	Diameter	Material	Nos.
1	Type A	1200 mm	Brick Masonry	9

Table 8-3-Pipe Table of Proposed upgradation of Drainage line at LIG, MIG Colony of Housing board in Anand Nagar Area

Sr No.	Diameter	Length (m)	Material
1	300 mm	3273.0	RCC NP4
	Total	3273.0	

Table 8-4-Manhole Table of Proposed upgradation of Drainage line at LIG, MIG Colony of Housing board in Anand Nagar Area

Sr No.	Type	Diameter	Material	Nos.
1	Type A	1200 mm	Brick Masonry	110

Table 8-5-Pipe Table of Proposed Upgradation of Drainage line from Tilaknagar Chowk to triangular Garden

Sr No.	Diameter	Length (m)	Material
1	400 mm	930.40	RCC NP4
	Total	930.40	

Table 8-6-Manhole Table of Proposed Upgradation of Drainage line from Tilaknagar Chowk to triangular Garden

Sr No.	Type	Diameter	Material	Nos.
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1	Type B	1500 mm	Brick Masonry	31
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Table 8-7-Pipe Table of Proposed Upgradation of Drainage line from Ambawadi chowk to Shree Mangala mata chowk.

Sr No.	Diameter	Length (m)	Material
1	300 mm	292.9	RCC NP4
	Total	292.9	

Table 8-8-Manhole Table of Proposed Upgradation of Drainage line from Ambawadi chowk to Shree Mangala mata chowk.

Sr No.	Type	Diameter	Material	Nos.
1	Type C	1500 mm	Pre cast	10

Table 8-9-Pipe Table of Proposed Upgradation of Drainage line at Dr Naravani & Vaghela mandap street

Sr No.	Diameter	Length (m)	Material
1	300 mm	983.10	RCC NP4
	Total	983.10	

Table 8-10-Manhole Table of Proposed Upgradation of Drainage line at Dr Naravani & Vaghela mandap street

Sr No.	Type	Diameter	Material	Nos.
1	Type A	1200 mm	Brick Masonry	35

Table 8-11-Pipe Table of Proposed Upgradation of Drainage line Shivaji Circle to Shubhash nagar Shmashan

Sr No.	Diameter	Length (m)	Material
1	1200 mm	1886.4	RCC NP4
	Total	1886.4	

Table 8-12-Manhole Table of Proposed Upgradation of Drainage line Shivaji Circle to Shubhash nagar Shmashan

Sr No.	Type	Diameter	Material	Nos.
1	Type C	1500 mm	Precast	62

- **DESIGN YEAR & POPULATION ESTIMATION**

The design year shall be considered for 30 years. Sewage flow data should be as per scope of work given.

- **DESIGN FLOW**

Design flow for proposed sewer network is taken for ultimate year 2053.

- **PEAK FACTORS**

The peak factors with respect to contributing population for domestic sewage as per CPHEEO manual, 2013 is furnished in the following table:

Table1 Recommended Peak Factors for Estimating Domestic Sewage

Contributing Population	Peak factor
Up to 20,000	3.00
20,000 to 50,000	2.50
50,000 to 7,50,000	2.25

Above 7,50,000	2.00
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- **DESIGN OF SEWER COMPONENTS**

Design for sewerage components shall include preliminary designs for sewage collection system including pipelines, manholes, associated Civil work, etc. Gravity sewer system will be designed up to restriction by excessive depth of cutting or by the existing topography. The sewer network will be designed and analyzed using Sewer CAD V8i software.

- **DESIGN FORMULA**

Manning's formula should be adopted as per CPHEEO Manual, Nov 2013 for design of gravity sewers and explained as under-

$$Q_f = V_f \times A$$

$$V_f = \frac{1}{N} \times R^{2/3} \times S^{1/2}$$

Where,

Q_f	=	Flow rate (in cumec)
A	=	Cross sectional area of pipe (sq. m.)
V_f	=	Velocity (in m/s)
N	=	Manning's roughness coefficient
R	=	Hydraulic radius (m).
S	=	Slope of energy gradient
A	=	Cross sectional area of pipe (sq. m.)

- **PIPE MATERIAL**

The pipe materials shall be used for gravity sewers is RCC pipes & DWC Pipes.

- **RECOMMENDATION**

The RCC pipes shall be used for Sewer network and DWC SN8 with suitable bedding.

- **COEFFICIENT OF ROUGHNESS**

The coefficient of roughness is based on type of sewer material proposed for the sewage conveyance. The design value of coefficient of roughness 'n' for RCC pipes shall be as prescribed in CPHEEO 2013 manual.

- **BEDDING FOR SEWERS**

The type of bedding would primarily depend on the soil strata, depth at which sewer is laid and sewer pipe material. Bedding provision for rigid & flexible conduit is different.

The type of bedding to be used for rigid conduit depends on the bedding factor as per Part A of CPHEEO Manual, Nov 2013 & mentioned in following table

Table-2 Type of Bedding

Bedding Factor	Type of Bedding
Up to 1.9	Granular (GRB)
1.9 - 2.8	Plain Concrete Cradle (PCCB)
2.8 - 3.4	Reinforced Concrete Cradle (RCCB)
> 3.4	Complete Concrete Encasement (CCE)

- **MINIMUM SIZE OF SEWERS**

The minimum diameter of sewer pipe (excl. H.C. line) shall be considered as 250 mm (OD) along the road from cleaning and maintenance point of view.

- **DESIGN CAPACITY OF SEWERS**

Sewers shall be designed to carry estimated peak flows generated in the design year and would be designed 80% full at ultimate peak flow. This is to ensure proper ventilation and prevent simplicity.

- **SELF CLEANSING VELOCITIES**

To ensure that deposition of suspended solids does not take place, self cleansing velocities estimated using Shield's formula shall be considered in the design of sewers.

$$V = \frac{1}{n} \times \left(R^{\frac{1}{16}} \times \sqrt{(K_s \times (S_s - 1) \times d_p)} \right)$$

Where,

S_s	=	Specific gravity of particle
d_p	=	particle size in mm
K_s	=	dimensionless constant
R	=	Hydraulic mean radius in m
n	=	Manning's Coefficient

Considering typical values of particle size and specific gravity, minimum partial flow velocities shall be considered at present peak flows and at design peak flows along with restricting maximum velocity to prevent scouring. Following table shows the minimum and maximum velocities in sewer as per CPHEEO Manual, Nov 2013.

Table 3 Maximum and Minimum Velocity in Sewer

Sr. No.	Criteria	Velocity (m/s)
1	Minimum velocity at initial peak flow	0.6

2	Minimum velocity at ultimate peak flow	0.8
3	Maximum velocity	3.0

- **DEPTH OF COVER**

To provide protection to sewers from external loads, the minimum depth of cover to be provided over the top of pipe at the start of the sewers should be 1.0 meters. Maximum cover will be up to 6m.

- **MANHOLES**

Circular manholes shall be provided. Manholes shall be provided at every change of alignment, gradient or diameter, at the head of all sewer lines and branches and at every junction of two or more sewer lines. The centre to centre distance between manholes is proposed to be adopted as 30m for ease of maintenance of sewers, however, it will be finally based on sewer size. The clear opening at the top in case of ordinary manholes should be minimum 560mm. C.I steps (PVC encapsulated) shall be provided at 300mm c/c inside the manhole. The size of manhole shall depend on diameter and depth of sewer. The manhole frame and cover proposed is of Steel Fiber Reinforced Concrete (SFRC) capable of withstanding heavy duty loads and extra heavy duty loads at sector roads, conforming to the IS:12592-2002. The internal diameters of manholes for varying depths are mentioned in following

Table 4 Internal Diameters of circular manholes as per the depths

Sr. No.	Manhole depth ranges	Internal diameter of sewer manholes
1	above 0.9m and up to 1.5m	1200 mm
2	above 1.5m and up to 4m	1500mm
3	above 4m and up to 6m	1500mm

- **VENT SHAFT**

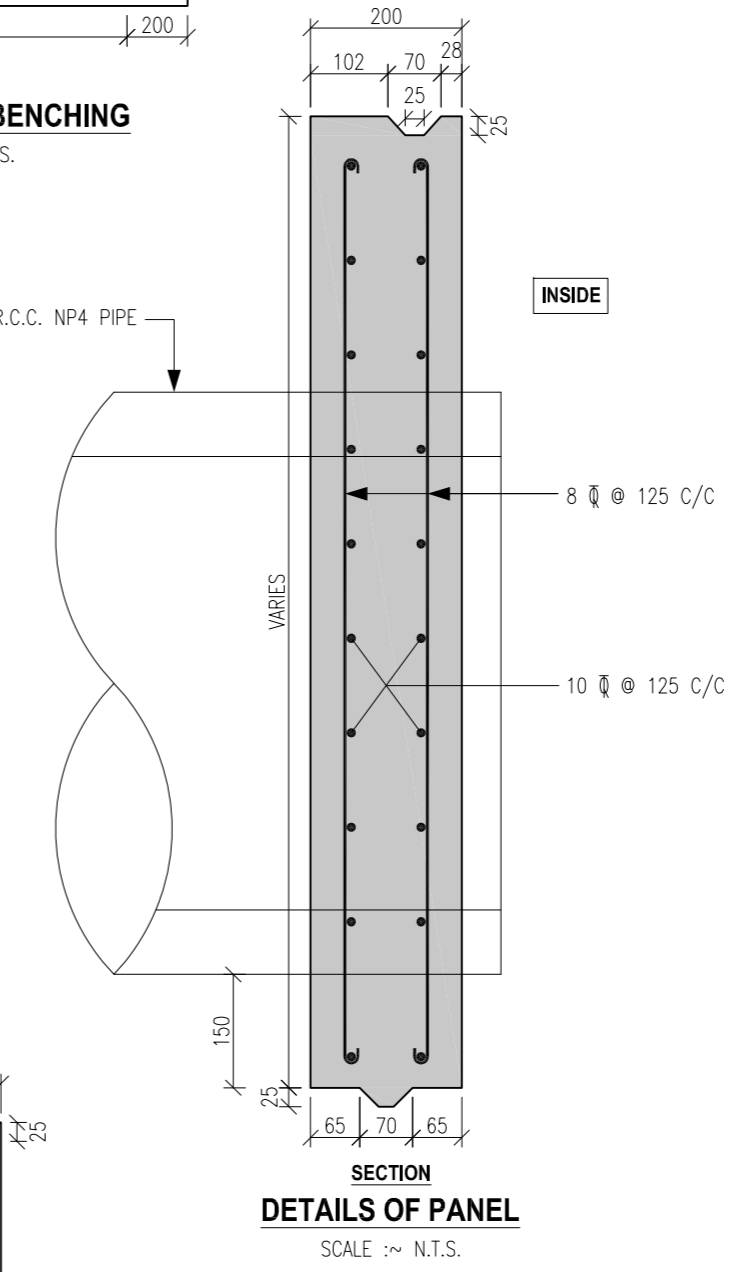
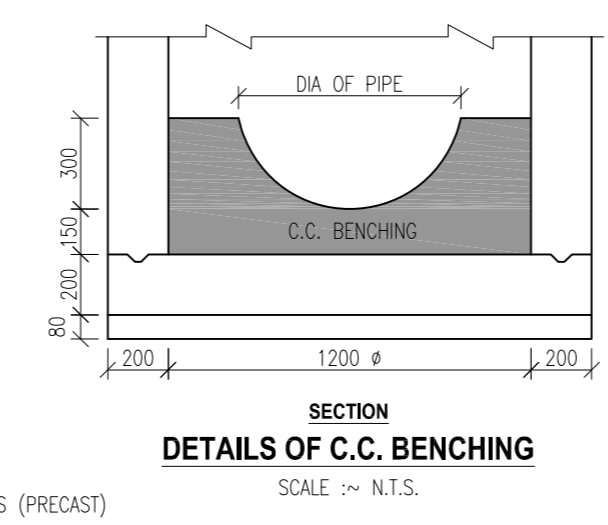
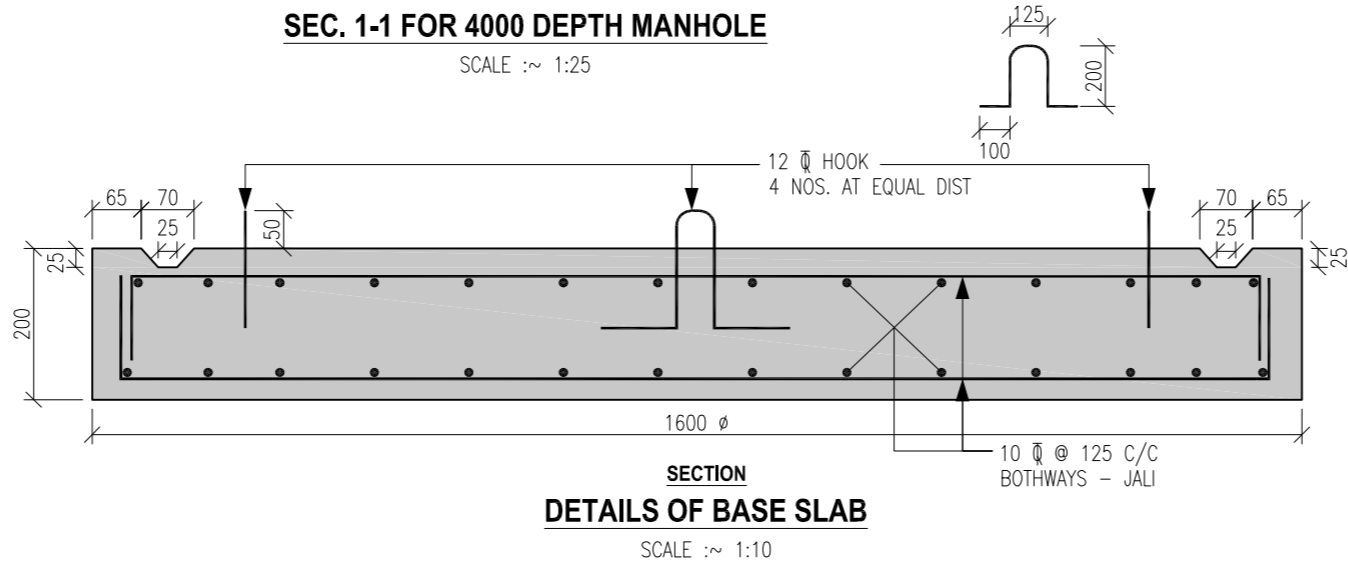
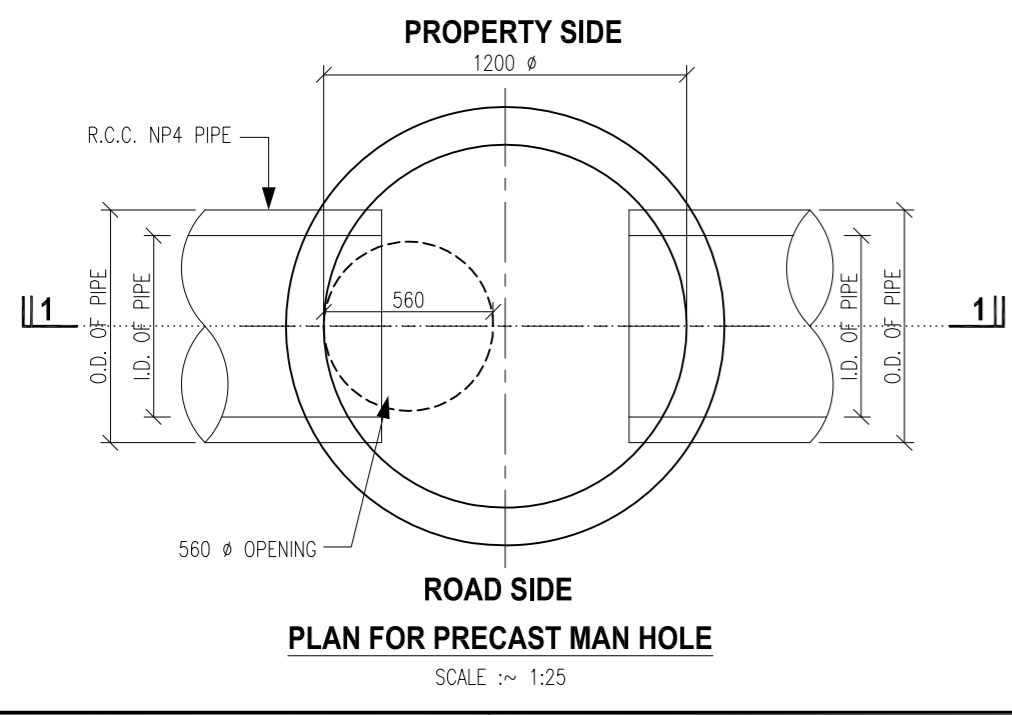
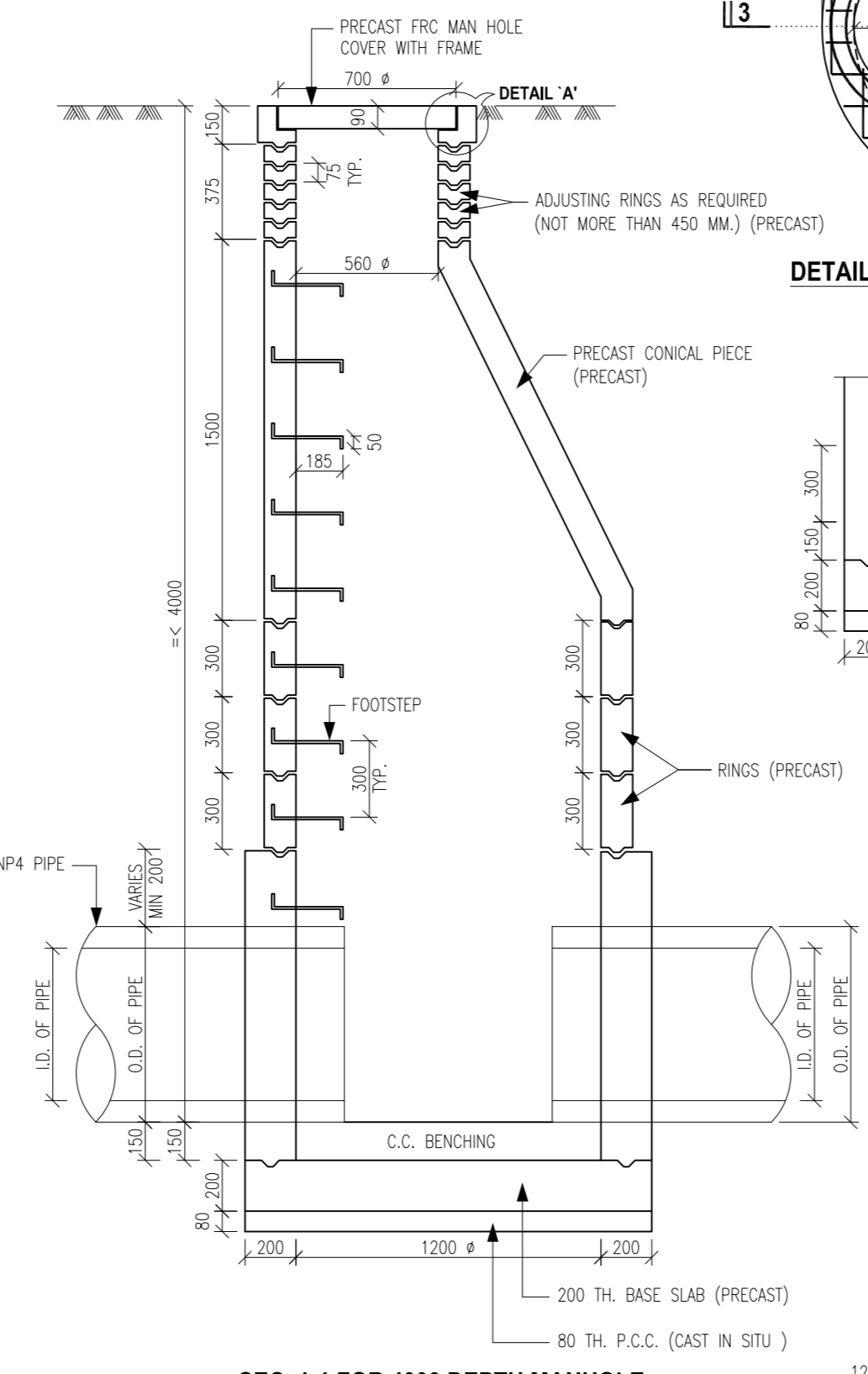
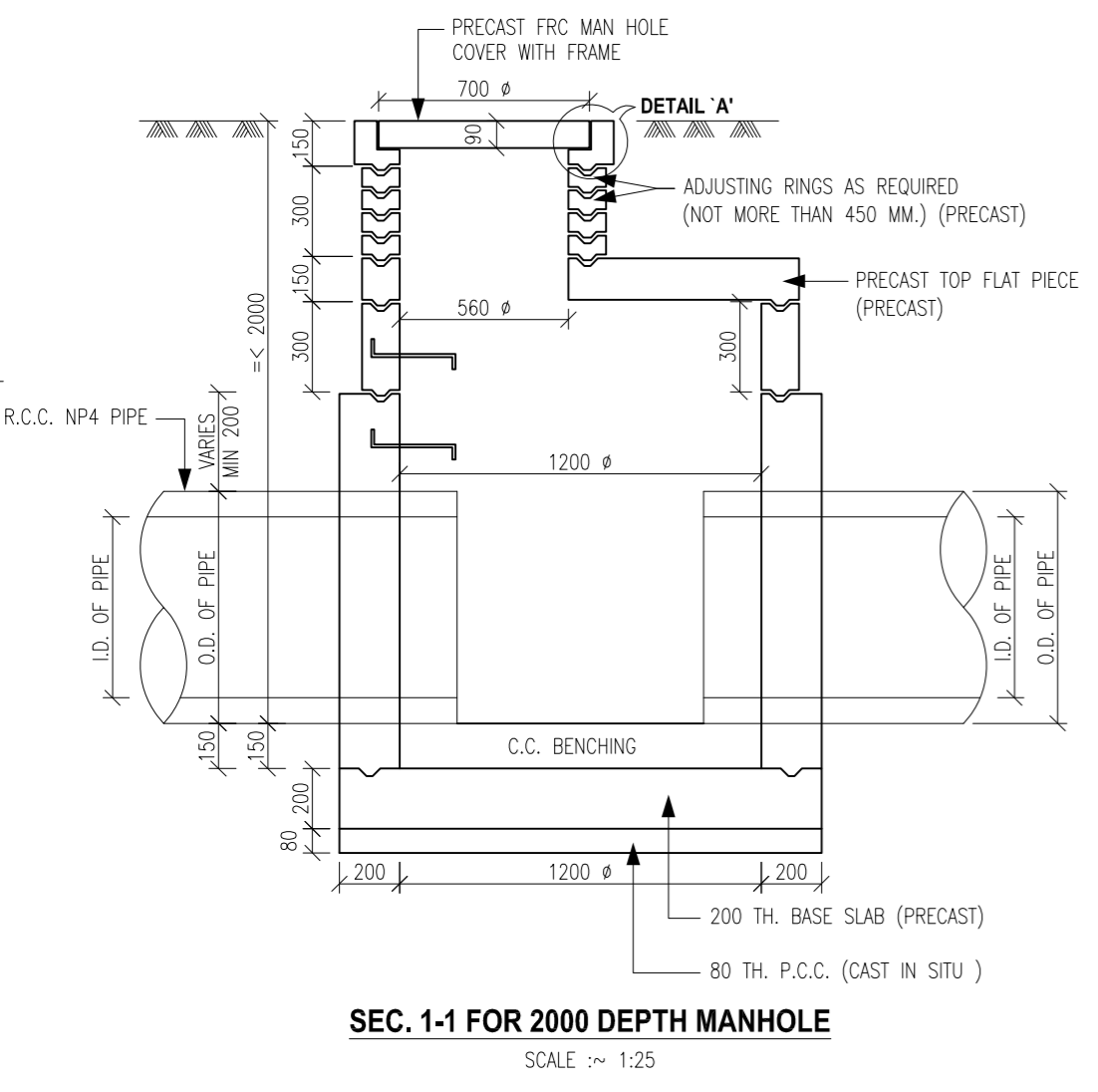
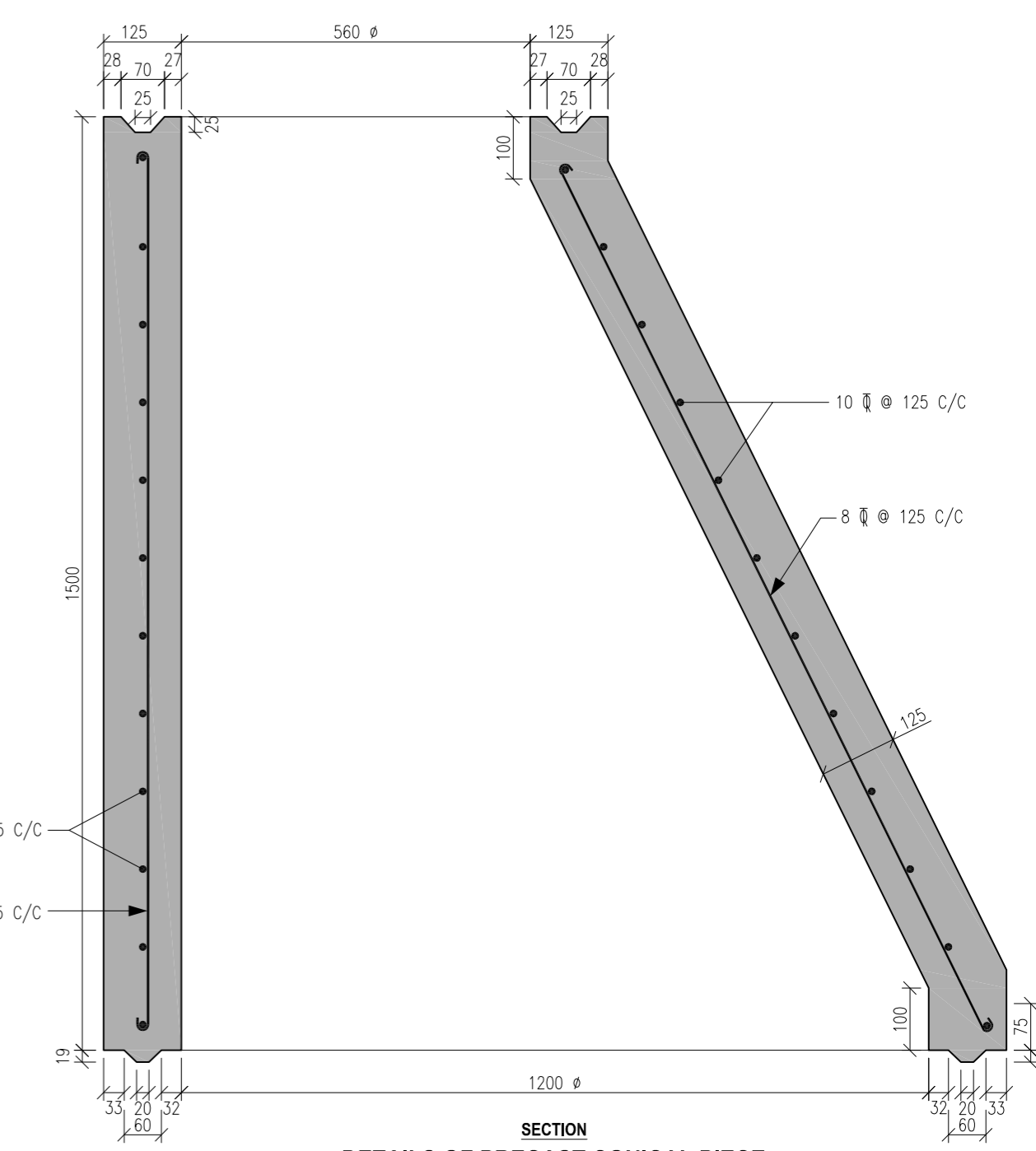
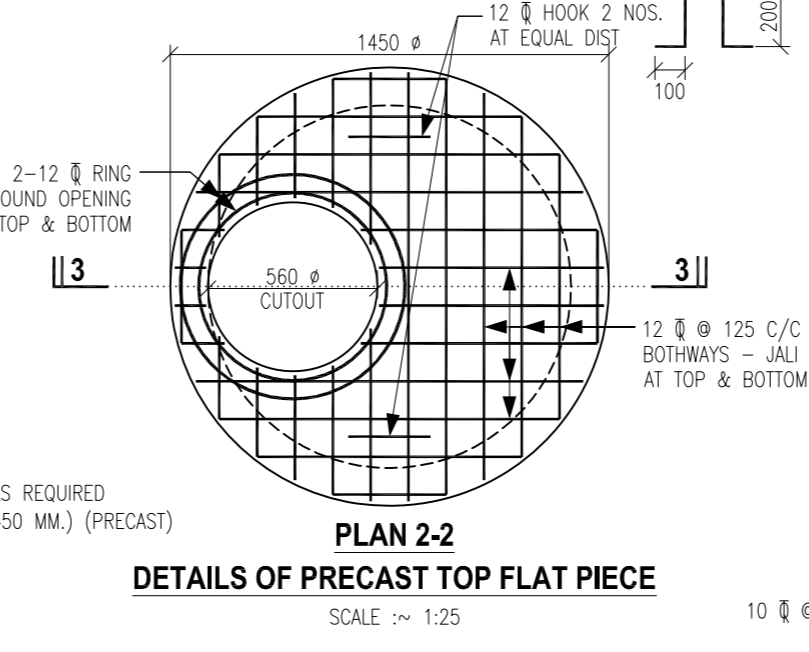
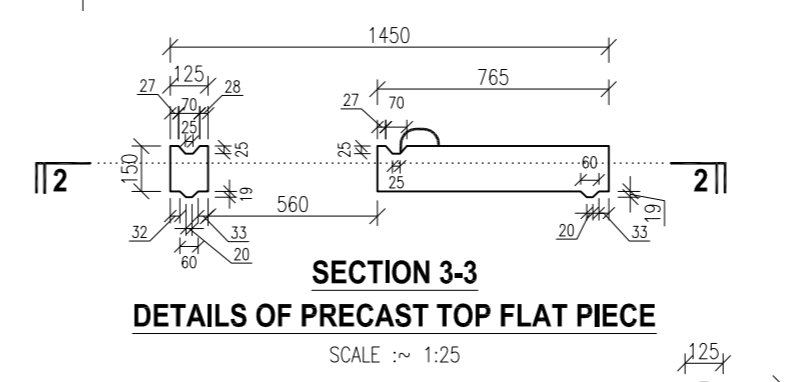
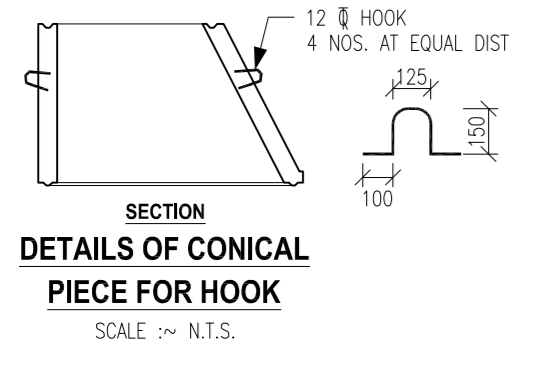
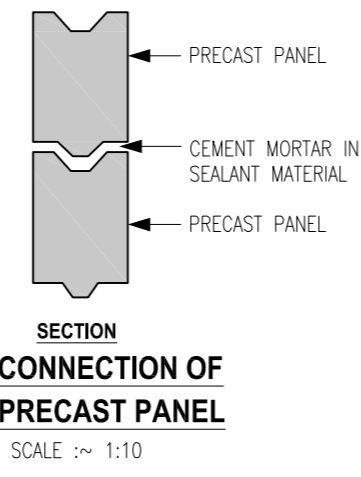
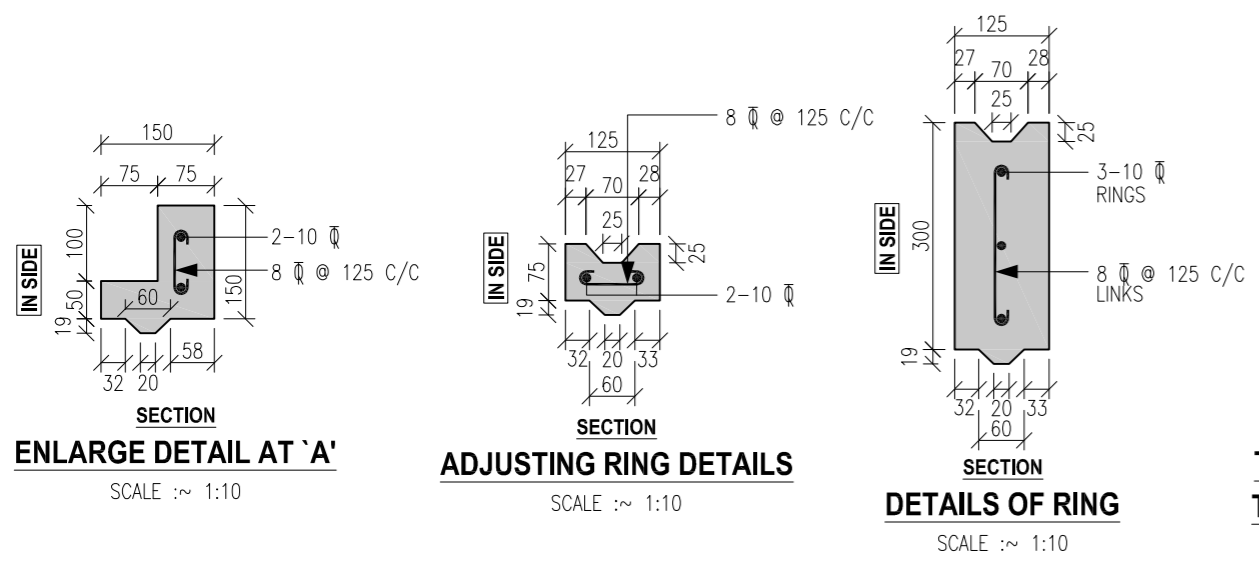
Vent Shafts have been considered for the system. Manholes will have perforated covers at intervals for release of accumulated gas.

- **NETWORK DESIGN**

Sewer CAD software should be used for network analysis. Zone wise networks will have to be analyze as per design criteria. Flow to each manhole shall be assigned by looking into vicinity, the number and type of consumers served by a particular manhole

Conditions:

1. All the pipes shall have to be inspected by the representative of the Owner as decided by Executive Engineer from time to time before use.
2. Cement to be brought and used by contractor as per the BMC approved vendor list enclosed.
3. Steel to be brought and used by contractor shall be as per the BMC approved vendor list enclosed.
4. The contractor has to provide safe store before taking delivery of materials required for the work or to be provided by the client.
5. For civil works and other allied works material required to be used for the same shall be furnished by the agency as per the standards as well as ISI Mark of reputed brand.
6. The bidder has to carry out level survey as per the instruction and guidance of the EIC or its official representative. The LS accordingly shall have to prepared and submitted to the project department for approval. The work on site shall be carried out only after getting the approval of LS.
7. As the work to be carried out in urban area the bidder shall have to restore all the service like water, drainage, septic tank, gas, electricity, electric- telephone cable etc. at his own cost.



- NOTES ~**
1. ALL DIMENSIONS ARE IN MILLIMETRE.
 2. DO NOT SCALE THIS DRAWING.
 3. ALL PLAIN AND REINFORCED CONCRETE SHALL CONFORM TO IS:456-2000, IS:3370.
 4. CEMENT FOR ALL R.C.C. WORK TO BE ORDINARY PORTLAND CEMENT CONFIRMING TO IS: 269, IS:456.
 5. ALL STRUCTURAL WORK SHALL BE CARRIED OUT AS PER RELEVANT INDIAN STANDARDS.
 6. CONCRETE GRADE OF R.C.C. FOR ALL STRUCTURE = M40, AND FOR P.C.C. = M15.
 7. @ INDICATE TOR STEEL (TMT Fe 500) CONFORMING TO IS 1786.
 8. COVER TO BE PROVIDED AT TOP & BOTTOM IN
 BASE SLAB = 40 MM.
 FLAT SLAB = 25 MM.
 CONICAL PIECE = 25 MM.

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**BHAVANAGAR MUNICIPAL CORPORATION
BHAVNAGAR**

VOLUME – III (Part-2)

ITEM WISE SPECIFICATIONS

Sr. No.	CONTENTS
Vol III (Part 1)	Extent of Work
Vol III (Part 2)	Item wise Specifications for Upgradation of Sewer Collection Network
Vol III (Part 3)	General & Material Specification
Vol III (Part 4)	DELETED
Vol III (Part 5)	DELETED
Vol III (Part 6)	Vendor List

Note: Following are the detail specification for major items mentioned Schedule B. Bidder shall refer relevant specifications for each Item mentioned in Schedule B.

Item no.1 of Schedule B1 to B6

Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chiseling only for finishing.

1.1 GENERAL :

1.1.1 All strata means : Any strata of soil including, soil, soft murrum, hard murrum, soft rock, hard rock , RCC road, WBM, Cement Block road, concrete underground structure etc, found in excavation fall under this category.

1.2 CLEARING OF SITES:

1.2.1 The site on which the pipeline is to be laid as shown on plan and the area required for setting out and other operation shall be cleared and all obstructions, loose stones and materials, rubbish of all kinds, stumps, brushwood as well as all trees, shall be removed as directed. The roots shall be entirely grubbed up.

1.2.2 The products of the clearing to be stacked in such a place and in such a manner, as directed by the Engineer-in-charge.

1.2.3 In Jungle clearings, all trees not specially marked for preservation, bamboos, Jungle wood and brushwood shall be cut and their roots grubbed-up. All wood and material from the clearing shall be the property of Corporation and shall be arranged as directed the Corporation Engineer or his authorized agent. The materials found to be use full by the Engineer will be conveyed and properly stacked as directed within the specified limit. Useless materials will be burnt or otherwise disposed off as directed, by the Engineer-in-charge.

1.2.4 All holes or hollows, whether originally existing or produced by drawing-up roots, shall be carefully filled up with earth, well rammed and leveled off, as may be directed.

1.3 SETTING OUT:

1.3.1 All the centre line of pipe trenches shall be given by the Engineer-in-charge and it will be the responsibility of the contractor to install substantial reference marks, bench marks etc. and maintain them as long as required true to line, level, curve & slopes. The contractor shall assume full responsibility for alignment, elevation and dimensions of each and all parts of the work. The labour, materials etc. required for setting out and establishing bench marks and other reference marks shall be arranged by the contractor at his own cost.

1.4 EXCAVATION:

Before excavating the trench the alignment of pipeline shall be approved by Owner/Engineer. The excavation of trenches and pits for manholes/ chambers shall be carried out in accordance with the Technical Specification and shall be done such that it does not get far ahead of the laying operating as approved by Owner/Engineer.

To protect persons from injury and to avoid damage to property, adequate barricades, instructions signs, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for the traffic to use the roadways. The relevant Indian Standards and the rules and regulations of local authorities in regards to safety provisions shall be observed.

Suitable barricading shall be provided along the sides of trenches and pits. The posts of fencing shall be of timber securely fixed in the ground not more than 3 m apart and they shall not be less than 75 mm in diameter or less than 1.2m above surface of the ground. There shall be two rails, one near the top of the post and the other about 450mm above the ground and each shall be from 50 mm to 70mm in diameter and sufficiently long to run from post to post to which they shall be bound with strong rope. The method of projecting rails beyond the post and trying them together where they meet will not be allowed on any account. All along the edges of the excavation trenches a bank of earth about 1.2m high shall be formed where required by owner/ engineer for further protection.

The road metal and also the rubble packing shall first be stripped off for the whole width of the trench/pit and separately deposited in such place or places as may be determined by Owner/Engineer.

During excavation, large stones and rubble shall be separated and removed from the excavated soil and stacked separately. The material from excavation shall be deposited on either side of the trench leaving adequate clear distance from the edges of the trench and pit, or as may be necessary to prevent the sides of the trench pit to slip or fall, or at such a distance and in such a manner as to avoid covering fire hydrants, sluice valves, manholes covers etc. and so as to avoid abutting the wall or structure or causing inconvenience to the public and other service organisations or otherwise as Owner/engineer may direct.

Contractor shall take into account additional excavation if any as Owner/Engineer may require in order locating the position of water pipes, drains, sewers etc. or any other works which may be met with, in or about the excavation of trenches/pits while quoting the rates for excavation. Such service lines if met with during excavation shall be properly maintained by Contractor, by means of shoring, strutting, planking over, padding or otherwise as Owner/Engineer may direct, and shall be protected by the Contractor from damage during the progress of the work. All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipeline of water, gas, sewage etc.

If the work for which the excavation has been made is not completed by the expected date of the setting of monsoon or the setting in of rain whichever is earlier, or before the day fixed by Owner/ Engineer for filling in any excavation on account of any festival or special occasion contractor shall backfill such excavation and consolidates the filling.

Utmost care shall be taken to see that the width of the trench at the top of pipe is not more than that specified in drawing. In case additional width is required it shall be provided only in the top portion from the ground level up to 300- mm above the top of pipe. If any extra width is provided in the area below this portion, Contractor shall have to provide remedial measures in the form of lime concrete or rubble masonry otherwise at the discretion and to the satisfaction of Owner/Engineer.

Wherever a socket or collar of pipe or fitting/special occurs, a grip is to be cut in the bottom of the trench or concrete bed to a depth of at least 75 mm below the bed of the pipe so that the pipe may have a fair bearing on its shaft and does not rest upon its socket. Such grip shall be of sufficient size in every respect to admit the hand all around the socket in order to make the joint and the grip shall be maintained clear until the joint has been approved by Owner/Engineer.

When welding is to be carried out with the pipes and specials in the trench, additional excavation of not more than 60 cm in depth and 90 cm in length shall be made at joints in order to facilitate welding.

The excess excavated material shall be carried away from site of works to a place up to a distance as directed by Owner/Engineer. This shall be done immediately so as not to cause any inconvenience to the public or traffic. If the instructions from Engineer are not implemented within seven days from the date of instructions to cart the materials and to clear the site, the same shall be carried out by Owner/Engineer at risk and cost of contractor and any claim or dispute shall not be entertained in this respect.

Obstruction to Traffic

The contractor shall be deemed to have knowledge about the condition of roads and areas where he has to lay the pipe. He shall make his own studies about the widths of roads particularly narrow, winding and steeply sloping roads to assess the difficulties he may have to face during excavation, stacking of pipes and materials, tools and plant during execution.

He shall make all the necessary arrangements for the diversion of traffic with least inconvenience to the public. He shall erect warning signals day and night and provide necessary barricades to avoid accidents. Any damages caused to the public/private property shall be made good at his own cost. He shall also be responsible to pay a compensation to any person subjected to injuries or death due to his negligence in providing necessary safety precautions.

- 1.4.1 The excavation for the pipe trenches shall include removal of all materials of whatsoever nature and whether wet or dry, necessary for the laying of pipe lines/ construction of sub-structure exactly in accordance with lines, levels, grades and curves shown on the plans L-sections or as directed by the Engineer-in-charge. Trenches shall be excavated to the exact width at the lowest portion of the trench and the sides shall be left vertical as far as possible or according to the angle or repose of various soils. The contractor shall notify the Engineer before starting excavation to enable him to take cross sectional levels for purpose of measurements before the ground is disturbed.
- 1.4.2 Excavation shall be carried out in stratas specified in item of schedule `B'. The lift will be also as specified in Schedule `B'. Tunneling in case of laying of deep sewers in place of open excavation shall be allowed up to 2 meter length with the permission by the Engineer-in-charge. Contractor shall, as far as possible avoid tunneling at the

joints of pipes. In such case, the levels and gradients of pipe line to be laid shall be properly attained and shall be got thoroughly checked by the contractor through the Engineer-in-charge. Payment of tunneling shall be made as per the rate for open excavation including bailing out of water. No deduction or extra payment shall be made in case of tunneling. Excavated material shall be stacked at a minimum distance of 1.5 meters away from the edge of the trench or as directed. Sight rails and boning rods shall be used for checking the gradients of bed or trenches. Before the trench excavation is started, sight rails made of good timber shall fixed truly vertical at a uniform height, above the invert as per the instruction of the Engineer-in-charge. The centre line shall be clearly marked on the sight rails. Depth of excavation shall be checked by boning rods of suitable size and length as per instructions of the Engineer-in-charge. All the sight rails shall be painted alternatively with two different colours so as to provide better visibility.

1.4.3 The bottom of the trenches shall be leveled both longitudinally and transversely as directed by the Engineer. The contractor shall, at his own cost, remove such portion of boulders or rock, as required to make the bottom of the trench level. No filling shall be allowed to bring the bottom of the trench in level. If by contractor's mistake excavation is made deeper than shown on the plan on order by the Engineer, the extra depth stuff duly watered and rammed as directed by the Engineer at the cost of the contractor. All rock or other hard foundation shall be cleared off, all soft and loose material cut to a firm surface, either level as directed by the Engineer. The Engineer may order such changes in the dimensions and elevation of bottom of trenches may be deemed necessary to secure satisfactory laying of pipe lines. The contractor shall at his own expense, make provision for all, dredging bailing out of draining water and the trenches shall be kept free of water, during construction work. Where pumping by pumping sets becomes essential such pumping shall be paid separately under respective item. Essentially of pumping by pumping sets shall be as decided by Engineer-in-charge.

1.4.4 Extra excavation required for collar pit shall not be paid for.

1.4.5 After each excavation is completed, the contractor shall notify the Engineer to that effect and no trench will be allowed to be filled up until the Engineer or his authorised agent approves the depths and dimensions of excavation and the nature of the strata met with and the level and/or measurements are recorded.

1.4.6 The work measured shall be maintained till completion and in case of collapse of

sides or bottom of trenches due to any reasons, it shall be made good without any extra cost.

1.5 PROTECTION:

- 1.5.1 The pipe trenches, shall be strongly fenced and red light signals shall be kept at night in charge of watchmen to prevent accidents. Sufficient care and protective measure shall be taken to see that the excavation shall not affect or damage the adjoining structure. The contractor shall be entirely responsible for any injury to life and damage to the properties etc. Necessary protection work such as guide ropes, crossing places, barricades, caution Boards etc. shall be provided by the Contractor. The wooden planks for crossing trenches by public as per requirement shall be provided by the contractor without any extra cost.

1.6 ADDITIONAL REQUIREMENTS:

- 1.6.1 At the joints the trench shall be excavated to an additional depth of 15 cms and width of 30 cms. and length of 15 cms. beyond the edge of collar on both the sides or as directed by Engineer-in-charge. No payment for such extra excavation made at the joints shall be payable. The trenches shall be excavated perfectly in straight line. The bottom of trench shall be kept as per invert level or as directed. In obtaining formation on the bottom trench, the usual method of sight rails and boning rods shall be adopted. The contractor shall have to provide and fix and maintain sight rails and boning rod without any extra cost.
- 1.6.2 If contractor fails or makes delay to give the hydraulic test of the pipe line laid or any section thereof without any genuine reasons shall be responsible to re-excavate any part of the length of trenches refilled in such case (i.e. before testing for safety of pedestrian and / or vehicular traffic) without any extra cost, if found necessary and as directed by the Engineer-in-charge. The contractor shall have to excavated the refilled trenches, during hydraulic test without any extra cost.
- 1.6.3 In case of excavation across a road, permission of road authorities shall have to be obtained. At all road crossings, trenches shall be excavated only for half width of the road and pipe shall be laid. The other half shall be excavated only after back filling over the laid pipe line making it suitable for the traffic. The contractor shall provide diversion when the pipe line is to be laid along the road as required and shall maintain the diversion or any part of it, if damaged without any extra cost. At all road

crossings, the pipe shall be laid below the crust of the road.

- 1.6.4 The contractor shall break the road surface by Excavation of chiseling to the exact width and length as shown on the drawing or as directed by the Engineer-in-charge. Separate provision for additional labor in breaking, removing of pavement is made and under these item quantities of excavation shall be excluding depth of such pavement removed.
- 1.6.5 The excavated stuff shall be deposited in uniform layers to avoid mixing with other kind of materials at no objectionable place or as directed by the Engineer-in-charge.
- 1.6.6 The contractor shall have to make his own arrangements for taking trial pits etc. at his own cost, as directed by the Engineer-in-charge.
- 1.6.7 If necessary, temporary arrangements shall have to be made to divert or convey across all natural water ways or build up drains etc. without any extra cost.
- 1.6.8 All water pipes, cables, any structure shall be protected by the contractor as directed by the Engineer-in-charge, if met during excavation. Any damage caused shall be rectified without any extra cost.
- 1.6.9 Breaking of brick structures/R.C.C. works, cement concrete etc. coming in excavation shall be considered as excavation in strata shown in the item, as above and will be paid at the same rate.
- 1.6.10 All safety precautions shall have to be made by the Contractor including shoring and strutting. Shoring and strutting shall be paid separately under respective item.
- 1.6.11 The excavation in narrow streets, lanes shall have to be carried out with full precautions so that no property may be damaged. Any compensation to be paid to the other party will be paid by the contractor for which the Bhavnagar Municipal Corporation will not be responsible.
- 1.6.12 All obstacles, structures etc. shall be removed and made good without further claim or extra cost.

1.7 CLASSIFICATION OF STRATA:

1.7.1 The decision regarding classification of strata shall rest with the Engineer-in-charge and his decision shall be final and binding to the contractor.

1.7.2 All the materials encountered in the excavation shall be classified as under.

1.7.3 All sorts of soil, sand, gravel and other similar soft and loose materials which will include all materials of an earthy or sandy nature which can be easily ploughed or small shingle and gravel which can be easily removed of shall boulders not exceeding 0.30 Cu.m. or 30 litres (about one Cft.) occurring in such strata will be included in the rate for this item.

1.7.4 Soft Murrum :

1.7.4.1 This shall include materials which can be easily removed with the shovel after loosening with a pick.

1.7.5 Hard Murrum :

1.7.5.1 This shall include all kinds of disintegrated rock or shale or inundated clay from boulders, larger than 0.30 Cu.m. or 30 litres (about one Cft.) and which can be removed with pick and shovel though not without some difficulty any which do not require blasting.

1.7.6 Hard Murrum and Boulders :

1.7.6.1 This shall include all kinds of disintegrated rock or shale or inundated clay interspersed with boulders less than half (0.5) a cubic meter (about half Ci.cft.) and large than 0.30 Cu.m. or 30 litres (approx. one Cft.) which do not normally required blasting and can be removed with pick, bar wedge and hammer.

Boulders bigger than 0.5 Cu.m. will be paid for as soft or hard rock according to as it is soft or hard-rock.

1.7.7 Soft Rock :

1.7.7.1 This shall include all materials which is rock or hard conglomerate, all decomposed and weather rock, highly fissured rock, old masonry and also soft rock boulders bigger than 0.5 Cubic meter and other varieties of rock which do not require blasting

and which can be removed with rock, crow bars, wedges and hammer with some difficulty.

1.7.8 Hard Rock (Blasted)

1.7.8.1 This shall include all rocks, occurring in masses which could best be removed blasting and where in the opinion of the Engineer, blasting is necessary and is permissible.

1.7.9 Hard Rock (Chiseled, Wedge or Line Drilled)

1.7.9.1 This shall include all rock, occurring in masses or boulders bigger than half cubic meter size each, which can best be removed by blasting but which owing to the proximity or structures, possibility of shattering the rock below or for any other reasons should be cut by means of cold chisels or wedges or line drilling.

1.7.10 Excavation on Bituminous Road

1.7.10.1 Under this item contractor shall demolish existing asphalt or WBM pavement met with during laying of Pipes. Only area of pavement intercepted in pipe laying shall be demolished same shall be reinstated by the contractor.

Work which is likely to restrict traffic should not be carried out between the hours of 7:00am to 9:00am and 4:00pm to 6:00pm on peak flow traffic lanes unless unavoidable due to emergency circumstances or as otherwise approved by BMC. Works shall be organized so as to cause minimal disruption to traffic, pedestrians and access to properties at all time. Only complete lanes shall be closed and a minimum of one half of the roadway shall remain open to all traffic at all times, unless otherwise approved by the BMC. Any additional breakage of the existing pavement edge shall be cut out square to the edge of the excavation prior to reinstatement. Unless otherwise approved by the BMC, excavated material shall not be reused in the reinstatement of trenches and shall be removed from the site and appropriately disposed of as directed by Engineer in charge, in accordance with the requirements of the Environment Protection Act.

1.7.11 Laterite :

1.7.11.1 This shall include laterite rock soft and hard which can be removed with hammer, chisels, crow or by blasting. Lateritic murrum which has not hardened into stone

shall be classified as hard murrum.

1.7.11.2 The classification of various strata met with during excavation will be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

1.7.11.3 Rock referred to above would include Basalt, Trap, Granite, Quartzite, Gneiss, laterite and other types.

1.7.11.4 The use of explosive in excavation will not be considered as a reason for other classification than the above unless clearly necessary in the opinion of Engineer-in-charge.

1.8 DEWATERING:

1.8.1 **Unless specially provided for as a separate item in the contract, the rate of excavation would include bailing out all water which may accumulate in the excavation during the progress of the work,** either, by percolation, seepage, springs, rain or any other cause and diverting surface flow if any, by earthen bunds shall be removed as soon as the work is completed.

1.9 DISPOSAL OF EXCAVATED STUFF:

1.9.1 The surplus excavated earth, after backfilling the trenches shall have to be removed from the site as directed. Transportation of surplus soil shall be paid separately under respective item.

1.9.2 After compaction and consolidation, if any shortfall of earth is found then contractor has to bring the same to the required quantity in order to meet shortfall at his own cost. Moreover, if any settlement of road after reinstatement is observed during the defect liability period of the work. Contractor shall be fully responsible for the defective work and patches / depression / settlement shall be repaired with quarry spoil or metal at contractor's own cost. If contractor fails to repair the patches/ depression / settlement in time, corporation will repair it at all risk and cost of contractor.

Surplus earth shall not be disposed off in a way that leads to nuisance to the public or BMC.

1.9.3 The site should be cleared off all debris on completion of work.

1.10 MEASUREMENT AND PAYMENT:

1.10.1 The payment of various classes of excavation, depending upon the depth of excavation, shall be made at the unit rate per cubic meter for the quantity actually excavated and accepted by the Engineer limited to dimensions shown in the sanctioned plans L-Section or as directed by the Engineer. Excavation in excess of the sanctioned dimensions shall not be measured nor paid for and if so ordered by the Engineer the contractor shall have to fill up the excess depth with selected excavated stuff duly watered and rammed as directed by the Engineer-in-charge without any extra payment to the Contractor.

1.10.2 Dimension shall be measured correct to two places of decimals of a meter and individual quantity shall be calculated to two places of decimals of a cubic meter.

1.10.3 The rate for the item of excavation shall include (Unless and otherwise mentioned).

- (a) Clearing of site.
- (b) Setting out work including all materials and labour.
- (c) Bailing out of minor seepage water from the excavation pit trench during the progress of work.
- (d) Light compaction of bottom of the trench if required.
- (e) Excavation & removal, sorting and stacking of all excavated stuff up to as directed lead.
- (f) Necessary protection arrangements including labour, materials equipment etc. to ensure safety and protection against risk or accident.
- (g) Providing facilities for inspection and measurements at any time by the concerned Corporation Officials.
- (h) Compensation for injury to life and damage to property if caused during

progress of work.

- (i) Providing motorable diversion facility taking all safety measures.

1.10.4 All measurement shall be taken for true vertical depth from the fixed invert of pipe. The depth shall be measured from invert of pipe upto G.L. top of road leveling. No extra shall be paid for collar pits.

- For excavation in RCC roads, unit of measurement is Rmt.

The measurement under this item shall exclude the quantity excavated for manholes/ chambers. Cost of electric/telephone poles and cables required to be shifted during excavation shall be borne by the contractor.

Item No. 1.11

Breaking of RCC Road while crossing the sewer line with excavation upto 0 to 1.5m depth.

Under this item contractor shall demolish existing concrete pavement met its during laying of Pipes. Only area of pavement intercepted in pipe laying shall be demolished same shall be reinstated by the contractor.

Work which is likely to restrict traffic should not be carried out between the hours of 7:00am to 9:00am and 4:00pm to 6:00pm on peak flow traffic lanes unless unavoidable due to emergency circumstances or as otherwise approved by BMC. Works shall be organized so as to cause minimal disruption to traffic, pedestrians and access to properties at all time. Only complete lanes shall be closed and a minimum of one half of the roadway shall remain open to all traffic at all times, unless otherwise approved by the BMC. Any additional breakage of the existing pavement edge shall be cut out square to the edge of the excavation prior to reinstatement. Unless otherwise approved by the BMC, excavated material shall not be reused in the reinstatement of trenches and shall be removed from the site and appropriately disposed of as directed by Engineer in charge, in accordance with the requirements of the Environment Protection Act. All concrete pavements, base course in carriage way and shoulders etc., designed for removal shall be broken to pieces whose volume shall not exceed 0.02 cum and stockpiled at designated locations if the materials is to be used later or otherwise arranged for disposal as directed.

Item No.2 of Schedule B1to B6

Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges

1.1 The concrete bedding of proportion (1:4:8) shall be according to specification of Item of concrete works.

1.2 MODE OF MEASUREMENTS & PAYMENT:

The payment shall be made for concrete bedding as per drawings. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

The rate shall be for a unit of one cubic meter.

ITEM NO: 3

Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC Cables, Internet cables, etc

During the execution of water network pipe line , there will be various types of utility services on the alignment which may be damaged. The contractor has to inform the engineer in charge for all these utilities and take approval of the concerned Govt Deptt or its owner before damaging the same . During the execution it should not be damaged. If in case it isrequired to remove these utilities to carry out the work permission should be obtained and after getting permission it should be removed, After laying of pipe line all the utilities shall have to be repaired and services shall have to be restarted in its original condition to the satisfaction of engineer in charge and the owner . All the cost of material and labor shall have to be born by the contractor .On getting clearance from the concerned owner the payment will be made

The payment will be made per cum basis.

Item No. 4 of Schedule B1 to B6

Providing and supplying ISI Standard and ISI marked R.C.C. pipes (of Sulphate Resisting Cement) in standard lengths of following class and diameter suitable for EPDM Spigot socket rubber ring joints including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete. (IS - 458/ 1989)

Special Note:

(1) Sulfur Resistance Cement(SRC) shall be used for Manufacturing of pipe

SCOPE

This specification covers the requirements for manufacturing, testing, supplying, jointing and testing at work sites of Reinforced Cement Concrete (RCC) pipe NP3 & NP4 & NP4 for gravity sewers and storm water drains. Laying of pipes and fittings/specials are covered in Technical Specifications:

APPLICABLE CODES

The manufacturing, testing, supplying, jointing and testing at work sites of RCC pipes shall comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the codes shall be referred to. If requirements of this specification conflict with the requirements of the codes and standards, this specification shall govern.

MATERIALS

- a) IS: 458 - Specification for precast concrete pipes (with and without reinf.)-2003
- b) IS: 3597 -Method of tests for concrete pipes.
- c) IS: 5382 -Specification for rubber sealing rings for gas mains, water mains and sewers.
- d) IS: 516 -Method of test for strength of concrete.

CODE OF PRACTICE

- a) IS: 456 -Code of practice for plain and reinforced concrete
- b) IS: 783 -Code of practice for laying of concrete pipes

DESIGN

Design of RCC pipes including reinforcement details and the ends of pipes shall be in accordance with the relevant clauses of IS: 458-2003.

MANUFACTURING

GENERAL:

RCC NP3 & NP4 & NP4/NP4 Pipe should be manufactured by vertical vibrated casting process or horizontal spinning method with BIS mark of IS-458-1998 / latest can also be permitted to used.

The method of manufacture shall be such that the form and the dimensions of the finished pipes are accurate within the limits specified in relevant clause of IS: 458. The surfaces and edges of the pipes shall be well defined and true, and their ends shall be square with the longitudinal axis. The ends of the pipes shall be further reinforced by an extra ring of reinforcement to avoid breakage during transportation.

The RCC pipes and rubber rings shall be systematically checked for any manufacturing defects by experienced supervisors so as to maintain a high standard of quality.

Owner/Engineer shall at all reasonable times have free access to the place where the pipes and collars/rubber rings are manufactured for the purpose of examining and testing the pipes and collars/rubber rings and of witnessing the test and manufacturing.

All tests specified either in this specification or in the relevant Indian Standards shall be performed by the supplier/contractor at his own cost and in presence of Owner/Engineer if desired. For this, sufficient notice before testing of the pipes and fittings shall be given to Owner/Engineer.

If the test is found unsatisfactory, Owner/Engineer may reject any or all pipes of that lot. The decision of Owner/Engineer in this matter shall be final and binding on Contractor and not subject to any arbitration or appeal.

MATERIALS

Cement

Cement used for the manufacture of RCC pipes should be Sulphate Resisting Cement (SRC) only and shall conform to relevant IS codes.

Aggregates

Aggregates used for the manufacture of RCC pipes shall conform to IS: 383. The maximum size of aggregate should not exceed one-third the thickness of the pipe or 20 mm, whichever is smaller.

Mixing and Curing Water

Water shall be clean, colorless and free from objectionable quantities of organic matter, alkali, acid, salts or other impurities that might reduce the strength, durability or other desirable qualities of concrete and mortar.

Reinforcement

Reinforcement used for the manufacture of the RCC pipes shall be mild steel Grade I or medium tensile steel bars conforming to IS: 432 (Part-I) or hard drawn steel wire conforming to IS: 421 (Part-2). Reinforcement cages for pipes shall be as per relevant requirements of IS: 458.

Concrete

Concrete used for the manufacture of RCC pipes shall conform to IS: 456. The minimum cement content and minimum compressive strength of concrete shall be as per relevant requirements of IS:458 (Latest Edition). Compressive strength tests shall be conducted on 15 cm cubes in accordance with the relevant requirements of IS: 456 and IS: 516.

Rubber Ring

For the spigot and socket joints Rubber ring chords used in pipe joints shall be with EPDM rubber ring as per IS 5382.

CURING

Pipes manufactured in compliance with IS:458 (Latest Edition) shall be either water cured or steam cured for minimum stipulated curing period in accordance with relevant requirements of the latest revised IS:458 (Latest Edition).

DIMENSIONS

The internal diameter, wall thickness and length of barrel and collar of pipes, reinforcement (longitudinal and spiral), type of ends and minimum clear cover to reinforcement and strength test requirements shall be as per the relevant clauses/tables of IS: 458 for different classes of pipes.

Table – 2

**Design and Strength Test Requirements of Concrete Pipes of Class NP3 & NP4 & NP4
Reinforced Concrete, Medium Duty, Non-Pressure Pipes**

(Clauses 6.1.1, 6.1.2.1, 6.1.3, 6.2.2, 7.3.2 and 8.1 and Table 20)

Internal Diameter of Pipes in mm	Barrel Wall Thickness	Reinforcements			Strength Test Requirements for Three Edge Bearing Test	
		Longitudinal, Mild Steel or Hard Drawn Steel	Spirals, Hard Draws Steel	Load to Produce 0.25 mm Crack kN/linear metre	Ultimate Load	
		Minimum number	Kg/linear metre	Kg/linear metre		kN/linear metre
(1)	(2)	(3)	(4)	(5)	(6)	(7)
200	30	6	0.59	0.81	14.5	21.75
250	30	6	0.59	1.24	15.00	22.50
300	40	8	0.78	1.80	15.50	23.25
400	75	8	0.78	3.30	19.16	28.74
600	85	8 or 6+6	1.18	7.01	28.74	43.11
800	95	8 or 6+6	2.66	13.04	38.32	57.48
900	100	6+6	2.66	18.30	43.11	64.67
1000	115	6+6	2.66	21.52	47.90	71.85

1200	120	8+8	3.55	33.57	57.48	86.22
1400	135	8+8	3.55	46.21	67.06	100.60
1600	140	8+8	3.55	65.40	76.64	114.96
1800	150	12+12	9.36	87.10	86.22	129.33
2000	170	12+12	9.36	97.90	95.80	143.70
2200	185	12+12	9.36	133.30	105.38	158.07

Note :

1. If mild steel is used for spiral reinforcement, the weight specified under col.5 shall be increased to 140/125.
2. The longitudinal reinforcement given in this table is valid for pipes upto 2.5 m. effective length for internal diameter of pipe upto 250 mm and upto 3 m. effective length for higher diameter pipes.
3. Total mass of longitudinal reinforcement shall be calculated by multiplying the values given in col.4 by the length of the pipe and then deducting for the cover length provided at the two ends.
4. Concrete for pipes shall have a minimum compressive strength of 35 N/mm² at 28 days.

Table – 3

**Design and Strength Test Requirements of Concrete Pipes of Class NP3 & NP4
Reinforced Concrete, Medium Duty, Non-Pressure Pipes Made by Vibrated Casting
Process**

(Clauses 5.5.1, 6.1.1, 6.1.2.1, 6.1.3, 6.2.2, 7.3.2 and 8.1; and Table 20)

Internal Diameter of Pipes in mm	Minimum Barrel Wall Thickness	Reinforcements		Strength Test Requirements for Three Edge Bearing Test	
		Longitudinal, Mild Steel or Hard Drawn Steel	Spirals, Hard Draws Steel	Load to Produce 0.25 mm Crack kN/linear metre	Ultimate Load
		Minimum number	Kg/linear metre	Kg/linear metre	kN/linear metre

(1)	(2)	(3)	(4)	(5)	(6)	(7)
300	50	8	0.78	1.53	15.5	23.25
400	60	8	0.78	1.6	19.16	28.74
600	75	8 or 6+6	1.18	2.2	28.74	43.11
800	95	8 or 6+6	2.66	6.87	38.32	57.48
900	100	6+6	2.66	11.55	43.11	64.67
1000	115	6+6	2.66	15.7	47.90	71.85
1200	125	8+8	3.55	21.25	57.48	86.22
1400	140	8+8	3.55	30	67.06	100.60
1600	165	8+8	3.55	50.63	76.64	114.96
1800	180	12+12	9.36	64.19	86.22	129.33
2000	190	12+12	9.36	83.12	95.8	143.7
2200	210	12+12	9.36	105.53	105.4	158.07

Note : Concrete for pipes shall have a minimum compressive strength of 35 N/mm² at 28 Days

WORKMANSHIP AND FINISH

Pipes shall be straight and free from cracks except that craze cracks may be permitted. The ends of the pipes shall be square with their longitudinal axis so that when placed in a straight line in the trench no opening between ends in contact shall exceed 3 mm in pipes up to 600 mm diameter (inclusive), and 6 mm in pipes larger than 600 mm diameter.

The outside and inside surfaces of the pipes shall be smooth, dense and hard, and shall not be coated with cement wash or other preparation unless otherwise agreed to between Owner/Engineer and the manufacturer or supplier.

The pipes shall be free from defects resulting from imperfect grading of the aggregate, mixing or molding.

The pipes shall be free from local dents or bulges greater than 3 mm in depth and extending over a length in any direction greater than twice the thickness of barrel.

The deviation from straight in any pipe throughout its effective length, tested by means of a rigid straight edge parallel to the longitudinal axis of the pipe shall not

exceed, for all diameters 3 mm forever meter run.

TESTING

All pipes for testing purposes shall be selected at random from the stock of the manufacturer and shall be such as would not otherwise be rejected under the criteria of tolerances as mentioned in IS:458 (Latest Edition).

During manufacture, tests on concrete shall be carried out as per IS:456. The manufacturer shall supply, when required to do so by Owner/Engineer the results of compressive tests of concrete cubes and split tensile tests of concrete cylinders made from the concrete used for the pipes. The manufacturer shall supply cylinders or cubes for test purposes required by the Owner/Engineer and such cylinders or cubes shall withstand the tests prescribed by the manufacturer for the hydrostatic test pressure. For non-pressure pipes, 2 percent of the pipes shall be tested for hydrostatic test pressure.

The specimen of pipes for the following tests shall be selected in accordance with relevant Clause of IS: 458 (Latest Edition) and tests in accordance with the methods described in IS: 3597.

- i) Flow test
- ii) Three edge bearing test
- iii) Absorption test

Note: Three edge bearing strength to produce 0.25 mm crack in case of special design of pipes shall be as per IS:458:2003.

For Inspection at manufacturing site 24 hrs. Access shall be provided to Client's Engineers.

Note: Testing of pipe at site of work may also be perform by contractor, if the engineer in charge won't to check. The work agency/manufactures have no any obligation for testing of a pipe at site. They should arrange testing work at site without any extra charges for breaking of pipe and weighing of cage for checking of used steel in pipe for its position as per drawing and standard design weight, if instructed by engineer in charge. The sampling of pipe will be done by randomly selection as per instruction of engineer in charge and weight of steel should be checked at site. The contractor has to provide weighing facility at site.

SAMPLING AND INSPECTION

In any consignment, all the pipes of same class and size and manufactured under similar conditions of production shall be grouped together to constitute a lot. The conformity of a lot to the requirements of this specification shall be ascertained on the basis of tests on pipes selected from it.

The number of pipes to be selected from the lot for testing shall be in accordance with Table 15 of IS:458 (Latest Edition).

Pipes shall be selected at random. In order to ensure randomness, all the pipes in the lot may be arranged in a serial order and starting from any pipe, every 'n'th pipe be selected till the requisite number is obtained, n being the integral part of N/n , where N is the lot size and n is the sample size.

All pipes selected as per IS : 458 shall be inspected for dimensional requirements, finish and deviation from straight. A pipe failing to satisfy one or more of these requirements shall be considered as defective.

The number of pipes to be tested for tests under IS : 458 shall be in accordance with column 4 of Table 15 of IS:458 (Latest Edition). These pipes shall be selected from pipes that have satisfied the requirements mentioned in Clause above.

A lot shall be considered as conforming to the requirements of IS:458 (Latest Edition) of the following conditions are satisfied.

- (a) The number of defective pipes shall not be more than the permissible number given in column 3 of Table 15 of IS:458 (Latest Edition).
- (b) All the pipes tested for various tests as per IS-458 shall satisfy corresponding requirements of the tests.
- (c) In case the number of pipes not satisfying requirements of any one or more tests, one Or two further samples of same size shall be selected and tested for the test or tests in which failure has occurred. All these pipes shall satisfy the corresponding requirements of the test.

MARKING

The following information shall be clearly marked on out surface of the each pipe:

- a) Internal diameter of pipe
- b) Class of pipe
- c) Date of manufacture,
- d) Name of manufacturer or his registered trademark or both.
- e) Owner and Project name
- f) ISI marking
- g) Manufacturing pipe number in sequence.

Mode of measurement: In Running meter basis and payment shall as shown in payment breakup schedule.

Contractor is instructed not to supply more than laying requirement at the conclusion stage of work and BMC will not take any surplus material/pipes etc.,

Item No. 5 of Schedule B1 to B6

Lowering, laying and jointing R. C. C. NP3 & NP4, NP4 pipes by EPDM Rubber ring of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including conveyance from stores to site of work, labor, giving hydraulic testing as per ISI code.

SCOPE

The specification covers the requirements for laying of pipes and fittings/specials below ground. The two parts that is supply of pipes and laying of pipes are complementary and are to be read together for a correct interpretation of the provisions of this specification.

APPLICABLE CODES

The laying of pipes and fittings/specials shall comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred to. In all cases, the latest revision of the standards/codes shall be referred to. If requirements of this specification conflict with the requirements of the standards/codes, these specifications shall govern.

CODES OF PRACTICE

- a) IS: 783 -Code of practice for laying of concrete pipes
- b) IS: 3114 -Code of practice for laying of cast iron pipes
- c) IS: 3764 -Excavation work - Code of Safety
- d) IS: 4127 -Code of practice for laying of glazed stoneware pipes
- e) IS: 5822 -Code of practice for laying of electrically welded steel pipes for water supply
- f) IS: 6530 -Code of practice for laying of asbestos cement pressure pipes

CARTING AND HANDLING

Pipes and fittings/specials shall be transported from the factory to the worksites at places along the alignment of pipeline as directed by Owner/ Engineer. Contractor shall be responsible for the safety of pipes and fittings/specials in transit, loading/unloading. Every care shall be exercised in handling pipes and fittings/specials to avoid damage. While unloading, the pipes and fittings/specials shall not be thrown down from the truck on to hard surfaces. They should be unloaded on timber skids with steadying ropes or by any other approved means. Padding shall be provided any other approved means. Padding shall be provided between coated pipes, fittings/ specials and timber skids to avoid damage to the coating. Suitable gaps between pipes should be left at intervals in order to permit access from one side to the other. In case of spigot socket pipes, care should be taken regarding orientation of pipes while unloading. As far as possible pipes shall be unloaded on one side of the trench only. The pipes shall be checked for any visible damage (such as broken edges, cracking or spalling of pipe) while unloading and shall be sorted out for reclamation. Any pipe, which shows sufficient damage to preclude it from being used, shall be discarded. Dragging of pipes and fittings/specials along concrete and similar pavement with hard surfaces shall be prohibited. Pipes can be brought to site only after the mandatory tests i.e. are completed and pipe lots accepted. i.e. Cube tests, T.E.B., Hydrostatic, water absorption test.

STORAGE

Each stack of pipes shall contain only pipes of same class and size, with consignment or batch number marked on it with particulars of suppliers wherever possible. Storage shall be done on firm level and clean ground and wedges shall be provided at the bottom layer to keep the stack stable. The stack shall be in pyramid shape or the pipes laid length-wise and crosswise in alternate layers. The pyramid stack shall be made

for smaller diameter pipes for conserving space in storing them. The height of the stock shall not exceed 1.5m.

Fittings/specials shall be stacked under cover and separated from pipes.

Rubber rings shall be stored in a clean, cool store away from windows, boiler, electrical equipment and petrol, oils or other chemicals. Particularly in the field where the rubber rings are being used it is desirable that they are not left out on the ground in the sun or overnight under heavy frost or snow conditions.

LAYING JOINTING

The laying of RCC pipes shall conform to Technical Specifications:

GENERAL

Jointing of RCC pipes shall be done with SRC cement only and as per the requirements of following specifications and as per the relevant IS. The type of joints shall be as below. After jointing, extraneous material, if any, shall be removed from the inside of the pipe and the newly made joints shall be thoroughly cured. In case, rubber-sealing rings are used for jointing, these shall conform to IS 5382 and shall be of such type as mentioned in IS-458: 2003.

FLUSH JOINT (INTERNAL):

This joint shall be generally used for culvert pipes of 900-mm diameter and over. The ends of the pipes are specially shaped to form a self-centering joint with an internal jointing space 13-mm wide. The finished joint is flush with both inside and outside with the pipe wall. The jointing space is filled with cement mortar in the proportion as specified in IS-458-2003, mixed sufficiently dry to remain in position when forced with a trowel or rammed.

FLUSH JOINT (EXTERNAL)

This joint is suitable for pipes which are too small for jointing from inside. This joint is composed of specially shaped pipe ends. Each end shall be butted against each other and adjusted in correct position. The jointing space shall then be filled with cement mortar as specified in IS-458-2003, sufficiently dry and finished off flush. Great care shall be taken to ensure that the projecting ends are not damaged as no

repairs can be readily affected from inside the pipe.

SPIGOT AND SOCKET JOINT (FLEXIBLE)

The RCC pipe with the rubber ring accurately positioned on the spigot shall be pushed well home into the socket of the previously laid pipe by means of uniformly applied pressure with the aid of a jack or similar appliance. The RCC pipes shall be of spigot and socket type for more than 300 mm dia. pipe as specified in IS-458-2003, shall be used, and the manufacturer's instructions shall be deemed to form a part of these specifications.

Socket & Spigot NP2, NP3 & NP4 & NP4 pipe with rubber ring roll on joint for diameter upto 900 mm should be provided as per IS 458 : 2003.

Socket & spigot NP2, NP3 & NP4 & NP4 pipe with rubber ring of confined joint for diameter 1000 mm to 2200 mm should be provided as per IS 458:2003.

CLEANING OF PIPES

As soon as a stretch of RCC pipes has been laid complete from manhole to manhole or for a stretch as directed by Owner/Engineer, contractor shall run through the pipes both backwards and forwards a double disc or solid or closed cylinder 75 mm less in diameter than the internal diameter of pipes. The open end of the incomplete stretch of pipeline shall be securely closed as may be directed by Owner/Engineer to prevent entry of mud or silt etc.

If as a result of the removal of any obstructions Owner/Engineer considers that damages may have been caused to the pipelines, he shall be entitled to order the stretch to be tested immediately. Should such test prove unsatisfactory, contractor shall amend the work and carry out such further tests as are required by Owner/Engineer.

It shall also be ascertained by contractor that each stretch from manhole to manhole or the stretch as directed by Engineer is absolutely clear and without any obstruction by means of visual examination of the interior of the pipeline suitably enlightened by projected sunlight or otherwise.

TESTING AT WORK SITE

After laying and jointing of RCC pipes is completed the pipeline shall be tested at work site as per the following specifications and as directed by Owner/Engineer. All equipment for testing at work site shall be supplied and erected by contractor. Water for testing of pipes shall be arranged by him. Damage during testing shall be contractor's responsibility and shall be rectified by him to the full satisfaction of Owner/Engineer. Water used for test shall be removed from pipes and not released to the excavated trenches.

After the joints have thoroughly set and have been checked by Owner/Engineer and before backfilling the trenches, the entire section of the sewer or storm water drain shall be proved by contractor to be water tight by filling in pipes with water to the level of 1.50 m above the top of the highest pipe in the stretch and heading the water up for the period of one hour. The apparatus used for the purpose of testing shall be approved by Owner/Engineer. Contractor if required by Owner/Engineer shall dewater the excavated pit and keep it dry during the period of testing. The loss of water over a period of 30 minutes should be measured by adding water from a measuring vessel at regular 10 minutes intervals and noting the quantity required to maintain the original water level. For the approval of this test the average quantity added should not exceed 1 litre/hour/100 linear metres/100 mm of nominal internal diameter. Any leakage including excessive sweating which causes a drop in the test water level will be visible and the defective part of the work should be removed and made good.

In case of pressure pipeline the completed stretch of pipeline shall be tested for site test pressure as specified in IS-458-2003. The site test pressure should not be less than the maximum operating pressure plus the calculated surge pressure, but in no case should it exceed the hydrostatic test pressure as specified in IS:458 (Latest Edition).

MEASUREMENT

All RCC pipes shall be measured according to the work actually done and no allowance will be made for any waste in cutting to the exact length required. The measurement for pipes shall be in running meter nearest to a cm. of length along the centre line of pipe as actually laid at work sites.

The rate for providing, laying and jointing of RCC pipes shall be deemed to include the cost of rubber rings, jointing material, testing and extra excavation required for ordinary bedding of pipes and also for pipe sockets, if any.

NOTES

- If any damage is caused to the pipeline during the execution of work or while cleaning/testing the pipeline as specified. Contractor shall be held responsible for the same and shall replace the damaged pipeline and retest the same at his own cost to the full satisfaction of Engineer.
- Water for testing of pipeline shall be arranged by Contractor at his own cost.
- Pipes shall be brought on site proportionate to the required progress for Thirty days only, for this purpose contractor has to submit schedule of work planning to the client office in advance and contractor has to take approval for the planning and accordingly the contractor also has to submit Inspection call for testing of pipes periodically.
- RCC pipes shall be with ISI marking only.

MODE OF MEASUREMENT & PAYMENT

All RCC pipes shall be measured according to the work actually done and no allowance will be made for any waste in cutting to the exact length required. The measurement for pipes shall be in running meter nearest to a cm. of length along the centre line of pipe as actually laid at work sites.

The rate for providing of RCC pipes shall be deemed to include the cost of rubber rings, jointing material.

NOTES

- If any damage is caused to the pipeline during the execution of work or while cleaning/testing the pipeline as specified. Contractor shall be held responsible for the same and shall replace the damaged pipeline and retest the same at his own cost to the full satisfaction of Engineer.
- Water for testing of pipeline shall be arranged by Contractor at his own cost.
- Pipes shall be brought on site proportionate to the required progress for Thirty days

only.

DEWATERING

During the excavation, if subsoil water is met with Contractor shall have to provide necessary equipment and laborers for dewatering the trenches/pits by bailing out water or water mixed with clay; if pumping out subsoil water is found to be necessary, Contractor shall provide sufficient number of pumps for the same. In both the above cases the excavation shall be done to the required level and the pipes shall be laid to proper alignment and gradient. Contractor shall also make necessary arrangement for the disposal of drained water to nearby storm water drain or in a pit if allowed by Owner/Engineer. In no case the water shall be allowed to spread over the adjoining area. Before discharging this water into public sewer/drain, Contractor shall take necessary permission from the local authorities.

SPECIAL FOUNDATION IN POOR SOIL

Where the bottom of the trench and sub-grade is found to consist of material which is unstable to such a degree that in the opinion of Owner/Engineer, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the pipes, in accordance with relevant drawings and as instructed by Owner/Engineer shall be constructed.

WOODEN SHORING

Contractor shall suitably design polling bards, walling and struts to meet different soil conditions that might be encountered in excavating trenches/ pits. The horizontal and vertical spacing of struts shall be such that not only the sides of trenches shall be prevented from collapse but also easy lowering of pipe in trenches shall be ensured without creating undue obstructions for the excavation of the work. Any inconvenience and/or delay that might be caused in lowering pipes in trenches as a result of adopting improper spacing of struts by Contractor shall be his sole responsibility. No part of shoring shall be at any time be removed by Contractor without obtaining permission from Owner/Engineer. While taking out shoring planks the hollows of any form must simultaneously be filled in with soft earth well rammed with rammers and with water.

Owner/Engineer may order portions of shoring to be left in the trenches/pits at such

places, where it is found absolutely necessary to do so to avoid any damage, which may be caused to buildings, cables, gas-mains, water mains, sewers etc. in close proximity of the excavation, by pulling out the shoring from the excavations. Contractor shall not claim, on any reason whatsoever, for the shoring which may have been left in by him at his won discretion.

STEEL PLATE SHORING

Where the subsoil conditions are expected to be of a soft and unstable character in trench/pit excavation, the normal method of timbering may prove insufficient to avoid subsidence of the adjoining road surfaces and other services. In such circumstances Contractor will be required to use steel trench sheeting or sheet piling adequately supported by timber struts, walling etc., as per the instructions, manner and method directed by Owner/ Engineer. Contractor shall supply, pitch, drive and subsequently remove trench sheeting or piling in accordance with other items of the specification.

BONING STAVES AND SIGHT RAILS

In laying the pipes and fittings/specials the centre for each manhole/chamber or pipeline shall be marked by a peg. Contractor shall dig holes for and set up two posts (about 100 x 100 x 1800 mm) at each manhole/chamber or junction of pipelines at nearly equal distance from the peg and at sufficient distances there from to be well clear of all intended excavation, so arranged that a sight rail when fixed at a certain level against the post shall cross the centre line of the manhole/chamber or pipelines. The sight rail shall not in any case be more than 30m apart. intermediate rails shall be put up if directed by Owner/Engineer.

Boning staves of 75mm x 50 mm size shall be prepared by Contractor in various lengths, each length being of a certain whole number of meters and with a fixed tee head and fixed intermediate cross pieces, each about 300 mm long. The top-edge of the cross piece must be fixed below the top-edge of the cross piece must be fixed below the top-edge of the tee-head at a distance equal to the outside diameter of the pipe or the thickness of the concrete bed to be laid as the case may be. The top of cross pieces shall indicate different levels such as excavation for pipeline, top of concrete bed, top of pipe etc. as the case may be.

The sight rail of size 250-mm x 40 mm shall be screwed with the top edge resting

against the level marks. The centre line of the pipe shall be marked on the rail and this mark shall denote also the meeting point of the centre lines of any converging pipes. A line drawn from the top edge of one rail to the top edge of the next rail shall be vertically parallel with the bed of the pipe, and the depth of the bed of pipe at any intermediate point may be determined by letting down the selected boning staff until the tee head comes in the line of sight from rail to rail.

The post and rails shall be perfectly square and planned smooth on all sides and edges. The rails shall be painted white on both sides and the tee-heads and crosspiece of the boning staves shall be painted black.

For the pipes converging to a manhole/chamber at various levels, there shall be a rail fixed for every different level. When a rail comes within 0.60 M of the surface of the ground, a higher sight-rail shall be fixed for use with the rail over the next point.

The posts and rails shall in no case be removed until the trench is excavated, the pipes are laid and Owner/Engineer gives permission to proceed with the backfilling.

BEDDING

The type of bedding for pipes shall be as per attached sketch (tender volume of drawings) showing thickness of bedding with MOC.

LAYING OF PIPES AND FITTINGS/SPECIALS

All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipeline of water, gas, sewage etc. After excavation of trenches, pipes shall not be lowered unless the dimensions of trenches and bedding work for pipes at the bottom of the trenches are approved and measured by Owner/Engineer. Pipes and fittings/specials shall be carefully lowered in the trenches. Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fitting/specials shall be made by Contractor. In no case pipes and fittings/specials shall be dropped. Slings of canvas or equally non-abrasive material of suitable width or special attachment to fit the ends of pipes and fittings/specials shall be used to lift and lower the coated pipes and fittings/specials. The pipes and fittings/specials shall be inspected for defects and is rung with slight hammer preferably while suspended to detect cracks. If doubt persists, further

confirmation shall be done by pouring a little kerosene /dye on the inside of the pipe at the suspected spot. No sign of kerosene/dyke should appear on the outside surface. Pipes and fittings/specials damaged during lowering or aligning shall be rejected by Owner/Engineer.

All the pipes are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe the socket end of the pipe shall face upstream, except when the pipeline runs uphill in which case the socket ends should face the upgrade. The laying of pipes shall always proceed upgrade of a slope. After placing a pipe in the trench, the spigot end shall be centered in the socket and the pipe forced home and aligned to required gradient. The pipes shall be secured in place with approved backfill material tamped under it except at the socket. Pipes and fittings/specials, which do not allow a sufficient and uniform space for joints, shall be removed and replaced with pipes and fittings/specials of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the jointing space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by Owner/Engineer. During the period that the plug is on, the Contractor shall take proper precautions against floating of the pipe owing to entry of water into the trench. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or where long radius curves are permitted the deflection allowed at joints shall not exceed 2½%. In case of pipes, with joints to be made with loose collars, the collars shall be slipped on before the next pipe is laid. The pipes shall be laid such that the marking on pipes appears at the top of the pipes.

The cutting of pipe for inserting valves, fittings or specials shall be done in a neat and workman like manner without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. For this purpose, pipe cutting machine shall be used.

Lowering, laying and jointing RCC NP3 & NP4 pipe by fixing ISI marked EDPM rubber ring suitable for 600mm diameters in proper position, grade and alignment on average 18cm thick PCC surface prepared for pipe laying as directed by Engineer in charge including conveyance from stores to site work, labour, giving hydraulic testing as per ISI .

JOINTING

Jointing for pipes and fittings/specials shall be as per IS-783 (latest revision) done in

accordance with the relevant specifications depending upon the type of pipes being used. Basic requirements for jointing the pipes are

- a) Cleanliness of all parts , particularly joint surface.
- b) Correct location of components.
- c) Centralization of spigot within socket.
- d) Provision of the correct gap between the end of the spigot and the back of the socket to ensure flexibility at each joint.
- e) Any lubricant used shall be approved as to composition and method of application.

TESTING AND COMMISSIONING

Testing and commissioning of pipes shall be as per IS-783 (latest Revision) clause 15.5 done in accordance with the relevant specifications.

MODE OF MEASUREMENT AND PAYMENT :

The measurements shall be paid per meter length of the pipe line laid, jointed and tested and measured along the centre line and shall be paid according to the inner diameter of the pipes and as per the rates quoted by the tenderer in respective items of Schedule-B.

The pipes may be available in approximate size either in metric system, or British system. No additional payment or reduction in payment will be made for such approximate size.

Extra payment for dewatering by installing dewatering sets for pumping out such water shall be made under respective item no payment shall be made for bailing out of water manually. No extra payment for collar pits shall be made. No extra payment for cutting of pipes, if required shall be made to the Contractor.

In absence of hydraulic test 20% of the amount of the laying and jointing work of pipe line work will be withheld from the running bills till satisfactory hydraulic test is given. If level for invert of pipes is not maintained by the Contractor 100% payment shall be withheld.

Item No.6 of Schedule B1,B2,B3,B5

Providing and constructing Sewer manholes including excavation, refilling and carting of soils for Manhole in all types of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chieilling only for finishing with lead up to 5 km , as per the type design in brick masonry in C. M. 1:5 and inside and outside 20mm thick plastering in C. M. 1:3 necessary 100 mm coping with reinforcement in R.C.C.M. 200 fixing C. I. steps and fixing manhole frame and covers over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers and frames) over manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete as per latest CPHEEO manual including required excavation in all types of strata with safety measures.

(a) Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer)

Manhole type "A" as above but upto 1.0 M depth.

Extra depth beyond 1.0 mt. and up to 1.5 mt. for type "A" manhole above

(b) Manhole type "B" Circular type having inside diameter of 1500 mm for depth from 1.5 m to 4.0 m depth (for 150 mm to 600 mm dia sewer)

Manhole type "B" as above but upto 1.5 M depth.

Extra depth beyond 1.5 mt. and up to 4.0 mt. for type "B" manhole above

(c) Manhole type "C" Circular type having inside diameter of 1500 mm for depth from 4.0 m to 6.0 m depth (for 150 mm to 1800 mm dia sewer)

Manhole type "C" as above but upto 4.0 M depth.

Extra depth beyond 4.0 mt. and up to 6.0 mt. for type "C" manhole above

(d) Manhole type "S1" rectangular type for 600 mm dia. to 1200 mm dia. Sewer pipes and depth 2.5 to 9.0 mt.

Manhole type "S1" as above but up to 2.5 m. Depth

Extra depth beyond 2.5 mt. and up to 9 mt. for type "S1" manhole above

MATERIALS:

Water shall conform to M-1, Cement Conform to M-2, Stone coarse aggregate of 20 mm nominal size shall conform to M-5, Grit shall conform to M-4, Steel reinforcement shall conform to M-12. Brick shall conform to M-8 and it should be of conventional size and of chimney burnt clay brick, Cement mortar of specified proportion shall conform to M-32, The cast iron steps shall conform to IS standards.

Manhole cover with frame of required size and weight shall be procured by the contractor. Supply of manhole frame and cover shall be paid separately under respective item.

WORKMANSHIP :

The manhole of different types and sizes as specified shall be constructed in sewer line at such place and to such levels and dimension as shown in drawing or as directed.

Excavation :- The excavation for construction of manhole including dismantling

of all types of roads surface guarding, barricading, lightening the trenches, baling out water if required, removing and replacing, shifting of telephone/electric cables, pipe line etc. and all other safety provisions like shoring and strutting etc. till refilling of trenches and completion of manhole construction, stacking of excavated stuff within the specified lead, back filling of selected excavated earth, watering and consolidation etc. complete shall be carried out as per relevant specification, including disposal of surplus soil as directed.

Concrete work :- The bed concrete in C.C. 1:3:6, Copping in C.C. 1:1.5:3 and benching concrete in proportion c.c. 1:2:4 (1 Cement : 2 coarse sand : stone aggregate of 20 mm nominal size) by volume with necessary centering and shuttering work shall be provided. It shall be placed and rammed or vibrated and cured as directed by Engineer-in-charge.

REINFORCEMENT:

All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be security held in position during placing of concrete by annealed No. 1 binding work not less than 1 mm is size and by using stay block or metal chair spacers, metal hangers, supporting wires or other approved devices it sufficiently close intervals. Bars shall not be allowed to lag between supports nor displaced during concrete of any other operation of the work. 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.

Bars shall be bent cold to specified shape and dimensions or as directed, attain proper radius of bends, Bars shall not be bent or straightened in a manner that will injure the materials. Bars bend during transport of handling shall be straightened before being used on the work. Unless otherwise specified for mild steel a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement.

In case 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 cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall however, comply with relevant anchorage requirements.

Bars crossing each other where required shall be secured by binding wires (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.

As far as possible bars of full length shall be used. In case this not possible overlapping of bars shall be done as directed. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

When permitted or specified on the drawings joints of reinforcement bars shall butt welded so as to transmit their full stresses. Welded joints shall preferably located at points where 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. 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, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work.

BRICK MASONRY WORK :

Before 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 one foundation, bed, before foundation masonry is started.

Wetting of Bricks : The brick 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 an indication of through wetting of bricks.

Brick shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond. Closers in such case shall be cut to required size and used near the ends of walls.

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 tamping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar the next brick is laid and pressed against it. On completion of course, the vertical

joints shall be fully sealed from the top with mortar.

The wall shall be taken up truly in plumb. All corners 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.

The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, monsoon 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.

Both the faces of walls of thickness of 23 cms. shall be kept in proper plain. 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 stopper than 45 degrees.

All fixtures like pipe inlet and outlet of water, C.I./Polypropelene steps, manhole cover and frame etc. which are required to be built in wall shall be embedded in cement mortar.

Brick shall be so laid that all joints shall not exposed 12 mm. The face joints shall be raked out as directed by raking tool daily during the progress of work, when the mortar in still green so as to provide key for plaster or pointing to be done.

For the face of brick work, plastering is to be done joints shall be racked 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.

PLASTER WORK :

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae efflorescence and other foreign mortar by water or by brushing. Smooth surface shall be roughened by wire brushing not hard by racking if it is hard. In case of concrete surface, if a chemical retarder 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 retarders is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be

carried out to get an even surface.

The work shall be soaked but only damped evenly before applying the plaster. If the surface become dry, such areas shall be moistened again.

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surface 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 of wooden float accordingly excessive troweling or over working 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. Rounding or chamfering corners, arises, junctions etc. shall be carried out with proper templates the size required.

Cement mortar for plaster shall be used within half an hour after addition of water. And mortar for plaster which is partially set shall be rejected and removed forthwith from the site.

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 edge of the old work shall be scraped clear and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly get 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 bends and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on walls and copings these invariably leads to leakage. No portion of the surface shall be depth out initially to be packed up latter on.

FIXING OF POLY PROPYLENE STEPS AND MANHOLE COVER :

During the construction of masonry wall of the manhole the cement mortar of required proportion shall be used for embedding the Poly propylene steps in the wall masonry. The spacing of steps in the masonry shall be 350-450 mm centre to centre in the staggered position in the vertical direction with two staggered

raw at 385 mm centre to centre in the horizontal direction. The top of the manhole shall not be more than 300 mm above the first step from top of manhole frame and cover and the centre line of two staggered raws shall be the centre line of the shorter side of manhole frame in the roof of chamber.

The detailed specifications for the "Poly propylene steps as below:

The Polypropylene conforming to an ASTM D-4101, injection molded around a 12 mm dia. IS 1786 grade Fe-415 steel reinforcing bar and should meet the load required 225 Kg. as per IS-5455. The measurement should be as per attached drawing. The tolerance in the length and width is +/- 5 mm and +/- 1 mm in thickness. The weight of the steps should not be less than 0.900 Kg.

Un chequered portion of the step shall be inserted with the rich cement mortar during the course of masonry work so constructed around the steps as to keep the step on its right position. The non-slip grip chequered portion of the steps shall be well kept outside the masonry.

During fixing of the steps, the wall should not be damaged and shall not vibrate or shall not shake during ascents and decants otherwise they shall have to be re fixed correctly as per the drawings or as mentioned above.

Manhole frame shall be firmly and securely laid on top of shafts of conical tops in 25 mm thick cement mortar and shall be embedded in 150 mm thick cement concrete of proportion 1:2:4 (1 Cement : 2 coarse sand : 4 Kapchi as aggregate of 20 mm nominal size) in such a way that the top of M.H. frame shall be flush with concrete surface and top surface neatly finished 25 mm thick with cement mortar 1:3 in conformity with ground or road levels.

OTHER REQUIREMENTS:

As per line and level and size of the manhole pit shall be excavated as per drawing or as ordered by the Engineer.

The foundation concrete 1:3:6 with required thickness as per drawing or as directed shall be laid after compacting the bottom of the pit. The cement concrete shall conform to specified specification of Cement Concrete.

The clear inside chamber size of opening shall be as per the drawing or as directed by the Engineer-in-charge.

The masonry wall shall be plastered inside and outside with 15 mm thick 1:3 cement mortar. The off set for the concrete foundation shall be 100 mm on all sides beyond walls of chamber.

Whenever pipes enter or leave the masonry chamber bricks on edge must be so laid around the upper half of the pipes so as to form the arch to prevent the weight of the masonry chamber over it.

On the top of masonry walls RCC coping 1:1.5:3 150mm thick or as directed shall be laid and then 1:1 cement mortar shall be laid and then R.C.C. slab of grade 1:2:4 necessary and as directed by the Engineer with coarse aggregate of trap metal of 20 mm nominal shall be laid necessary from work and centering shall have to be provided by the contractor at his own cost as per relevant specification of cement concrete.

In the bottom of manhole the channel and benching shall be done in C.C. 1:2:4 (1 Cement : 2 Coarse sand : 4 graded stone aggregate of 20 mm nominal size) The channel at the bottom of the chamber shall be plastered 15 mm thick in c.m. 1:3 (1 Cement : 3 fine sand) and steel trowel smooth.

Channels shall be in semi circular in the bottom half and a diameter equal to the sewer. Above the horizontal diameter, the side 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 junctions with the main channel an appropriate fall suitably rounded off in the direction of flow in the main channel shall be given.

For conical shaft of manhole necessary conical portion shall be treated from 1200 to 800 mm below the bottom of concrete of slab for fixing of manhole cover and frame.

The item includes curing of all the cement work for 14 days.

If dewatering is required by installing pumping sets the same shall be paid separately Under respective item.

MODE OF MEASUREMENTS & PAYMENTS :

Payment shall be made on the basis as per number of masonry manholes chambers constructed with all constructing materials labours, refilling curing, finishing providing and fixing Polypropylene steps, constructing laying half round gutter fixing R.C.C. manhole cover etc. complete in all respect for incomplete item. Payment will be made on part rate basis.

The item will be paid per No. of construction of complete masonry manhole chamber as shown in the drawing upto the depth specified and shown in the type design drawing. For every increase or decrease in the minimum specified depth of masonry manhole chamber increase or decrease in rate shown in schedule B will be paid taking in consideration every 10 CM increase or decrease depth of masonry chambers. For the purpose of payment of masonry chamber every increase or decrease of the 10 cm depth than the specified minimum depth of masonry manhole chambers as shown in drawing/ or in Schedule-B will paid more or less for every 10 cm depth.

The measurements shall be made for number of chamber constructed and for additional depth plus the rate shall be paid for meter length correct upto 10 cm depth. The surplus excavated stuff shall be disposed of within municipal limits. as directed by Engineer-in-charge without any extra claim.

The depth of manholes shall be the distance between the top 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.

The item include :-

- (i) Bed concrete slab concrete and copping.
- (ii) Necessary brick work with cement plaster 20 mm thick, cement finished inside and outside plastering completely.
- (iii) Providing and fixing polypropylene steps.
- (iv) Fixing of manhole frame cover with necessary concrete and finishing.
- (v) Refilling with necessary watering and consolidation/(as per refilling item if any).
- (vi) Shoring is required/ (as per shoring item if any).
- (vii) Leveling coarse concrete, Benching concrete

- (viii) Disposal of surplus soil /(as per carting item if any).
- (ix) Curing for 14 days.
- (x) Defect liability period as mentioned
- (xi) Includes joining of incoming and outgoing sewers by making hole in brick masonry and filling extra wide hole by concreting after laying of pipe.
- (xii) Plugging to upstream side MH/sewer for if any sewage/ground water intrusion from existing any structure nearby.
- xiii) Excavation including dewatering for Manholes

ITEM NO: 7 of Schedule B1 to B6

RCC precast M.H. Frame & Cover : RCC precast M.H. Frame & Cover Manufacture, supply & Delivery at store or at site of work precast RCC M.200 Frame & cover suitable to drainage M.H. and as per type design & Drawing including cost of reinforcement M.S. Angles or Flat, curing mold work etc.

➤ **Heavy duty Frame and Cover suitable for 50 cm Dia opening of MH**

Heavy duty Frame and Cover suitable for Clear opening of MH

Precast RCC Manhole Frame & cover shall be as per IS: 12592 (part – I & II). The M.H. Frame &

Cover shall be of Heavy duty of Grade designation HD- 20 – Circular in shape with clear opening of Man Hole. 50 cm Dia.

Materials such as cement, aggregate, water, reinforcement shall be of standard as prescribed in the material part. Other materials to be used for Frame & Cover shall be as under:

1. Concrete:

The mix proportions of concrete shall be determined by the manufacturer and shall be such as will

produce a dense concrete without voids, honey combing, etc.(IS: 456 – 1978). The minimum cement content in the concrete shall be 360 Kg/m³ with a maximum water content ratio of 0.45. Concrete weaker than grade M 20 shall not be used. Compaction of concrete shall be done by table machine vibration.

2. Steel Fibers:

The diameter/equivalent diameter of steel fibers shall not be greater than 0.75 mm.

The aspect

ratio of the fibers shall be in the range of 50 to 80. The minimum volume of fibers, where used, shall be 0.5 percent of the volume of the concrete.

3. Additives or Admixtures:

Additives or admixtures may be added either as additives to the cement during manufacture, or as

admixtures to the concrete mix. Additives or admixtures used for covers may be:

A- Accelerating, water-reducing and air-entertaining admixtures confirming to IS: 9103-1979. B- Coloring pigments

C- Fly ash confirming to IS: 3812-1981

D- Water proofing agents conforming to IS: 2645-1975.

4. Dimensions and Tolerances:

Length, breadth and diameter of precast concrete manhole covers shall be such that the maximum clearance at top between the cover & frame of corresponding grade and shape shall be 5 mm. The

minimum thickness of heavy duty precast manhole cover shall be 70 mm. The top surface of frame & cover is in level within a tolerance of ± 5 mm.

Placing of reinforcement, compaction of concrete & curing shall be attended as per IS: 12592.

Edge Protection & Finishing shall be provided as per relevant IS.

Physical requirements

All the frame & covers shall be sound and shall be free from cracks & other defects, which interferes with the proper placing of the units or impair the strength or performance of the units.

Minor chippings resulting from the customary methods of handling and transportation shall not be

deemed ground for rejection.

Marking:

Each Cover shall have following marking:

Date of manufacture

Grade Designation

ISI mark

Bhavnagar Municipal Corporation - Identification mark

Frame & covers will be tested at factory by owner / consultant & accepted goods shall be procured on site of work.

Light duty Frame and Cover suitable for Clear opening of MH

Precast RCC Manhole Frame & cover shall be as per IS: 12592 (part – I & II). The M.H. Frame & Cover shall be of Heavy duty of Grade designation HD- 20 – Rectangular in shape with clear opening of Man Hole.60 x 45 cm

Materials such as cement, aggregate, water, reinforcement shall be of standard as prescribed in the material part. Other materials to be used for Frame & Cover shall be as under:

1. Concrete:

The mix proportions of concrete shall be determined by the manufacturer and shall be such as will produce a dense concrete without voids, honey combing, etc. (IS: 456 – 1978). The minimum cement content in the concrete shall be 360 Kg/m³ with a maximum water content ratio of 0.45. Concrete weaker than grade M 20 shall not be used. Compaction of concrete shall be done by table machine vibration.

2. Steel Fibers:

The diameter/equivalent diameter of steel fibers shall not be greater than 0.75 mm. The aspect ratio of the fibers shall be in the range of 50 to 80. The minimum volume of fibers, where used, shall be 0.5 percent of the volume of the concrete.

3. Additives or Admixtures:

Additives or admixtures may be added either as additives to the cement during manufacture, or as admixtures to the concrete mix. Additives or admixtures used for covers may be:

- A- Accelerating, water-reducing and air-entertaining admixtures confirming to IS: 9103-1979.
- B- Coloring pigments
- C- Fly ash confirming to IS: 3812-1981
- D- Water proofing agents conforming to IS: 2645-1975.

4. Dimensions and Tolerances:

Length, breadth and diameter of precast concrete manhole covers shall be such that the maximum

clearance at top between the cover & frame of corresponding grade and shape shall be 5 mm. The minimum thickness of heavy duty precast manhole cover shall be 70 mm.

The top surface of frame & cover is in level within a tolerance of ± 5 mm.

Placing of reinforcement, compaction of concrete & curing shall be attended as per IS: 12592. Edge Protection & Finishing shall be provided as per relevant IS.

Physical requirements

All the frame & covers shall be sound and shall be free from cracks & other defects, which interferes with the proper placing of the units or impair the strength or performance of the units. Minor chippings resulting from the customary methods of handling and transportation shall not be deemed ground for rejection.

Marking:

Each Cover shall have following marking:

Date of manufacture Grade Designation ISI mark

Bhavnagar Municipal Corporation - Identification mark

Frame & covers will be tested at factory by owner / consultant & accepted goods shall be procured on site of work.

The rate shall be paid on number basis for set of Frame & Cover

ITEM NO: 08 of Schedule B1 to B6

Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3 km. (The carting for surplus stuff will be paid as per relevant other item but carting require for refilling will not payable.)

FILL, BACK FILLING AND SITE GRADING

GENERAL

Back filling of the trenches shall not be commenced till the pipes are tested for hydraulic pressure and till approval for filling of the trenches is given by the Engineer. Back filling of the trenches shall be done with approved back fill material

free from boulders, sharp objects, and rubbish. The filling shall be carried out in layers not more than 150 mm thick. The filled up material shall be well watered and consolidated, taking proper care to see that the pipes are not disturbed.

All fill material will be subject to Engineer's approval. If any material is rejected by Engineer, contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be deposited / disposed off as directed by Engineer after the fill work is completed upto a distance of 5 Km for which separate payment will be paid under the corresponding item.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineer.

MATERIAL

To the extent available, selected surplus soils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the boulders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth fill up the voids and the mixture used for filling.

If any selected fill material is required to be borrowed, Contractor shall make arrangements for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of Engineer. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc, top soil containing salts / sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer. Contractor shall make necessary access to borrow areas and maintain the same, if such access road does not exist, at his cost.

FILLING IN PITS AND TRENCHES AROUND FOUNDATIONS OF STRUCTURES, WALLS ETC.

As soon as the work in pipeline trenches and foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. shall be cleaned of all debris, and filled with earth in layers not exceeding 20 cm, each layer being watered, rammed and properly consolidated, before the succeeding one is laid.

Each layer shall be consolidated to the satisfaction of Engineer. Earth shall be rammed with approved mechanical compaction machines if instructed. Usually no manual compaction shall be allowed unless Engineer is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and leveled to proper profile as directed by Engineer or indicated on the drawing.

FILLING IN TRENCHES

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. The backfilling material shall be properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes.

Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the centreline of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the centreline of the pipe shall also be done with selected earth by hand compaction or other approved means in layers not exceeding 20 cm.

In case of excavation of trenches in rock, the filling upto a level 30 cm above the top of the pipe shall be done with fine materials, such as earth, moorum etc. The filling up of the level of the centreline of the pipe shall be done by hand compaction in layers not exceeding 20 cm. Also the filling above the centreline of the pipe shall be done by hand compaction or approved means in layers not exceeding 20 cm. The filling from a level 30 cm. Above the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 20 cm mixed with fine material as available to fill up the voids.

Filling of the trenches shall be carried simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

After compaction and consolidation, if any short fall of earth is found then contractor has to bring the same to the required quantity in order to meet shortfall at his own cost. More over, if any settlement of road after reinstatement is observed during the defect liability period of the work. Contractor shall be fully responsible for the defective work and patches / depression / settlement shall be repaired with quarry spoil or metal at contractor's own cost. If contractor fails to repair the patches /

depression / settlement in time, client will repair it at all risk and cost of contractor.

Measurement and Payment

Backfilling as per specifications in the trenches and on the sides of foundations of structures, walls, tanks, rafts, trenches etc. with excavated material shall be done. As a rule material to be backfilled shall be stacked temporarily within the basic lead of 90 meters unless otherwise directed by the Engineer. If Engineer directs / permits a lead of over 90 meters for such material, the conveyance of the material for the extra distance over the basic lead of 90 meters for backfilling will be paid for.

Payment shall be made per cubic meter for actual quantity of consolidated back filling done as per specifications.

GENERAL SITE GRADING

Site grading shall be carried out as indicated in the drawings and as directed by Engineer. Excavation shall be carried out as specified in the specification. Filling and compaction shall be carried out as specified elsewhere otherwise as indicated below.

If no compaction is called for, the fill may be deposited to the full height in one operation and levelled. If the fill has to be compacted, it shall be placed in layers not exceeding 200 mm and leveled uniformly and compacted as indicated before the next layer is deposited.

To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by Contractor at his cost.

Field compaction test shall be carried out at different stages of filling and also after the entire height has been completed. This shall hold good for embankments as well.

Contractor shall protect the earth fill from being washed away by rain or damage in any other way. Should any slip occur, Contractor shall remove the affected material and make good the slip at his cost.

The fill shall be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

If specifically permitted by Engineer, compaction can be obtained by allowing loaded trucks conveying fill or other material to ply over the fill area. Even if such a method is permitted, it will be for contractor to demonstrate that the desired / specified compaction has been obtained. In order that the fill may be reasonably of varying thickness to bring the surface to the required level the material should be dumped in place in approximately in required thickness. Traffic over the fill shall then be so routed to compact the area uniformly throughout.

If so specified, the rock as obtained from excavation may be used for filling and leveling to indicate grades without further breaking. In such an event, filling layers shall not exceed 50 cms approximately. After rock filling the void in the rocks shall be filled with finer materials such as earth, broken stone etc. and the area flooded with water so that the finer materials fill up the voids. Care shall be taken to ensure that the finer fill material does not get washed out. Over the layer so filled, a 100 mm thick mixed layer of broken materials and earth shall be laid and consolidation carried out by a 12 tonne roller. No less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.

Fill Density

The compaction, only where so called for, in the schedule of quantities / items shall comply with the specified (Standard Proctor / modified Proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor shall demonstrate adequately at his cost, by field and laboratory tests that the specified density has been obtained.

Lead

Lead for deposition / disposal of excavated material, shall be as specified in the respective item of work. For the purpose of measurement of lead, the area to be excavated or filled or area on which excavated material is to be deposited / disposed off shall be divided into suitable blocks and for each of the blocks, the distance from the centre line of block shall be considered for lead which shall be measured by the shortest straight line route taken by Contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land / route.

Item No 9 as per Schedule B1 to B6

Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I.

ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing.

Item No. 10 of Schedule B

Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.

GENERAL:

1.1.1 This item is applicable only when the trench having more than 5.0 mt. depth and if the sides of trenches cannot be sloped or stepped due to any reason and the Engineer-in-charge feel the necessity for safety of trench and adjacent property and traffic. The Contractor should have to take previous approval from Engineer-in-charge before commencing this item.

1.2 MATERIALS:

1.2.1 Sheathing, planks, wales, struts etc. required for shoring and strutting shall be of approved quality of wood or structural steel as per requirements of IS-3764-1966.

1.3 WORKMANSHIP:

1.3.1 The Contractor before execution shall get approval of design of shoring from Engineer-in-charge. The shoring shall be of sufficient strength to resist side pressure and ensure safety from slips and below and to prevent damage to work and to prevent injury to persons. It shall be removed after getting permission of Engineer-in-charge, after all items for which it is required area completed. Shoring and strutting shall conform to IS - 3764 - 1966 or its latest version.

1.3.2 The sheeting shall be placed against the side of trench so that length of each piece of sheeting is vertical. The sheeting shall be held securely in place against the Wales by ensuring that sheeting is kept firmly placed against the wall of the trench. Where the trench is excavated in loose, sandy or soft soil or soil which has been previously excavated or soil which is under hydrostatic pressure, each piece of sheeting shall

be driven into the bottom of trench so has to be firmly held in place.

- 1.3.3 Where two or more pieces of sheeting are used one above another, the sheeting shall be so arranged that the lower piece of sheeting overlap the lowest Wales supporting the pieces of sheeting next above next above it. These pieces of sheeting shall be firmly driven in to the soil and securely supported by Wales and struts as the trench is made deeper.
- 1.3.4 The wales shall be supported parallel to the bottom or the proposed bottom of the trench. Each wale shall be supported on cleats spliced to the sheathing or by posts set on the wales next below it and in the case of lowest wale on the bottom of the trench itself. Where necessary, wedges may be provided between a wale and sheathing is supports to that roughly uniform support is given to all individual pieces of sheathing.
- 1.3.5 Struts shall be horizontal and at right angles to the wales of sheathing supported thereby. Struts shall be cut to the proper length required to fit in tightly between wales, where necessary, the struts shall be held securely in place by wedges, driven between struts and the wales. Struts shall be placed on cleats spliced or bolted to posts supporting wales.
- 1.3.6 The sizes and spacing of sheathing, wales struts and wedges used for shoring and timbering for different depth shall conform the requirement of IS-3764-1966 or its latest version.
- 1.3.7 The extra width of excavation that may be deemed necessary for the purpose of shoring and strutting will be under-stood to be covered in the rate for item of shoring and strutting for drain side.
- 1.3.8 The contractor shall have to make all the necessary arrangements while removing shoring strutting. However, if contractor fails to remove the shoring strutting safely, the corporation shall not be responsible for any type of damages and contractor shall have to bear all the cost for the same and the corporation shall not pay any extra payment for the same.
- 1.3.9 Shoring and strutting shall be close or open depending on the nature of soil and the depth of trench. The type of shoring and strutting shall be determined by the Engineer in charge. It shall be the responsibility of the contractor to take all

necessary steps to prevent the sides of trenches from collapse. Engineer in charge should take guidance from IS: 3764-1966 for designing the shoring and strutting arrangements and specifying the profile of excavation.

1.4 Measurement:

1.4.1 The item includes all labours, materials, equipments, tools etc. complete for whole the period for satisfactory completion of the item.

1.4.2 No extra payment shall be given for extra excavation that required to do shoring or strutting.

1.4.3 The rate shall be for a unit of one square meter.

1.4.4 No payment shall be made to any wood which has been left out by the contractor while removing the shoring, strutting etc

Item No 11 Dewatering of Schedule B1 TO B6

Dewatering by pumping set of required capacity including temporary platform carting pumping at site and fixing the same in position including all accessories and fuel and labour etc complete during execution of work - one-time payable only

If pumping by pumping sets become essential, pumping of water from trenches etc. shall be carried out by the Contractor by arranging for required number of dewatering sets . Contractor should take precaution to prevent any damage to the foundation, trench, concrete, or masonry or any adjacent structure. The excavation shall be kept free from water by the contractor (1) during inspection and measurement (2) when concrete and/or masonry are in progress and till the construction work reaches above, the natural water level and (3) till the Engineer considers that the mortar is sufficiently set.

Rate shall be for a unit of cum.

Item No 12 of Schedule B1 TO B6

Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling.

*Existing Pipe Remocal of Any Material (CI, DI, RCC, PVC, MS, DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)

Item No 13 of Schedule B1 TO B6

Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6-meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works

As per relevant IS code and drawing and general specification.

Item No 14 of Schedule B1 TO B6

Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all diameters.

As per relevant IS code and drawing and general specification.

Item No 15 Schedule B1 TO B6

Supplying and installation of IS Standard quality perforated manhole cover and suitable frame up to 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation up to site or store etc. complete as per instruction of site in charge.

As per relevant IS code and drawing and general specification.

Item No 16 Schedule B1 TO B6

Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four-wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head

Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.

As per relevant IS code and drawing and general specification.

Item No 17 Schedule B1 TO B6

Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.

401 GRANULAR SUB-BASE

401.1 Scope

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

402 Materials

401.2.1 The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV shall preferably be used in lower sub-base. Gradings V and VI shall be used as a sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the Contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150 mm.

401.2.2 If the water absorption of the aggregates determined as per IS:2386 (Part 3) is

greater than 2 percent, the aggregates shall be tested for wet Aggregate Impact Value (AIV) (IS:5640). Soft aggregates like Kankar, brick ballast and laterite shall also be tested for Wet AIV (IS:5640).

Table 400-1: Grading for Granular Sub-Base Materials

IS Sieve	Percent by Weight Passing the IS Sieve					
	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	100	-
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25-55	40-65	10-30	15-35	25-50	30-55
2.36 mm	20-40	30-50	-	-	10-20	10-25
0.85 mm	-	-	-	-	2-10	-
0.425 mm	10-15	10-15	-	-	0-5	0-8
0.075 mm	<5	<5	<5	<5	-	0-3

Table 400-2: Physical Requirements for Materials for Granular Sub-base

Aggregate Impact Value (AIV)	IS:2386 (Part 4) or IS:5640	40 maximum
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6
CBR at 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract

401.2 Construction Operations

401.2.1 Preparation of Sub-grade

Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

401.3.2 Spreading and Compacting

The sub-base material of the grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing. So as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS:2720 (Part 8). The mix shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer.

Moisture content of the mix shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 percent below the optimum moisture content.

Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer, up to 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall or on super-elevation. For carriageway having cross fall on both sides, rolling shall commence at the edges and progress towards the crown.

Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks, or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

401.4 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

401.5 Arrangements for Traffic

During the period of construction, arrangements for the traffic shall be provided and maintained in accordance with Clause 112.

401.6 Measurements for Payment

Granular sub-base shall be measured as finished work in position in cubic metres.

The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

401.7 Rate

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- i. making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;
- ii. supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts;
- iii. all labour, tools, equipment, and incidentals to complete the work to the Specifications;
- iv. carrying out the work in part widths of road where directed; and
- v. carrying out the required tests for quality control.

Item No 18 Schedule B1 TO B6

Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.

406. WET MIX MACADAM SUB-BASE/BASE

406.1. Scope

This work shall consist of laying and compacting clean, machine crushed chips and granular material, premixed with water, to a dense mass on a prepared sub grade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these specifications. The material shall be laid in single layer as necessary to lines, grades and cross-sections shown on the approved drawings or as

directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 125mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be up to 125 mm with the approval of the Engineer.

406.2. Materials

406.2.1. Aggregates

406.2.1.1. Physical requirements :

Coarse aggregates shall be crushed stone. If crushed gravel / single is used, not less than 90 percent by weight of the gravel / single pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-12 below.

If the water absorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5).

TABLE - 400-12. PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE/BASE COURSES

Test	Test Method	Requirements
1. * Los Angeles Abrasion value or *Aggregate impact value.	IS: 2386 (PART-4) IS: 2386 (PART-4) or IS: 5640	40 percent (Max) **30 percent (Max)
2. Combined Flakiness and Elongation indices (Total)	IS: 2386 (PART-I)	35 percent (Max)**

* Aggregate may satisfy requirements of either of the two tests.

* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles are separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up.

406.2.1.2. Grading requirements:

The aggregates shall conform to the grading given in Table 400.13.

TABLE 400.13

GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADAM

IS Sieve Designation	Percent by weight passing the IS sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 Micron	8-22
75.00 Micron	0-8

Materials finer than 425 micron shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

406.3. Construction Operations

406.3.1. Preparation of base: The surface of the subgrade/sub-base/base to receive the wet mix macadam course shall be prepared to the specified lines and crossfall (camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained if necessary by sprinkling water. Any sub-base/base/surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (levelling course) to Clause 501 of these Specifications.

As far as possible, laying wet mix macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage to the pavement at the interface of two courses. It is desirable to completely pick out the existing bituminous course where wet mix macadam is proposed to be laid over it.

406.3.2. Provision of lateral confinement of aggregates: While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 404.3.3.

406.3.3. Preparation of mix: Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing

arrangement like pug mill or pan type mixer of concrete batching plant. The plant shall have following features:

- i. For feeding aggregates- three/ four bin feeders with variable speed motor
- ii. Vibrating screen for removal of oversize aggregates
- iii. Conveyor Belt
- iv. Controlled system for addition of water
- v. Forced/positive mixing arrangement like pug-mill or pan type mixer
- vi. Centralized control panel for sequential operation of various devices and precise process control
- vii. Safety devices

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, dew allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

406.3.4. Spreading of mix: Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade/sub- base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The mix may be spread by a paver finisher. The paver finisher shall be self-propelled of adequate capacity with following features:

- i. Loading hoppers and suitable distribution system, to provide a smooth uninterrupted material flow for different layer thicknesses from the tipper to the screed.
- ii. Hydraulically operated telescopic screed for paving width up to 8.5 m and fixed screed beyond this. The screed shall have tamping and vibrating arrangement for initial compaction of the layer.
- iii. Automatic levelling control system with electronic sensing device to maintain mat thickness and cross slope of mat during laying procedure.

In exceptional cases where it is not possible for the paver to be utilized, mechanical means like motor grader may be used with the prior approval of the Engineer. The motor grader shall be capable of spreading the material uniformly all over the surface.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth

blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

The Engineer may permit manual mixing and /or laying of wet mix macadam where small quantity of wet mix macadam is to be executed. Manual mixing/laying in inaccessible / remote locations and in situations where use of machinery is not feasible can also be permitted. Where manual mixing/laying is intended to be used, the same shall be done with the approval of the Engineer.

406.3.5. Compaction:

After the mix has been laid to the required thickness, grade and cross fall / camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 KN weight may be used. For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h.

In portions having unidirectional cross fall / super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m in away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding tracks by at least one-third width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

Along forms, kerb, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the sub-base / base course or sub grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (Part-8).

After completion, the surface of any finished layer shall be well closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose,

segregated or otherwise defective areas shall be made good to the full thickness of the layer and recomputed.

406.3.6. Setting and drying :

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

406.4. Opening to Traffic

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course lay.

406.5. Surface Finish and Quality Control of Work

406.5.1. Surface evenness : The surface finish of construction shall conform to the requirements of Clause 902.

406.5.2. Quality control: Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

406.6. Rectification of Surface Irregularity

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3. The area treated in the aforesaid manner shall not be less than 5 in long and 2 in wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

406.7. Arrangement for Traffic

During the period of construction, arrangement of traffic shall be done as per Clause 112.

406.8. Measurements for Payment

Wet mix macadam shall be measured as finished work in position in **cubic metres**,

406.9. Rates

The Contract unit rate for **wet mix macadam** shall be payment in full for carrying out the following operations including full compensation for all components listed below.

1. Making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;

2. Supplying all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
3. All labour, tools, equipment and incidentals to complete the work to the Specifications;
4. Carrying out the work in part widths of road where directed and Carrying out the required tests for quality control

Item No 19 Schedule B1 TO B6

Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.

This work shall consist of construction of Bituminous Concrete, for use in wearing and profile corrective courses. This work shall consist of construction in a single layer of bituminous concrete on a previously prepared bituminous bound surface. A single layer shall be **40 mm in thickness**.

2.0 Materials

2.1 Bitumen: The bitumen shall be paving bitumen of **viscosity grade VG-30** complying with Indian Standard Specifications for “Paving Bitumen” IS: 73, and of the Viscosity indicated in Table 500-18, for semi dense bituminous concrete, or this bitumen as modified by one of the methods specified in Clause 521, or as otherwise specified in the Contract. Guidance on the selection of an appropriate grade of bitumen is given in the Manual for Construction and Supervision of Bituminous Works.

Viscosity Grade (VG) Bitumen Specification as per IS 73 : 2013

Characteristics	VG - 10	VG-20	VG-30	VG-40
Absolute Viscosity 60°C, poises, min	800	1600	2400	3200
Kinematic Viscosity 135°C CSI, min	250	300	350	400
Flash point, C, min	220	220	220	220
Solubility in trichloroethylene, % min	99.0	99.0	99.0	99.0
Viscosity at 25°C	80-100	60-80	50-70	40-60
Softening point, C min	40	45	47	50
Test on residue from thin film oven test / RTFOT :				
(A) Viscosity ration at 60°C, max	4.0	4.0	4.0	4.0
(B) Ductility at 25°C, cm, min after thin film over test	75	50	40	25

507.2.1.1 Coarse Aggregates

The coarse aggregates shall be generally as specified in Clause 504.2.2, except that the aggregates shall satisfy the physical requirements of Table 500-16 and where crushed gravel is proposed for use as aggregate, not less than 95 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

Table 500-16 : Physical Requirements for Coarse Aggregate for Bituminous Concrete

Property	Test	Specification	Method of test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max30% Max24%	IS:2386 Part IV
Durability	Soundness either:Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Polishing	Polished Stone Value	Min 55	BS:812-114
Water Absorption	Water Absorption	Max2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95%	IS:6241
Water Sensitivity	Retained Tensile Strength*	Min 80%	AASHTO 283

* If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the requirement.

507.2.3 Fine Aggregates

The fine aggregates shall be all as specified in Clause 505.2.3.

507.2.4 Filler

Filler shall be as specified in Clause 505.2.4.

507.2.5 Aggregate Grading and Binder content

When tested in accordance with IS:2386 Part 1 (Wet grading method), the combined grading of the coarse and fine aggregates and filler shall fall within the limits shown in Table 500-17. The grading shall be as specified in the Contract.

Table 500-17: Composition of Bituminous Concrete Pavement Layers

Grading	1	2
Nominal aggregate size*	19 mm	13.2 mm
Layer thickness	50 mm	30-40 mm
IS Sieve¹(mm)	Cumulative % by weight of total aggregate passing	
45		
37.5		
26.5	100	
19	90-100	100
13.2	59-79	90-100
9.5	52-72	70-88
4.75	35-55	53-71
2.36	28-44	42-58
1.18	20-34	34-48
0.6	15-27	26-38
0.3	10-20	18-28
0.15	5-13	12-20
0.075	2-8	4-10
Bitumen content % by mass of total mix	Min 5.2*	Min 5.4**

Notes:

- * The nominal maximum particle size is the largest specified sieve size up on which any of the aggregate is retained.
- ** Corresponds to specific gravity of aggregate being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is - 10°C or lower, the bitumen content may be increased by 0.5 percent.

507.3 Mix Design**507.3.1 Requirement for the Mix**

Clause 505.3.1 shall apply.

507.3.2 Binder Content

Clause 505.3.2 shall apply.

507.3.3 Job Mix Formula

Clause 505.3.3 shall apply.

507.3.4 Plant Trials - Permissible Variation in Job Mix Formula

The requirements for plant trials shall be as specified in Clause 505.3.4 and permissible limits for variation as given in Table 500-18.

Table 500-18: Permissible Variation in plant Mix from the job Mix Formula

Description	Permissible Variation
Aggregate passing 19 mm sieve or larger	±7%
Aggregate passing 13.2 mm, 9.5 mm	±6%
Aggregate passing 4.75 mm	±5%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	±4%
Aggregate passing 0.3 mm, 0.15 mm	±3%
Aggregate passing 0.075 mm	± 1.5%
Binder content	± 0.3%
Mixing temperature	± 10°C

507.3.5 Laying Trials

The requirements for laying trials shall be as specified in Clause 505.3.5. The compacted layers of bituminous concrete (BC) shall have a minimum field density equal to or more than 92 percent of the average theoretical maximum specific gravity (G_{mm}) obtained on the day of compaction in accordance with ASTM 02041.

507.4 Construction Operations

507.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply.

507.4.2 Preparation of Base

The surface on which the bituminous concrete is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by mechanical broom and dust removed by compressed air. In locations where a mechanical broom cannot get access, other approved methods shall be used as directed by the Engineer.

507.4.3 Geosynthetics

Where Geosynthetics are specified in the Contract, this shall be in accordance with the requirements stated in Clause 703.

507.4.4 Stress Absorbing Layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 517.

507.4.5 Tack Coat

The provisions as specified in Clause 504.4.6 shall apply.

507.4.6 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3, 501.4 and 504.4.7 shall apply.

507.4.7 Spreading

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

507.4.8 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials.

507.5 Opening to Traffic

Provisions in Clause 504.5 shall apply.

507.6 Surface Finish and Quality Control

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these Specifications.

507.8 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

507.8 Measurement for Payment

Dense Graded Bituminous Materials shall be measured as finished work either in **MT**, at a specified thickness as indicated in the Contract drawings, or documents, or as otherwise directed by the Engineer.

8.0 Rate

The contract unit rate for **Bituminous Concrete** shall be payment in full for carrying out the all required operations as specified, and shall include, but not necessarily limited to

- (i) Making arrangements for traffic to Clause 112 except for initial treatment to verge, shoulders and construction of diversion;
- (ii) Preparation of the surface to receive the material.
- (iii) Providing all materials to be incorporated in the work including arrangement for stock yards, all royalties, fees, rents where necessary and all leads and lifts;
- (iv) Mixing, transporting, laying and compacting the mix, as specified.
- (v) All labour, tools, equipment, plant including installation of **batch mix plant**, power supply units and all machinery, incidental to complete the work to these Specifications;

- (vi) Carrying out the work in part width of the road where directed;
- (vii) Carrying out all tests for control of quality and
- (viii) The rate shall cover the provision of bitumen at the rate specified in the contract, with the provision that the variation in actual percentage of bitumen used will be assessed and the payment adjusted accordingly.
- (ix) The rates for premixed material are to include for all wastage in cutting of joints etc.
- (x) The rates are to include for all necessary testing, mix design, transporting and testing of samples, and cores. If there is not a project specific laboratory, the Contractor must arrange to carry out all necessary testing at an outside Laboratory, approved by the Engineer, and all costs incurred are deemed to be included in the rate quoted for the material.
- (xi) The cost of all plant and laying trials as specified to prove the mixing and laying methods is deemed to be included in the Contractor's rates for the material.

The rate shall include the provision of bitumen at **5.40 percent** for grading 1 and grading 2 by weight of total mix respectively. The variation in actual percentage of bitumen used will be assessed and the payment adjusted plus and minus accordingly

Item No 20 Schedule B1 TO B6

Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete

505 DENSE BITUMINOUS MACADAM

505.1 Scope

The specification describes the design and construction procedure for Dense Bituminous Macadam, (DBM), for use mainly, but not exclusively, in base/binder and profile corrective courses. The work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be **specified**.

505.2 Materials

505.2.1 Bitumen

The bitumen shall be viscosity grade paving bitumen complying with the Indian Standard

Specification IS:73, modified bitumen complying with Clause 501.2.1 or as otherwise specified in the Contract.

The type and grade of bitumen to be used shall be specified in the Contract.

505.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates has poor affinity for bitumen, the Contractor shall produce test results that with the use of anti-stripping agents, the stripping value is improved to satisfy the specification requirements. The Engineer may approve such a source and as a condition for the approval of that source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacturer's recommendations, at the cost of the Contractor. The aggregates shall satisfy the requirements specified in Table 500-8.

Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

505.2.3 Fine Aggregates

Fine aggregates shall consist of crushed or naturally occurring mineral material, or a combination of the two, passing the 2.36 mm sieve and retained on the 75-micron sieve. These shall be clean, hard, durable, dry, and free from dust, and soft or friable matter, organic or other deleterious matter. Natural sand shall not be allowed in binder courses. However, natural sand upto 50 percent of the fine aggregate may be allowed in base courses. The fine aggregate shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37). The plasticity index of the fraction passing the 0.425 mm sieve shall not exceed 4, when tested in accordance with IS:2720 (Part 5).

505.2.4 Filler

Filter shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer. The filler shall be graded within the limits indicated in Table 500-9.

The filler shall be free from organic impurities and have a plasticity Index not greater than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8, then 2 percent by total weight of aggregate, of hydrated lime shall be used and percentage of fine aggregate reduced accordingly.

505.2.5 Aggregate Grading and Binder Content

When tested in accordance with IS:2386 Part 1 (wet sieving method), the combined grading of the coarse and fine aggregates and filler for the particular mixture shall fall within the limits given in Table 500-10 for grading 1 or 2 as specified in the Contract. To avoid gap grading, the combined aggregate gradation shall not vary from the lower limit on one sieve to higher limit on the adjacent sieve.

Table 500-8: Physical Requirements for Coarse Aggregate for Dense Bituminous Macadam

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max 5% passing 0.0075 mm sieve	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices*	Max 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max 35% Max 27%	IS:2386 Part IV
Durability	Soundness either: Sodium Sulphate or Magnesium Sulphate	Max 12% Max 18%	IS:2386 Part V
Water Absorption	Water Absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Minimum retained coating 95 %	IS:6241
Water Sensitivity	Retained Tensile Strength**	Min. 80%	AASHTO 283

* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

** If the minimum retained tensile test strength falls below 80 percent, use of anti-stripping agent is recommended to meet the requirement.

Table 500-9: Grading Requirements for Mineral Filler

IS sieve (mm)	Cumulative Percent Passing by Weight of Total Aggregate
0.6	100
0.3	95-100
0.075	85-100

Table 500-10: Composition of Dense Graded Bituminous Macadam

Grading	1	2
Nominal aggregate size*	37.5 mm	26.5 mm
Layer thickness	75-100 mm	50-75 mm
IS Sieve ¹ (mm)	Cumulative % by weight of total aggregate passing	
45	100	
37.5	95-100	100
26.5	63-93	90-100
19	-	71-95
13.2	55-75	56-80
9.5	-	-
4.75	38-54	38-54
2.36	28-42	28-42
1.18	-	-
0.6	-	-
0.3	7-21	7-21
0.15	-	-
0.075	2-8	2-8
Bitumen content % by mass of total mix of total mix	Min. 4.0**	Min. 4.5**

* The nominal maximum particle size is the largest specified sieve size upon which any of the aggregate is retained.

** Corresponds to specific gravity of aggregates being 2.7. In case aggregate have specific gravity more than 2.7, the minimum bitumen content can be reduced proportionately. Further the region where highest daily mean air temperature is 30°C or lower and lowest daily air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

505.2.5.2 Bitumen content indicated in Table 500-10 is the minimum quantity. The quantity shall be determined in accordance with Clause 505.3.

505.3 Mix Design

The bitumen content required shall be determined following the Marshall mix design procedure contained in Asphalt Institute Manual MS-2.

The Fines to Bitumen (F/B) ratio by weight of total mix shall range from 0.6 to 1.2.

505.3.1 Requirements for the Mix

Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11.

Table 500-11: Requirements for Dense Graded Bituminous Macadam

Properties	Viscosity Grade Paving Bitumen	Modified bitumen		Test Method
		Hot climate	Cold climate	
Compaction level	75 blows on each face of the specimen			
Minimum stability (kN at 600C)	9.0	12.0	10.0	AASHTO T245
Marshall flow (mm)	2-4	2.5-4	3.5-5	AASHTOT245
Marshall Quotient $\left(\frac{\text{Stability}}{\text{Flow}}\right)$	2-5	2.5-5		MS-2 and ASTM 02041
% air voids	3-5			
% Voids Filled with Bitumen (VFB)	65-75			
Coating of aggregate particle	95% minimum			IS:6241
Tensile Strength ratio	80% Minimum			AASHTO T 283
% Voids in Mineral Aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA)			

505.3.2 Binder Content

The binder content shall be optimized to achieve the requirements of the mix set out in Table 500-11. The binder content shall be selected to obtain 4 percent air voids in the mix design. The Marshall method for determining the optimum binder content shall be adopted as described in the Asphalt Institute Manual MS-2.

Where maximum size of the aggregate is more than 26.5 mm, the modified Marshall method using 150 mm diameter specimen described in MS-2 and ASTM D 5581 shall be used. This method requires modified equipment and procedures. When the modified Marshall test is used, the specified minimum stability values in Table 500-12 shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

Table 500-12: Minimum Percent Voids in Mineral Aggregate (VMA)

Nominal Maximum Particle Size ¹ (mm)	Minimum VMA Percent Related to Design Percentage Air Voids		
	3.0	4.0	5.0
26.5	11.0	12.0	13.0

37.5	10.0	11.0	12.0
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Note: Interpolate minimum voids in the mineral aggregate (VMA) for designed percentage airvoids values between those listed.

505.3.3 Job Mix Formula

The Contractor shall submit to the Engineer for approval at least 21 days before the start the work, the job mix formula proposed for use in the works, together with the following details:

- i. Source and location of all materials;
- ii. Proportions of all materials expressed as follows:
 - a. Binder type, and percentage by weight of total mix;
 - b. Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;
- iii. A single definite percentage passing each sieve for the mixed aggregate;
- iv. The individual gradings of the individual aggregate fraction, and the proportion of each in the combined grading;
- v. The results of mix design such as maximum specific gravity of loose mix (Gmm), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test;
- vi. Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch;
- vii. Test results of physical characteristics of aggregates to be used;
- viii. Mixing temperature and compacting temperature.

While establishing the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredients satisfy the physical and strength requirements of these Specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer.

The approved job mix formula shall remain effective unless and until a revised Job Mix Formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded by the Contractor to the Engineer for approval before the placing of the material.

505.3.4 Plant Trials - Permissible Variation in Job Mix Formula

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials to establish that the plant can produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500-13 and shall remain within the gradation band. These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900.

Table 500-13: Permissible Variations in the Actual Mix from the Job Mix Formula

Description	Base/binder Course
Aggregate passing 19 mm sieve or larger	±8%
Aggregate passing 13.2 mm, 9.5 mm	±7%
Aggregate passing 4.75 mm	±6%
Aggregate passing 2.36 mm, 1.18 mm, 0.6 mm	±5%
Aggregate passing 0.3 mm, 0.15 mm	±4%
Aggregate passing 0.075 mm	±2%
Binder content	±0.3%
Mixing temperature	± 10°C

505.3.5 Laying Trials

Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid and compacted all in accordance with clause 501. The laying trial shall be carried out on a suitable area which is not to form part of the works. The area of the laying trials shall be a minimum of 100 sq.m of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid.

The Contractor shall previously inform the Engineer of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. The compacted layers of Dense Graded Bituminous Macadam (DBM) shall have a minimum field density equal to or more than 92% of the density based on theoretical maximum specific gravity (G_{mm}) obtained on the day of compaction in accordance with ASTM D 2041.

Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer, who may at his discretion require further laying trials.

505.4 Construction Operations

505.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply.

505.4.2 Preparation of Base

The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 as appropriate, or as directed by the Engineer.

505.4.3 Geosynthetics

Where Geosynthetics are specified in the Contract, this shall be in accordance with the requirements stated in clause 703.

505.4.4 Stress Absorbing Layer

Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 517.

505.4.5 Prime Coat

Where the material on which the dense bituminous macadam is to be laid is other than bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502, or as directed by the Engineer.

505.4.6 Tack Coat

Where the material on which the dense bituminous macadam is to be laid is either bitumen bound layer or primed granular layer, tack coat shall be applied, as specified, in accordance with the provisions of Clause 503, or as directed by the Engineer.

505.4.7 Mixing and Transportation of the Mix

The provisions as specified in Clauses 501.3 and 501.4 shall apply. Table 500-2 gives the mixing, laying, and rolling temperature for dense mixes using viscosity grade bitumen. In case of modified bitumen, the temperature of mixing and compaction shall be higher than the mix with viscosity grade bitumen. The exact temperature depends upon the type and amount of modifier used and shall be adopted as per the recommendations of the manufacturer. In order to have uniform quality, the plant shall be calibrated from time to time.

505.4.8 Spreading

The provisions of Clauses 501.5.3 and 501.5.4 shall apply.

505.4.9 Rolling

The general provisions of Clauses 501.6 and 501.7 shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

505.5 Opening to Traffic

It shall be ensured that the traffic is not allowed without the approval of the Engineer in writing, on the surface until the dense bituminous layer has cooled to the ambient temperature.

505.6 Surface Finish and Quality Control of Work

The surface finish of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 of these Specifications.

505.7 Arrangements for Traffic

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112.

505.8 Measurement for Payment

Dense Graded Bituminous Materials shall be measured as finished work in **M.T. basis** at a specified thickness as indicated in the contract, drawings or documents or as otherwise directed by Engineer in charge.

505.9 Rate

The contract unit rate for **Dense Graded Bituminous** shall be payment in full for carrying out the all required operations as specified, and shall include, but not necessarily limited to

- (i) Making arrangements for traffic to Clause 112 except for initial treatment to verge, shoulders and construction of diversion;
- (ii) Preparation of the surface to receive the material.
- (iii) Providing all materials to be incorporated in the work including arrangement for stock yards, all royalties, fees, rents where necessary and all leads and lifts;
- (iv) Mixing, transporting, laying and compacting the mix, as specified.
- (v) All labour, tools, equipment, plant including installation of **batch mix plant**, power supply units and all machinery, incidental to complete the work to these Specifications;
- (vi) Carrying out the work in part width of the road where directed;

- (vii) Carrying out all tests for control of quality; and
- (viii) The rate shall cover the provision of bitumen at the rate specified in the contract, with the provision that the variation in actual percentage of bitumen used will be assessed and the payment adjusted accordingly.
- (ix) The rates for premixed material are to include for all wastage in cutting of joints etc.
- (x) The rates are to include for all necessary testing, mix design, transporting and testing of samples, and cores. If there is not a project specific laboratory, the Contractor must arrange to carry out all necessary testing at an outside Laboratory, approved by the Engineer, and all costs incurred are deemed to be included in the rate quoted for the material.
- (xi) The cost of all plant and laying trials as specified to prove the mixing and laying methods is deemed to be included in the Contractor's rates for the material.

The rate shall include the provision of bitumen at **4.50 percent** by weight of the total mixture.

The variance in actual percentage of bitumen used will be assessed and the payment adjusted up or down accordingly.

ITEM 21 of Schedule B3

Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with required length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8 mm

GENERAL SPECIFICATIONS

At Roads, Railway, public highways, at such other crossings as are shown in the construction Drawings issued by the company the pipeline shall be installed in M.S. casing pipes Conforming to the specifications given herein. The casing pipes shall be installed in accordance with the details given in drawing and the casing, bushing and insulators, etc., shall be installed on the carrier pipe as Detailed in drawings. Casing pipe size shall be as per approved by appropriate authority to facilitate the insertion of the sewerage pipe without disturbing the casing pipe and to provide adequate drainage, Casing shall be installed with

even Bearing throughout its length and shall slope towards one end, as specified or desired by the engineer-in-charge. The ends of the casing shall be sealed to outside Of carrier pipe in accordance with the details given in drawing. Before installation, holes for installing vent pipes shall be cut and burrs if any shall be removed. The welding of both carrier pipe and casing pipe shall be done in Accordance with the welding specifications, given herein. Before installing the casing Pipe, it should be cleaned of all internal obstructions and during installation care should be taken to keep the inside clean. The section of carrier pipe to be placed in any casing shall be closed at each end, hydrostatically tested preferably with dead weight tested for at least two hours. Only on successful completion of this test, shall the carrier pipe section be inserted in the casing pipe. The installation of casing may open cut as circumstances may permit or require as directed by the engineer-in-charge. The installation of casing in bended section of the carrier pipe shall be performed by meter bends of the casing pipe provided that the length of each meter cut out of casing pipe shall be such as to provide a clearance of at least 1-1/2" between the inside of the casing pipe and the outside of the coated carrier pipe. Excavation for casing installation done if any shall be immediately backfilled at the completion of the work with suitable solid matter and packed thoroughly to prevent seepage of water into the excavation.

ROAD, RAILWAYS AND IRRIGATION CANAL CROSSINGS:

At, and Road, Railway, & canal crossings the work shall be performed to the specifications Of local authorities or such public bodies as may be in charge (S) of Roads, Railway and Canals to be crossed. In case, however the minimum requirements of the governing agencies are less than Those set out in the drawing or the specifications given herein, then the Requirements given in the drawings and the specifications given for encased line Shall be followed. Whereas the casing pipe in the case of encased line to be laid normal by boring, tunneling, engineer-in-charge may at his discretion permit open-cuts to be made for the installation of casing provided, however, that the TENDERER shall procure the necessary permit / license for the same from competent authority. At locations wherein the open cut methods are permitted, the TENDERER shall pass the carrier pipe through the casing located in the trench after the approval of the engineer in charge in writing and care shall be exercised to avoid damage to pipe coating and wrapping during this operation. The TENDERER shall produce a certificate in writing from concerned authorities for its satisfactory restoration and payment therefore. At all crossings the carrier pipe shall be laid straight without bends so that

if Necessary the pipe at a later dates may be replaced without cutting the casing. The Carried pipe shall extend at least 2 meters beyond the end of casing pipe at either End. At Road crossings the TENDERER shall eliminate unnecessary bending of pipe to Conform to the contour of ground by gradually deepening the ditch at such Approaches as directed by the engineer-in-charge. Where the installation of the Casing has been made by open cut TENDERER shall install suitable.

Temporary bridge Work ensuring the safety of the traffic aids and safeguards for protection of the Public safety, or he shall provide suitable diversions as desired by the engineer in Charge. At all Roads, Railway pipeline crossings shall be bored with horizontal boring machine. The method of carrying out a cased crossing by boring for various crossings on this Pipeline route shall be jointly inspected by the representative of the COMPANY and TENDERER for each category of work prior to commencement of actual work. Pipeline under Road track and irrigation canal an applicable portion of the right of way shall be encased in accordance with the specification. This item of work shall include, necessary clearing and grading required therefore, trenching to the depths and widths required, welding of casing and carrier pipes, testing, lowering in, Installation of vent assemblies, end seals, insulator and all other fittings that may be Required, backfilling, clean up, complete restoration to the original condition and Further strengthening and protective works as may be required. The work shall be carried out in accordance with the drawings and as directed by the engineer-in-Charge. For various operations mentioned above, the specifications pertaining to these operations shall apply in addition to the specifications given herein. The TENDERER shall be permitted to use William Sons type Neoprene seals in place of concrete end seals for the crossings. The item shall be procured by the TENDERER Himself as per the provisions under the appropriate head of work in case TENDERER so desires. The representative of the COMPANY may also be associated to determine the quality of the material and its delivery schedule from the open market. However, the particular work defined under the proper head shall not be delayed on account Of non availability of Neoprene end seals. In such case, concrete seals may be provided. On both ends of pushing concrete supports are to be provided as per direction of Engineer in charge.

Measurement and Payment

The items of the work shall be measured and paid on the number basis completed in all

respects including all materials, labours, jointing materials, tools, transportation, taxes and other including items for completion of work after receiving no due certificate from concern Road / Railway authority.

Item No 22 of Schedule B4 & B6

Providing Supplying Lowering Laying and Jointing Precast Sewer manholes as per tender Design, as per the type design in Reinforced Cement Concrete with neat finish without any damage and honey combs with fixed HDPE steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete (excl. excavation). rates are inclusive of grouting the joints between two members basic chambers constitutes of Base Slab, 1st cylindrical piece with pipe opening on both sides top piece (Conical or slab piece as per design type drawing) and additional rings as per depth adjustment according to design type

- Garde of Concrete M25 and steel TMT Bar FE 500 and as per design drawing.
- For methodology, please refer Item 6 of Brick masonry manhole chamber.

Item General

Re-instatement of Concrete Roads including construction of granular sub-base of 0.15 m thickness, providing and laying Cement Concrete 1 :4:8 for foundation of 0.15 m thickness and M-40 grade concrete for pavement of 0.15 m thickness as per tender scope and specification and as directed by engineer incharge.

1.0 SCOPE

1.1 GENERAL

The scope includes the reinstatement of asphalt road of design thickness crossing the sewerage pipelines.

1.2 REINSTATEMENT

1. The scope includes the reinstatement of asphalt road of design thickness crossing the sewerage pipelines.

2. After the work of laying and jointing of pipeline is completed, the earthwork, murrum surface and asphalt surface will be reconstructed by matching the existing level and line as per the designed thickness.
3. The scope includes, work of providing following layers of given thickness
 - a) **Earthwork for embankment including breaking clods, dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C. to required dry density including filling the depression which occur during the process using power roller 8T to 10T.(B) From Borrow area within 0.5KM. lead (more than 10 ton)**

Thickness = 0.15 m

Specification as mentioned in previous Item.

- b) **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.**

Thickness: 0.15 m

1.1 Materials :

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Stone aggregate 40 mm. nominal size shall conform to M-5.

1.2 Workmanship :

Relevant specifications of item No. 2.8-A. shall be followed except that cement concrete shall be mixed in the proportion of 1:4:8 instead of 1:3:6 by volume.

- c) **Cement Concrete M40 grade of specified thickness in pavement using OPC 43 grade cement minimum @ 405 kg/cum and graded stone aggregates 25 mm nominal maximum size laid to required slope and camber in panels as required using appropriate batching and mixing plant, vibrating system comprising of needle vibrator, surface (screed) vibrator, floater etc, heavy duty steel form work made from MS channels including provision of contraction, expansion, construction and longitudinal joints, joint filler board, joint sealant, sealant primer, debonding strip, MS round dowel bar, tie rod all as per drawing and technical specifications, admixture (super plasticizer) conforming to IS:9103 @ 0.4 % by weight of cement, broom finishing, curing etc complete.**

602.1 Scope

- 602.1.1 The work shall consist of construction of un-reinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of these Specifications and

in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer. The design parameters, viz., thickness of pavement slab, grade of concrete, joint details etc. shall be as stipulated in the drawings.

602.2 MATERIALS

602.2.1 Source of materials

The Contractor shall indicate to the Engineer the source of all materials to be used in the concrete work with relevant test data sufficiently in advance, and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work in trial length. If the Contractor subsequently proposes to obtain materials from a different source during the execution of main work, he shall notify the Engineer, with relevant test data, for his approval, at least 45 days before such materials are to be used.

602.2.2 Cement

Any of the following types of cement capable of achieving the design strength may be used with prior approval of the Engineer.

S.No	Type	Conforming to
i)	Ordinary Portland Cement 43 Grade	IS:8112
ii)	Portlant Slag Cement	IS:455
iii)	Portland Pozzolana Cement	IS:1489-Part I
iv)	Ordinary Portland Cement 53 Grade	IS:12269

If the soil around PQC has soluble salts like sulphates in excess of 0.5 percent, the cement used shall be sulphate resistant and shall conform to IS:12330.

Cement to be used may preferably be obtained in bulk form. If cement in paper bags is proposed to be used, there shall be bag-splitters with the facility to separate pieces of paper bags and dispose them off suitably. No paper pieces shall enter the concrete mix. Bulk cement shall be stored in accordance with Clause 1014. The cement shall be subjected to acceptance test just prior to its use.

Fly ash upto 20 percent by weight of cement may be used in ordinary Portland cement 53 Grade. No fly ash shall be used in any other grade of Cement other than 53 Grade. The fly ash shall conform to IS:3812 (Part I).

Site mixing of fly ash and ground granulated slag shall be permitted only after ensuring availability of the equipments at site for uniform blending through a specific mechanized facility with automated process control like batch mix plants conforming to IS:4925 and IS:4926. Site mixing will not be allowed otherwise.

The Portland Pozzolana Cement produced in factory shall not have fly ash content more than 25 percent. The Portland Pozzolana Cement produced in factory with fly ash content more than 25 percent shall not be used. Certificate from the manufacturer to this effect shall be procured before use.

602.2.3 Chemical Admixtures

Admixtures conforming to IS:9103 and IS:6925 shall be permitted to improve workability of the concrete or extension of setting time, on satisfactory evidence that they will not have any adverse effect on the properties of concrete with respect to strength, volume change, durability and have no deleterious effect on steel bars. The particulars of the admixture and the quantity to be used, must be furnished to the Engineer in advance to obtain his approval before use. Satisfactory performance of the admixtures should be proved both on the laboratory concrete trial mixes and in the trial length paving. If air entraining admixture is used, the total quantity of air in air-entrained concrete as a percentage of the volume of the mix shall be 5 ± 1.5 percent for 31.5 mm nominal size aggregate.

602.2.4 Silica Fumes

Silica fume confirming to a standard approved by the Engineer may be used as an admixture in the proportion of 3 to 10 percent of cement. Silica fume shall comply with the requirements given in IS: 1538-2003, IS:456-2000, IRC:44-2008.

602.2.5 Fibers

Fibers may be used subject to the provision in the design/approval by the Engineer to reduce the shrinkage cracking and post-cracking. The fibers may be steel fiber as per IRC:SP:46 or polymeric Synthetic Fibres within the following range of specifications:

Effective Diameter	10 micron – 1.0 mm
Length	6 - 48 mm
Specific gravity	more than 1.0
Suggested dosage	0.6-2.0 kg/cu.m (0.2 -0.6 % by weight of cement in mix). Usage will be regulated as stipulated in IRC:44/IS:456 or any other specialist literature.
Water absorption	less than 0.45 percent
Melting point of this fiber shall not be less than 160°C.	
The aspect ratio generally varies from 200 to 2000.	
These synthetic fibers will have good alkali and UV light resistance.	

When fibers are used, the mix shall be so designed that the slump at paving concrete is 30 ± 15 mm site.

602.2.6 Aggregates

602.2.7 Aggregates for pavement concrete shall be natural material complying with IS:383 but with a Los Angeles Abrasion Test result not more than 35 percent. The limits of deleterious materials shall not exceed the requirements set out in Table 600-2.

Table 600-2 : Permissible Limits Of Deleterious Substances In Fine And Coarse Aggregates

S. No.	Deleterious Substance	Method of Test	Fine Aggregate Percentage by Weight,	Coarse Aggregate percentage by Weight
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Volume- III, Part-2, Item wise Specifications

(1)	(2)	(3)	(Max)		(Max)	
			(4)	(5)	(6)	(7)
			Uncrushed*	Crushed	Uncrushed*	Crushed
1.	Coal and lignite	IS:2386 (Part II) -1963	1.00	1.00	1.00	1.00
2.	Clay lumps	do	1.00	1.00	1.00	1.00
3.	Materials finer than 75 μ IS Sieve	IS:2386 (Part I) - 1963	3.00	8.00	3.00	3.00
4.	Soft fragments	IS:2386 (Part II) -1963			3.00	
5.	Shale	IS:2386 (Part II) -1963	1.00			
6.	Total of percentages of all deleterious materials (except mica) including SI No. (i) to (v) for col 4, 6 and 7 and SI No. (i) and (ii) for col 5 only	-	5.00	2.00	5.00	5.00

* Crushed aggregate at least one face fractured

Note: The presence of mica in the fine aggregate has been found to reduce considerably the durability and compressive strength of concrete and further investigations are underway to determine the extent of the deleterious effect of mica. It is advisable, therefore, to investigate the mica content of fine aggregate and make suitable allowances for the possible reduction in the strength of concrete or mortar; in cases where the stretch of the project road passes through micaceous belt.

The aggregates shall be free from chert, flint, chalcedony or other silica in a form that can react with the alkalis in the cement. In addition, the total chlorides content

expressed as chloride ion content shall not exceed 0.06 percent by weight and the total sulphate content expressed as sulphuric anhydride (SO₃) shall not exceed 0.25 percent by weight. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for atleast 72 hours before batching, as directed by the Engineer.

602.2.6.1 Coarse aggregates

Coarse aggregates shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of coarse aggregate shall not exceed 31.5 mm for pavement concrete. Continuously graded aggregates shall be used as per Table 600-1, No aggregate which has water absorption more than 2 percent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS:2386 (Part-5). After 5 cycles of testing, the loss shall not be more than 12 percent if sodium sulphate solution is used or 18 percent if magnesium sulphate solution is used. The combined flakiness and elongation index of aggregate shall not be more than 35 percent.

602.2.6.2 Fine aggregates

The fine aggregates shall consist of clean natural sand or crushed stone sand or a combination of the two and shall conform to IS:383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica and organic and other foreign matter. The fine aggregates shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37).

602.2.6.3 Combined Gradation of Fine and Coarse Aggregates

The combined gradation of fine and coarse aggregates shall be as per Table 600-3.

Table 600-3 : Aggregate Gradation for Pavement Quality Concrete

Sieve Designation	Percentage by Weight Passing the Sieve
31.5 mm	100
26.5 mm	85-95
19.0 mm	68-88
9.5 mm	45-65
4.75 mm	30-55
600 micron	8-30
150 micron	5-15
75 micron	0-5

602.2.8 Water

Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS:456.

602.2.9 Steel for Dowels and Tie Bars

Steel shall conform to the requirements of IS: 432 and IS:1786 as relevant. The dowel bars shall conform to IS:432 of Grade I. Tie bars shall be either High yield Strength Deformed bars conforming to IS:1786 and grade of Fe 500 or plain bars conforming to IS:432 of Grade I. The steel shall be coated with epoxy paint for protection against corrosion.

602.2.10 Joint Filler Board

Synthetic Joint filler board for expansion joints shall be used only at abutting structures like bridges and shall be of 20-25 mm thickness within a tolerance of ± 1.5 mm and of a firm compressible material and complying with the requirements of IS:1838, or BS:2630 "Preformed Joint Filler". It shall be 25 mm less in depth than the thickness of the slab within a tolerance of ± 3 mm and provided to the full width between the side forms. It shall be in suitable lengths which shall not be less than one lane width. Holes to accommodate dowel bars shall be accurately bored or punched out to give a sliding fit on the dowel bars.

602.2.11 Joint Sealing Compound

The joint sealing compound shall be of hot poured, elastomeric type or cold polysulphide/polyurethane/silicon type having flexibility, resistance to age hardening and durability as per IRC:57. Manufacturer's certificate shall be produced by the Contractor for establishing that the sealant is not more than six months old and stating that the sealant complies with the relevant standard as in Clause 602.2.8. The samples shall meet the requirements as mentioned in IRC:57. Hot applied sealant shall be as per IS:1834.

Cold poured sealant shall be as under :

- i) Polysulphide BS:5212(Part II), IS:11433(Part I)
- ii) Polyurethane BS:5212
- iii) Silicon ASTM 5893-04

602.2.12 Preformed Seals

The pre-formed joint sealing material shall be a vulcanized elastomeric compound using polychloroprene (Neoprene) as the base polymer. The joint seal shall conform to requirements of ASTM 0 2628.

602.2.13 Storage of materials

All materials shall be stored in accordance with the provisions of Clause 1014 of the Specifications and other relevant IS Specifications. All efforts must be made to store the materials in proper places so as to prevent their deterioration or contamination by foreign matter and to ensure their satisfactory quality and fitness for the work. The platform where aggregates are stock piled shall be on a levelled platform elevated from the ground atleast by 150 mm. This platform will be a pucca paved platform. The area shall have slope and drain to drain off rain water. The storage space must also permit easy inspection, removal and storage of the materials. Aggregates of different sizes shall be stored in partitioned stack-yards. All such materials even though stored in approved godowns must be subjected to acceptance test as per Clause 903 of these Specifications immediately prior to their use.

602.3 Proportioning of Concrete

602.3.1 After approval by the Engineer of all the materials to be used in the concrete, the Contractor shall submit the mix design based on weighed proportions of all ingredients for the approval of the Engineer. The mix design shall be submitted at least 30 days prior to the paving of trial length and the design shall be based on laboratory trial mixes using the approved materials and methods as per IRC:44 or IS:10262 (Recommended Guidelines for Mix Design). The target mean strength for the design mix shall be determined as indicated in Clause 602.3.3.1. The mix design shall be based on the flexural strength of concrete.

602.3.2 Cement content

When Ordinary Portland Cement (OPC) is used the quantity of cement shall not be less than 360 kg/cu.m. In case fly ash grade I (as per IS:3812) is blended at site as part replacement of cement, the quantity of fly ash shall be upto 20 percent by weight of cement and the quantity of OPC in such a blend shall not be less than 310 kg/cu.m. The minimum of OPC content in case ground granulated portland blast furnace is used, shall also not be less than 310 kg/m³. If this minimum cement content is not sufficient to produce concrete of the specified strength, it shall be increased as necessary by the Contractor at his own cost.

602.3.3 Concrete strength

602.3.4 The characteristic flexural strength of concrete shall not be less than 4.5 MPa (M 40 Grade). Target mean flexural strength for mix design shall be more than $4.5 \text{ MPa} + 1.65*s$, where s is standard deviation of flexural strength derived by conducting test on minimum 30 beams. While designing the mix in the laboratory, correlation between flexural and compressive strengths of concrete shall be established on the basis of at least thirty tests on samples. However, quality control in the field shall be exercised on the basis of flexural strength. It may, however, be ensured that the materials and mix proportions remain substantially unaltered during the daily concrete production. The water content shall be the minimum required to provide the agreed workability for full compaction of the concrete to the required density as determined by the trial mixes or as approved by the Engineer and the maximum free water cement ratio shall be 0.45 when only OPC is used and 0.50 when blended cement (Portland Pozzolana Cement or Portland Slag Cement or OPC blended with fly ash or Ground Granulated Blast Furnance Slag at site) is used.

602.3.3.1 The ratio between the 7 and 28 day strength shall be established for the mix to be used in the slab in advance, by testing pairs of beams and cubes at each stage on at least six batches of trial mix. The average strength of the 7 day cured specimens shall be divided by the average strength of the 28 day specimens for each batch, and the ratio "R" shall be determined. The ratio 'R' shall be expressed to three decimal places.

If during the construction of the trial length or during some normal working, the average value of any four consecutive 7 day test results falls below the required 7 day strength as derived from the value of 'R' then the cement content of the concrete shall, without extra payment, be increased by 5 percent by weight or by an amount agreed by the Engineer. The increased cement content shall be maintained at least until the four corresponding 28 day strengths have been assessed for in conformity with the requirements as per Clause 602.3.1. Whenever the cement content is increased, the concrete mix shall be adjusted to maintain the required workability.

602.3.5 Workability

602.3.4.1 The workability of the concrete at the point of placing shall be adequate for the concrete to be fully compacted and finished without undue flow. The optimum workability for the mix to suit the paving plant being used shall be determined by the Contractor and approved by the Engineer. The control of workability in the field shall be exercised by the slump test as per IS:1199.

602.3.4.2 The workability requirement at the batching and mixing plant and paving site shall be established by slump tests carried during trial paving. These requirements shall be established from season to season and also when the lead from batching and mixing plant site to the paving site changes. The workability shall be established for the type of paving equipment available. A slump value in the range of 30 ± 15 mm is reasonable for paving works but this may be modified depending upon the site requirement and got approved by the Engineer. These tests shall be carried out on every truck/dumper at batching and mixing plant site and paving site initially when the work commences but subsequently the frequency can be reduced to alternate trucks or as per the instructions of the Engineer.

602.3.6 Design mix

602.3.7 The Contractor shall carry out laboratory trials of design mix with the materials from the approved sources to be used. Trial mixes shall be made in presence of the Engineer or his representative and the design mix shall be subject to the approval of the Engineer. They shall be repeated, if necessary, until the proportions, that will produce a concrete which complies in all respects with these Specification, and conform to the requirements of the design/drawings.

602.3.5.1 The proportions determined as a result of the laboratory trial mixes may be adjusted, if necessary, during the construction of the trial length. Thereafter, neither the materials nor the mix proportions shall be varied in any way except with the written approval of the Engineer.

602.3.5.2 Any change in the source of materials or mix proportions proposed by the Contractor during the course of work shall be assessed by making laboratory trial mixes and the construction of a further trial length unless approval is given by the Engineer for minor adjustments like compensation for moisture content in aggregates or minor fluctuations in the grading of aggregate.

602.4 Sub-base

The cement concrete pavement shall be laid over the DLC sub-base constructed in accordance with the relevant drawings and Specifications.. If the sub-base is found damaged at some places or it has cracks wider than 10 mm, it shall be repaired with fine cement concrete (aggregate size 10 mm and down) or bituminous concrete before laying separation layer.

602.5 Separation Membrane

A separation membrane shall be used between the concrete slab and the sub-base. Separation membrane shall be impermeable plastic sheeting 125 microns thick laid flat without creases. Before placing the separation membrane, the sub-base shall be swept clean of all the extraneous materials using air compressor. Wherever overlap of plastic sheets is necessary, the same shall be at least 300 mm and any damaged sheeting shall be replaced at the Contractor's expense. The separation membrane may be nailed to the lower layer with concrete nails. The separation membrane shall be omitted when two layers of wax-based curing compound is used.

602.6 Joints

602.6.1 The location and type of joints shall be as shown in the drawing. Joints shall be constructed depending upon their functional requirement as detailed in the following paragraphs. The location of the joints should be transferred accurately at the site and mechanical saw cutting of joints done as per stipulated dimensions. It should be ensured that the full required depth of cut is made from edge to edge of the pavement. Transverse and longitudinal joints in the pavement and sub-base shall be staggered so that they are not coincident vertically and are at least 800 to 1000mm and 300 to 400 mm apart respectively. Sawing of joints shall be carried out with diamond studded blades soon after the concrete has hardened to take the load of the sawing machine and personnel without damaging the texture of the pavement.

Sawing operation could start as early as 4-8 hours after laying of concrete pavement but not later than 8 to 12 hours depending upon the ambient temperature, wind velocity, relative humidity and required maturity of concrete achieved for this purpose.

When the kerb is cast integrally with the main pavement slab, the joint cutting shall also be extended to the kerb.

When the use of maturity meter is specified, sawing should not be initiated when the compressive strength of the concrete is less than 2 MPa and should be completed before it attains the compressive strength of 7 MPa.

602.6.2 Transverse joints

602.6.2.1 Transverse joints shall be contraction and expansion joints constructed at the spacing described in the drawings. Transverse joints shall be straight within the following tolerances along the intended line of joints which is the straight line transverse to the longitudinal axis of the carriageway at the position proposed by the Contractor and agreed to by the Engineer, except at road junctions or roundabouts where the position shall be as described in the drawings:

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- i) Deviations of the filler board in the case of expansion joints from the intended line of the joint shall not be greater than ± 10 mm.
 - ii) The best fit straight line through the joint grooves as constructed shall be not more than 25 mm from the intended line of the joint.
 - iii) Deviations of the joint groove from the best fit straight line of the joint shall not be greater than 10 mm.
 - iv) Transverse joints on each side of the longitudinal joint shall be in line with each other and of the same type and width. Transverse joints shall have a sealing groove which shall be sealed in compliance with Clause 602.10.

602.6.2.2 Contraction joints

The contraction joints shall be placed transversely at pre-specified locations as per drawings/design using dowel bars. These joints shall be cut as soon as the concrete has undergone initial hardening and is hard enough to take the load of joint sawing machine without causing damage to the slab.

Contraction joints shall consist of a mechanical sawn joint groove, 3 to 5 mm wide and one fourth to one third depth of the slab ± 5 mm or as stipulated in the drawings and dowel bars complying with Clause 602.6.5.

Contraction joint shall be widened subsequently accommodate the sealant as per Clause 602.10, to dimensions shown on drawings or as per IRC:57.

602.6.2.3 Expansion joints

The expansion joints shall consist of a joint filler board complying with Clause 602.2.9 and dowel bars complying with Clause 602.6.5 and as detailed in the drawings. The filler board shall be positioned vertically with the prefabricated joint assemblies along the line of the joint within the tolerances given in Clause 602.6.2.1. The adjacent slabs shall be completely separated from each other by providing joint filler board.

602.6.3 Transverse construction joint

Transverse construction joints shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at the regular location of contraction joints using dowel bars. The joint shall be made butt type. At all construction joints, steel bulkheads shall be used to retain the concrete while the surface is finished. The surface of the concrete laid subsequently shall conform to the grade and cross sections of the previously laid pavement. When positioning of bulk head/ stop-end is not possible, concreting to an additional 1 or 2 m length may be carried out to enable the movement of joint cutting machine so that joint grooves may be formed and the extra 1 or 2 m length is cut out and removed subsequently after concrete has hardened.

Like contraction joint, the construction joint shall also be widened to dimensions shown on drawing or as per IRC:57, not before 14 days curing of PQC.

602.6.4 Longitudinal joint

- 602.6.5 The longitudinal joints shall be saw cut as per details of the joints shown in the drawing. The groove may be cut after the final set of the concrete. Joints should be sawn to at least 1/3 the depth of the slab ± 5 mm as indicated in the drawing. The joint shall also be widened to dimensions shown on drawing

602.6.6 Tie bars

Tie bars shall be provided at the longitudinal joints as per dimensions and spacing shown in the drawing and in accordance with Clause 602.6.6.the direction of the tie bars at curves shall be radial in the direction of the radius.

602.6.7 Dowel bars

602.6.5.1 Dowel bars shall be mild steel rounds in accordance with Clause 602.2.6 with details/dimensions as indicated in the drawing and free from oil, dirt, loose rust or scale. They shall be straight, free of irregularities and burring restricting slippage in the concrete. The sliding ends shall be sawn or cropped cleanly with no protrusions outside the normal diameter of the bar. The dowel bar shall be supported on cradles/dowel chairs in pre-fabricated joint assemblies positioned prior to the construction of the slabs or mechanically inserted with vibration into the plastic concrete by a method which ensures correct placement of the bars besides full re-compaction of the concrete around the dowel bars.

602.6.8 Unless shown otherwise on the drawings, dowel bars shall be positioned at mid depth of the slab within a tolerance of ± 20 mm, and centered equally about intended lines of the joint within a tolerance of ± 25 mm. They shall be aligned parallel to the finished surface of the slab and to the centre line of the carriageway and to each other within tolerances given hereunder, the compliance of which shall be checked as per Clause 602.11.7.

i) For bars supported on cradles prior to the laying of the slab:

a) All bars in a joint shall be within ± 3 mm per 300 mm length of bar

b) 2/3rd of the bars shall be within ± 2 mm per 300 mm length of bar

c) No bar shall differ in alignment from an adjoining bar by more than 3 mm per 300 mm length of bar in either the horizontal or vertical plane

d) Cradles supporting dowel bar shall not extend across the line of joint i.e. no steel bar of the cradle assembly shall be continuous across the joint

ii) For all bars inserted after laying of the slab the tolerance for alignment may be twice as indicated in (i) above.

602.6.5.2 Dowel bars, supported on cradles in assemblies, when subject to a load of 110 N applied at either end and in either the vertical or horizontal direction (upwards and downwards and both directions horizontally) shall conform to be within the limits given in Clause 602.6.5.2.

602.6.5.3 The assembly of dowel bars and supporting cradles, including the joint filler board in the case of expansion joints, shall have the following degree of rigidity when fixed in position:-

For expansion joints, the deflection of the top edge of the filler board shall be not greater than 13 mm, when a load of 1.3 kN is applied perpendicular to the vertical face of the joint filler board and distributed over a length of 600 mm by means of a bar or timber packing, at mid depth and midway between individual fixings, or 300 mm from either end of any length of filler board, if a continuous fixing is used. The residual deflection after removal of the load shall be not more than 3 mm. The joint

assembly fixings to sub-base shall not fail under the 1.3kN load applied for testing the rigidity of the assembly but shall fail before the load reaches 2.6 kN.

The fixings for contraction joint shall not fail under 1.3 kN load and shall fail before the load reaches 2.6 kN when applied over a length of 600 mm by means of a bar or timber packing placed as near to the level of the line of fixings as practicable.

Fixings shall be deemed to fail when there is displacement of the assemblies by more than 3 mm with any form of fixing, under the test load. The displacement shall be measured at the nearest part of the assembly to the centre of the bar or timber packing.

602.6.5.4 Dowel bars in the contraction joints, construction joints and expansion joints shall be covered by a thin plastic sheath. The sheath shall be not more than 0.5 mm thick and shall be tightly fitted on the bar for at least two-thirds of the length from one end for dowel bars in contraction joints or half the length plus 50 mm for expansion joints. The sheathed bar shall comply with the following pull-out tests:

Four bars shall be taken at random from stock and without any special preparation shall be covered by sheaths as required in this Clause. The ends of the dowel bars which have been sheathed shall be cast centrally into concrete specimens 150 x 150 x 600 mm, made of the same mix proportions to be used in the pavement, but with a maximum nominal aggregate size of 20 mm and cured in accordance with IS: 516. At 7 days a tensile load shall be applied to achieve a movement of the bar of at least 0.25 mm. The average bond stress to achieve this movement shall not be greater than 0.14 MPa.

602.6.5.5 For expansion joints, a closely fitting cap 100 mm long consisting of waterproofed cardboard or an approved synthetic material like PVC or GI pipe shall be placed over the sheathed end of each dowel bar. An expansion space at least equal in length to the thickness of the joint filler board shall be formed between the end of the cap and the end of the dowel bar by using compressible sponge. To block the entry of cement slurry between dowel and cap it may be taped.

602.6.9 Tie bars

602.6.10 Tie bars in longitudinal joints shall be deformed steel bars of strength 415 MPa complying with IS: 1786 and in accordance with the requirements given below. The bars shall be free from oil, dirt, loose rust and scale.

602.6.11 Tie bars projecting across the longitudinal joint shall be protected from corrosion for 75mm on each side of the joint by a protective coating of bituminous paint with the approval of the Engineer. The coating shall be dry when the tie bars are used. In the case of coastal region, tie bars shall be epoxy coated as per IS:13620.

602.6.12 Tie bars in longitudinal joints shall be made up into rigid assemblies with adequate supports and fixings to remain firmly in position during the construction of the slab. Alternatively, tie bars at longitudinal joints may be mechanically or manually inserted into the plastic concrete from above by vibration using a method, which ensures correct placement of the bars and recompaction of the concrete around the tie bars.

602.6.13 Tie bars shall be positioned to remain within the middle third of the slab depth as indicated in the drawings and approximately parallel to the surface and approximately perpendicular to the line of the joint, with the centre of each bar on the intended line of the joints within a tolerance of ± 50 mm, and, with a minimum

cover of 30 mm below the joint groove. Spacing of tie bars on curves of radius less than 360 m shall not be less than 350 mm.

602.6.14 To check the position of the tie bars, one metre length, 0.5 m on either side of the longitudinal joint shall be opened when the concrete is green (within 20 to 30 minutes). The pit shall be refilled with the fresh concrete of same mix after checking.

602.7 Weather and Seasonal Limitations

602.7.1 Concreting during monsoon months

When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulin or other water proof cloth shall be provided along the line of the work. Any time when it rains, all freshly laid concrete which had not been covered for curing purposes shall be adequately protected. Any concrete damaged by rain shall be removed and replaced. If the damage is limited to texture, it shall be retextured in accordance with the directives of the Engineer.

602.7.2 Temperature limitation

No concreting shall be done when the concrete temperature is above 30 degree Centigrade. Besides, in adverse conditions like high temperature, low relative humidity, excessive wind velocity, imminence of rains etc., if so desired by the Engineer, tents on mobile trusses may be provided over the freshly laid concrete for a minimum period of 3 hours as directed by the Engineer. The temperature of the concrete mix on reaching the paving site shall not be more than 30° C. To bring down the temperature, if necessary, chilled water or ice flakes should be made use of. No concreting shall be done when the concrete temperature is below 5 degree Centigrade and the temperature is descending.

602.8 Fixed Form Paving

602.8.1 Side Forms, Rails and Guidewires

Side forms and rails: All side forms shall be of mild steel of depth equal to the thickness of pavement or slightly less to accommodate the surface regularity of the sub-base. The forms can be placed on series of steel packing plates or shims to take care of irregularity of sub-base. They shall be sufficiently robust and rigid to support the weight and pressure caused by paving equipment. Sideforms for use with wheeled paving machines shall incorporate metal rails firmly fixed at a constant height below the top of the forms. The forms and rails shall be firmly secured in position by not less than 3 stakes/pins per each 3 m length so as to prevent movement in any direction. Forms and rails shall be straight within a tolerance of 3 mm in 3 m and when in place shall not settle in excess of 1.5 mm in 3 m while paving is being done. Forms shall be cleaned and oiled immediately before each use. The forms shall be bedded on a continuous bed of low moisture content lean cement mortar or concrete and set to the line and levels shown on the drawings within tolerances ± 10 mm and ± 3 mm respectively. The bedding shall not extend under the slab and there shall be no vertical step between adjacent forms of more than 3 mm. The forms shall be got inspected from the Engineer for his approval before 12 hours on the day before the construction of the slab and shall not be removed until at least 12 hours afterwards.

602.8.2 At all times sufficient forms shall be used and set to the required alignment for at least 200 m length of pavement immediately in advance of the paving operations, or the anticipated length of pavement to be laid within the next 24 hrs whichever is more.

602.8.3 Slip Form Paving

602.8.3.1 Use of guidewires

Where slip form paving is proposed, a guidewire shall be provided along both sides of the slab. Each guidewire shall be at a constant height above and parallel to the required edges of the slab as described in the contract/drawing within a vertical tolerance of ± 3 mm. Additionally, one of the wires shall be kept at a constant horizontal distance from the required edge of the pavement as indicated in the contract/drawing within a lateral tolerance of ± 10 mm.

602.8.3.2 The guidewires shall be supported on stakes not more than 8 m apart by connectors capable of fine horizontal and vertical adjustment. The guidewire shall be tensioned on the stakes so that a 500-gram weight shall produce a deflection of not more than 20 mm when suspended at the mid point between any pair of stakes. The ends of the guidewires shall be anchored to fixing point or winch and not on the stakes.

602.8.3.3 The stakes shall be positioned and the connectors maintained at their correct height and alignment from 12 hours on the day before concreting takes place until 12 hours after finishing of the concrete. The guidewire shall be erected and tensioned on the connectors at any section for at least 2 hours before concreting that section.

602.8.3.4 The Contractor shall submit to the Engineer for his approval of line and level, the stakes and connectors, which are ready for use in the length of road to be constructed by 12 hours on the working day before the day of construction of slab. Any deficiencies noted by the Engineer shall be rectified by the Contractor who shall then re-apply for approval of the affected stakes. Work shall not proceed until the Engineer has given his approval. It shall be ensured that the stakes and guidewires are not affected by the construction equipment when concreting is in progress.

602.9 Construction

602.9.1 General

A systems approach may be adopted for construction of the pavement, and the Method Statement for carrying out the work, detailing all the activities, indication of time-cycle, equipment, personnel etc., shall be got approved from the Engineer before the commencement of the work. This shall include the type, capacity and make of the batching and mixing plant besides the hauling arrangement and paving equipment. The capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of atleast 500 m in one day. The desirable paving speed of slip form pavers is 1.0 m per minute, but it shall not be less than 0.6 m per minute average. The concreting should proceed continuously without stop & start.

602.9.2 Batching and mixing

Batching and mixing of the concrete shall be done at a central batching and mixing plant with automatic controls, located at a suitable place which takes into account sufficient space for stockpiling of cement, aggregates and stationary water tanks. This shall be, however, situated at an approved distance, duly considering the properties of the mix and the transporting arrangements available with the Contractor.

602.9.3 Equipment for Proportioning of Materials and Paving

602.9.4 Proportioning of materials shall be done in the batching plant by each type of material being weighed separately. The cement from the bulk stock may be weighed separately from the aggregates. Water shall be measured by volume. Specified percentage of plasticizer in volume will be added by weight of cement. Wherever p graded aggregate of uniform quality cannot be maintained as envisaged in the mix design, grading of aggregates shall be controlled by appropriate blending techniques. The capacity of batching and mixing plant shall be at least 25 percent higher than the proposed capacity of the laying/paving equipment.

602.9.3.1 Batching Plant and Equipment

- 1) General: The batching plant shall include minimum four bins, weighing hoppers, and scales for the fine aggregates and for each size of coarse aggregate. If cement is used in bulk, a separate scale for cement shall be included. There shall be a separate bin for flyash, if this additive is specified. The weighing hoppers shall be properly sealed and vented to preclude dust during operation. Approved safety devices shall be provided and maintained for the protection of all personnel engaged in plant operation, inspection and testing. The batch plant shall be equipped with a suitable non-resettable batch counter which will correctly indicate the number of batches proportioned. A continuous type of mixing plant can also be used provided the ingredients are weighed through electronic sensors before feeding.

- 2) Automatic weighing devices: Batching plant shall be equipped to proportion aggregates and bulk cement by means of automatic weighing devices using load cells. The weighing devices shall have an accuracy within $\pm 1\%$ in respect of quantity of cement, admixtures and water and $\pm 2\%$ in respect of aggregates and the accuracy shall be checked at least once a month.

- 3) Mixer: Mixers shall be pan type, reversible type or any other mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging the mix, without segregation. Each stationary mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, provided that each batch is mixed in 90 seconds or as per the manufacturer's recommendation. The mixer shall be equipped with a suitable non-resettable batch counter which shall correctly indicate the number of batches mixed.

The mixers shall be cleaned at suitable intervals. The pic-kup and throw-over blades in the drum or drums shall be repaired or replaced when they are worn down 20 mm or more. The Contractor shall (1) have available at the job site a copy of the manufacturer's design,

showing dimensions and arrangements of blades in reference to original height and depth, or (2) provide permanent marks on blade to show points of 20 mm wear from new conditions. Drilled holes of 5 mm diameter near each end and at midpoint of each blade are recommended. Batching Plant shall be calibrated in the beginning and thereafter at suitable interval not exceeding 1 month.

- 4) Control cabin: An air-conditioned centralized computer control cabin shall be provided for automatic operation of the equipment.
- 5) The design features of the batching plant should be such that it can be shifted quickly.

602.9.3.2 Paving equipment

The concrete shall be placed with an approved fixed form or slip form paver with independent units designed to (i) spread, (ii) consolidate, screed and flat-finish, (iii) texture and cure the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary and so as to provide a dense and homogeneous pavement in conformity with the plans and Specifications. The paver shall be equipped with electronic sensor controls to control the line and grade from either or both sides of the machine.

Vibrators shall operate at a frequency of 8000-10000 impulses per minute under load at a maximum spacing of 600 mm. The variable vibration setting shall be provided in the machine.

602.9.3.3 Concrete saw

The Contractor shall provide adequate number of concrete saws with sufficient number of diamond-edge saw blades. The saw machine shall be either electric or petrol/diesel driven type. A water tank with flexible hoses and pump shall be made available in this activity on priority basis. The Contractor shall have at least one standby saw in good working condition. The concreting work shall not commence if the saws are not in working condition.

602.9.5 Hauling and placing of concrete

602.9.4.1 Freshly mixed concrete from the central batching and mixing plant shall be transported to the paver site by means of tipping trucks of sufficient capacity and approved design in sufficient numbers to ensure a constant supply of concrete. Covers shall be used for protection of concrete against the weather. While loading the concrete trucks shall be moved back and forth under the discharge chute to prevent segregation. The tipping trucks shall be capable of maintaining the mixed concrete in a homogeneous state and discharging the same without segregation and loss of cement slurry. The feeding to the paver is to be regulated in such a way that the paving is done in an uninterrupted manner with a uniform speed throughout the day's work.

602.9.4.2 Placing of concrete

The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C and 30°C. Tipping trucks delivering concrete shall normally not run

on plastic sheathing nor shall they run on completed slabs until after 28 days of placing the concrete.

The placing of concrete in front of the PQC paver should preferably be from the side placer to avoid damage to DLC by concrete tipping trucks. In case of unavoidable situation, truck supplying PQC concrete to the paver may be allowed to ply on the DLC with the approval of the Engineer. The paver shall be capable of paving the carriageway as shown in the drawings, in a single pass and lift. Equipments or accessory to support the edges of concrete by means of steel plates shall be maintained in position by screwed jacks.

- 602.9.4.3 Where fixed form pavers are to be used, forms shall be fixed in advance as per Clause 602.8. Before any paving is done, the site shall be shown to the Engineer, in order to verify the arrangement for paving besides placing of dowels, tie-bars etc., as per the relevant Clauses of these Specifications. The mixing and placing of concrete shall progress only at such a rate as to permit proper finishing, protecting and curing of the concrete in the pavement.
- 602.9.4.4 In areas inaccessible to paving equipment, the pavement shall BE constructed using side forms, as per Clause 602.9.7.
- 602.9.4.5 In all cases, the temperature of the concrete shall be measured at the point of discharge from the delivery vehicle.
- 602.9.4.6 The addition of water to the surface of the concrete to facilitate the finishing operations will not be permitted except with the approval of the Engineer when it shall be applied as a mist by means of approved equipment.
- 602.9.4.7 If considered necessary by the Engineer, the paving machines shall be provided with approved covers to protect the surface of the slab under construction from direct sunlight and rain or hot wind.
- 602.9.4.8 While the concrete is still plastic, its surface shall be textured by brush or tines as per the instructions of the Engineer in compliance with Clause 602.9.8. The surface and edges of the slab shall be cured by the application of a sprayed liquid curing membrane in compliance with Clause 602.9.9. After the surface texturing, but before the curing compound is applied, the concrete slab shall be marked with the chainage at every 100 m interval by embossing.
- 602.9.4.9 As soon as the side forms are removed, edges of the slabs shall be corrected wherever irregularities have occurred by using fine concrete composed of one part of cement to 3 parts of aggregate [1:1:2, cement : sand : coarse agg (10 mm down)] and fine aggregates under the supervision of the Engineer.
- 602.9.4.10 If the requirement of Clause 902.4. for surface regularity fails to be achieved on two consecutive working days, then normal working shall cease until the cause of the excessive irregularity has been identified and remedied.

602.9.6 Construction by slip form paver

- 602.9.5.1 The slip form paving train shall consist of power machine which spreads, compacts and finishes the concrete in a continuous operation. The slip form paving machine shall compact the concrete by internal vibration and shape it between the side forms with either a conforming plate or by vibrating and oscillating finishing beams. The concrete shall be deposited without segregation in front of slip form paver across the whole width and to a height which at all times is in excess of the required surcharge. The deposited concrete shall be struck off to the necessary

average and differential surcharge by means of the strike off plate or a screw auger device extending across the whole width of the slab. The equipment for striking-off the concrete shall be capable of being rapidly adjusted for changes of the average and differential surcharge necessitated by change in slab thickness or crossfall.

- 602.9.5.2 The level of the conforming plate and finishing beams shall be controlled automatically from the guide wires installed as per Clause 602.8 by sensors attached at the four corners of the slip form paving machine. The alignment of the paver shall be controlled automatically from the guide wire by at least one set of sensors attached to the paver. The alignment and level of ancillary machines for finishing, texturing and curing of the concrete shall be automatically controlled relative to the guide wire or to the surface and edge of the slab.
- 602.9.5.3 Slip-form paving machines shall have vibrators of variable output, with a maximum energy output of not less than 2.5 KW per metre width of slab per 300 mm depth of slab for a laying speed upto 1.5 m per minute. The machines shall be of sufficient mass to provide adequate reaction during spreading and paving operations on the traction units to maintain forward movements during the placing of concrete in all situations.
- 602.9.5.4 If the edges of the slip formed slab slump to the extent that the surface of the top edge of the slab does not comply with the requirements of Clause 902.3, the work shall be stopped until such time as the Contractor can demonstrate his ability to slip the edges to the required levels. The deficient edge shall be temporarily supported by a side form and the thickness deficiency shall be made good by adding fresh concrete to the newly formed edge and compacting.
- 602.9.5.5 Slip-form pavers with adequate width to pave the entire carriageway width in one go shall be employed unless specified in the Contract. In situations where full width paving is not possible, paving in part widths may be permitted by the Engineer. Paving in part will be avoided, except in unavoidable circumstances. In case of part width paving, care shall be taken to ensure that while laying the next lane, bond between the remaining half length of tie bar or subsequently inserted tie bars and the newly laid concrete is adequately developed. Care shall be taken to avoid damage to the previous lane.
- 602.9.5.6 In case paving in separate lanes is allowed, work on the adjacent lane shall be permitted when the previously paved lane is cured for at least 14 days and is in a position to bear the weight of paving machine. When the wheels or crawler tracks are to ply on the already paved surface, necessary precautions shall be taken by placing protective pads of rubber or similar material so that texture is not damaged. The wheel or track shall be reasonably away from the edge to avoid damage to the previously laid slab.
- 602.9.5.7 Tube Floating

Upon the instructions of the Engineer, Contractor shall scrape the concrete surface when in plastic state with a 3 m long tube float fixed with a long and stable handle before texturing. Tube float shall be of an alloy steel tube of 50 to 60 mm diameter with a long and stable handle. The length of tube float shall preferably be longer than half the length of slab i.e., half the distance between two transverse contraction joints. This operation shall be done to improve surface irregularity caused due to varied causes like frequent stoppages of work, surface deformation due to plastic flow etc. The tube float shall be placed at the centre of the slab parallel to longitudinal joint and pulled slowly and uniformly towards the edges. After

the use of float tube, it shall be frequently cleaned before further use. The slurry removed shall be discarded. This activity shall be advanced laterally by providing an overlap of half the length of tube float. The removal of the cement slurry from the surface shall be sufficient enough such that the texture is formed on a firm surface and is more durable. This operation, however, shall be carried out after removing bleeding water.

602.9.7 Construction by Fixed Form Paver

602.9.6.1 The fixed form paving train shall consist of separate powered machines which spread, compact and finish the concrete in a continuous operation.

602.9.6.2 The concrete shall be discharged without segregation into a hopper spreader which is equipped with means for controlling its rate of deposition on to the sub-base. The spreader shall be operated to strike off concrete upto a level requiring a small amount of cutting down by the distributor of the spreader. The distributor of spreader shall strike off the concrete to the surcharge adequate to ensure that the vibratory compactor thoroughly compacts the layer. If necessary, poker vibrators shall be used adjacent to the side forms and edges of the previously constructed slab. The vibratory compactor shall be set to strike off the surface slightly high so that it is cut down to the required level by the oscillating beam. The machine shall be capable of being rapidly adjusted for changes in average and differential surcharge necessitated by changes in slab thickness or crossfall. The final finisher shall be able to finish the surface to the required level and smoothness as specified, care being taken to avoid bringing up of excessive mortar to the surface by over working.

602.9.8 Semi-Mechanised and Labour-Oriented Construction Technique

Areas in which hand-guided methods of construction become indispensable shall be got approved by the Engineer in writing in advance. Such work may be permitted only in restricted areas in small lengths. Work shall be carried out by skilled personnel as per methods approved by the Engineer. The acceptance criteria regarding level, thickness, surface regularity, texture, finish, strength, of concrete and all other quality control measures shall be the same as in the case of machine laid work. Guidelines on the use of plants, equipment, tools, hauling of mix, compaction floating, straight edging, texturing, edging etc. shall be as per IRC:15.

602.9.9 Transition Slabs

At the interface of rigid and flexible pavement, at least 3 m long reinforced buried slab should be provided to give a long lasting joint at the interface. The details shall be as given in IRC:15.

602.9.10 Anchor Beam and Terminal Slab Beam Adjoining Bridge Structures

RCC anchor beams shall be provided in the terminal slab adjoining bridge structures as per drawings and IRC:15.

602.9.11 The Treatment of Concrete Pavement on Culverts

The concrete pavement shall be taken over the culverts. At both ends of the culvert slab, a contraction joint shall be provided in the concrete pavement. Nominal reinforcement of 10 mm dia bars at 150 mm spacing in both directions shall be provided at 50 mm below the top of the slab. The reinforcement shall be stopped 50 mm short of the contraction joint. Such reinforcement shall also be provided in the next slab panel on either side.

602.9.12 Surface Texture

602.9.11.1

Tining

After final floating and finishing of the slab and before application of the liquid curing membrane, the surface of concrete slabs shall be textured either in the transverse direction (i.e., at right angles to the longitudinal axis of the road) or in longitudinal direction (i.e., parallel to the centreline of the roadway). The texturing shall be done by tining the finished concrete surface by using rectangular steel tines. A beam or a bridge mounted with steel tines shall be equipped and operated with automatic sensing and control devices from main paver or auxiliary unit. The tining unit shall have facility for adjustment of the download pressure on the tines as necessary to produce the desired finish. The tining rakes shall be cleaned often to remove snots of slurry. The tines will be inspected daily and all the damaged and bent tines shall be replaced before commencing texturing. Tined grooves shall be 3 mm wide and 3 to 4 mm deep. Before commencing texturing, the bleeding water, if any, shall be removed and texturing shall be done on a firm surface.

- a) Transverse Tining: When the texturing is specified in transverse direction, a beam of at least 3 m length mounted with tines shall be moved in transverse direction to produce the texture. The grooves produced shall be at random spacing of grooves but uniform in width and depth. The spacing shall conform to a pattern shown below:

Random spacing in mm

10	14	16	11	10	13	15	16	11	10	21	13	10
----	----	----	----	----	----	----	----	----	----	----	----	----

The above pattern shall be repeated. Texturing shall be done at the right time such that the grooves after forming shall not close and they shall not get roughened. Swerving of groove patterns will not be permitted. The completed textured surface shall be uniform in appearance.

- b) Longitudinal tining: Longitudinal tining shall be done, if specified in the Contract. The texturing bridge shall be wide enough to cover the entire width of the carriageway but within 75 mm from the pavement edge. The centre to centre spacing between the tins shall be 18 to 21 mm. The width of tine texture shall be 3 mm and depth shall be 3 to 4 mm.

602.9.11.2 Brush Texturing

Alternatively on the instructions of the Engineer, the brushed texturing shall be applied. The brushed surface texture shall be applied evenly across the slab in one direction by the use of a wire brush not less than 450 mm wide but wider brushes normally of 3 m length are preferred. The brush shall be made of 32 gauge tape wires grouped together in tufts placed at 10 mm centres. The tufts shall contain an average of 14 wires and initially be 100 mm long. The brush shall have two rows of tufts. The rows shall be 20 mm apart and the tufts in one row shall be opposite the centre of the gap between tufts in the other row. The brush shall be replaced when the shortest tuft wears down to 90 mm long.

The texture depth shall be determined by the Sand Patch Test as described in the Clause 602.12. This test shall be performed at least once for each day's paving and wherever the Engineer considers it necessary at times after construction as under:

Five individual measurements of the texture depth shall be taken at least 2 m apart anywhere along a diagonal line across a lane width between points 50 m apart

along the pavement. No measurement shall be taken within 300 mm of the longitudinal edges of a concrete slab constructed in one pass.

Texture depths shall not be less than the minimum required when measurements are taken as given in Table 600-3 nor greater than a maximum average of 1.25 mm.

Table 600-5 Texture Depth

Time of Test		Number of Measurements	Required Texture Depth (mm)	
			Specified Value	Tolerance
1.	Between 24 hours and 7 days after the construction, of the slab or until the slab is first used by vehicles.	An average of 5 measurements	1.00	±0.25
2.	Not later than 6 weeks before the road is opened to traffic.	An average of 5 measurements	1.00	+0.25 -0.35

After the application of the brushed texture, the surface of the slab shall have a uniform appearance.

Where the texture depth requirements are found to be deficient, the Contractor shall make good the texture across the full lane width over length directed by the Engineer, by retexturing the hardened concrete surface in an approved manner.

602.9.13 Curing

602.9.12.1 Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin-based aluminized reflective curing compound which hardens into an impervious film or membrane with the help of mechanical sprayer.

602.9.12.2 The curing compound shall not react chemically with the concrete and the film or membrane shall not crack, peel or disintegrate within three weeks of application. Immediately prior to use, the curing compound shall be thoroughly agitated in its containers. The rate of spread shall be in accordance with the manufacturer's instructions checked during the construction of the trial length and subsequently whenever required by the Engineer. The mechanical sprayer shall incorporate an efficient mechanical device for continuous agitation and mixing of the compound during spraying. To give continuous covering, the curing compound may be sprayed in two layers.

Curing compounds shall contain sufficient flake aluminium in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shall become stable and impervious to evaporation of water from the surface of the concrete within 60 minutes of application and shall be of approved type. The curing compounds shall have a water retention efficiency index of 90 percent in accordance with BS Specification No. 7542 or ASTM-C-309-81, type-2.

602.9.12.3 In addition to spraying of curing compound, the fresh concrete surface shall be protected for at least 3 hours by covering the finished concrete pavement with

tents as described in Clause 602.7.2, during adverse weather conditions as directed by the Engineer. After three hours, the pavement shall be covered by moist hessian laid in two layers and the same shall then be kept damp for a minimum period of 14 days after which time the hessian may be removed. The hessian shall be kept continuously moist. All damaged/torn hessian shall be removed and replaced by new hessian on a regular basis.

602.9.12.4 The Contractor shall be liable at his cost to replace any concrete damaged as a result of incomplete curing or cracked on a line other than that of a joint as per procedure in IRC:SP:83.

602.10 Preparation of joint grooves for sealing

602.10.1 General

All transverse joints in surface slabs shall be sealed using sealants described in Clause 602.2.10

602.10.2 Preparation of Joint Grooves for Sealing

602.10.2.1 Grooves are saw cut in the first instance just to provide minimum width (3-5 mm) to facilitate development of crack at joint locations, as shown in the drawing.

Subsequently before sealing, grooves are widened by sawing as per the dimension in the drawing. Dimension of the grooves shall be controlled by depth/width gauge

602.10.2.2 If rough arrises develop when grooves are made, they shall be ground to provide a chamfer approximately 5 mm wide. If the groove is at an angle upto 10 degree from the perpendicular to the surface, the overhanging edge of the sealing groove shall be sawn or ground perpendicular. If spalling occurs or the angle of the former is greater than 10 degrees, the joint sealing groove shall be sawn wider and perpendicular to the surface to encompass the defects upto a maximum width, including any chamfer, of 35 mm for transverse joints and 20 mm for longitudinal joints. If the spalling cannot be so eliminated then the arises shall be repaired by an approved thin bonded arises repair using cementitious materials.

602.10.2.3 All grooves shall be cleaned of any dirt or loose material by air blasting with filtered, oil-free compressed air. If need arises the Engineer may instruct cleaning by pressurised water jets. Depending upon the requirement of the sealant manufacturer, the sides of the grooves may have to be sand blasted to increase the bondage between sealant and concrete.

602.10.2.4 The groove shall be cleaned and dried at the time of priming and sealing.

602.10.2.5 Before sealing the temporary seal provided for blocking the ingress of dirt, soil etc., shall be removed. A highly compressible heat resistant paper-backed debonding strip as per drawing shall be inserted in the groove to serve the purpose of breaking the bond between sealant and the bottom of the groove and to plug the joint groove so that the sealant may not leak through the cracks. The width of debonding strip shall be more than the joint groove width so that it is held tightly in the groove. In the case of longitudinal joints, heat resistant tapes may be inserted to block the leakage through bottom of the joint where hot poured sealant is used. When cold poured sealant is used a debonding tape of 1.0-2.0 mm thickness and 6 to 8 mm width shall be inserted to plug the groove so that the sealant does not enter in the initially cut groove.

602.10.3 Sealing with sealants

602.10.3.1 When sealants are applied, an appropriate primer shall also be used if recommended by the manufacturer and it shall be applied in accordance with their recommendation. The sealant shall be applied within the minimum and maximum drying times of the primer recommended by the manufacturer. Priming and sealing with applied sealants shall not be carried out when the naturally occurring temperature in the joint groove to be sealed is below 7° C.

602.10.3.2 If hot applied sealant is used it shall be heated and applied from a thermostatically controlled, indirectly heated preferably with oil jacketed melter and pourer having recirculating pump and extruder. For large road projects, sealant shall be applied with extruder having flexible hose and nozzle. The sealant shall not be heated to a temperature higher than the safe heating temperature and not for a period longer than the safe heating period, as specified by the manufacturer. The dispenser shall be cleaned out at the end of each day in accordance with the manufacturer's recommendations and reheated material shall not be used.

602.10.3.3 Cold applied sealants with chemical formulation like polysulphide may be used. These shall be mixed and applied within the time limit specified by the manufacturer. If primers are recommended they shall be applied neatly with an appropriate brush. The Movement Accommodation Factor (MAF) shall be more than 25 per cent.

602.10.3.4 The sealants applied at contraction phase of the slabs would result in bulging of the sealant over and above the slab. Therefore, the Contractor in consultation with the Engineer shall establish the right temperature and time for applying the sealant. Thermometer shall be hung on a pole in the site for facilitating control during the sealing operation.

602.10.3.5 Sealant shall be applied, slightly to a lower level than the slab with a tolerance of 3 ± 1 mm.

602.10.3.6 During sealing operation, it shall be seen that no air bubbles are introduced in the sealant either by vapours or by the sealing process. The sealant after Pouring, shall be allowed to cure for 7 days or for a period as per instructions of manufacturers

602.11 Trial length

602.11.1 The trial shall be constructed at least one month in advance of the proposed start of concrete paving work. At least one month prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a detailed method statement giving description of the proposed materials, plant, equipment and construction methods. All the major equipments like paving train, batching plant, tipping trucks etc., proposed in the construction are to be approved by the Engineer before their procurement. No trials of new materials, plant, equipment or construction methods, nor any development of them shall be permitted either during the construction of trial length or in any subsequent paving work, unless they form part of further trials. The trial lengths shall be constructed away from the carriageway.

602.11.2 The Contractor shall demonstrate the materials, plant, equipment and methods of construction that are proposed for concrete paving, by first constructing a trial length of slab, at least 100 m but not more than 300 m long for mechanised construction and at least 50 m long for hand guided methods. If

the first trial is unsatisfactory, the Contractor shall have to demonstrate his capability to satisfactorily construct the pavement in subsequent trials.

602.11.3 The trial length shall be constructed in two parts over a period comprising at least part of two separate working days, with a minimum of 50 m constructed each day for mechanised construction and a minimum of 25 m on each day for hand guided construction. The trial length shall be constructed at a paving rate (speed, around 1 m/hr similar) to that which is proposed for the main work.

602.11.4 Transverse joints and longitudinal joints of each type that are proposed for dowel-jointed unreinforced concrete slabs in the main work shall be constructed and assessed in the trial length.

602.11.5 The trial length shall comply with the Specifications in all respects, with the following additions and exceptions:

602.11.5.1 Surface levels and regularity

a) In checking for compliance with Clause 902.3 the levels shall be taken at intervals at the locations specified in this Clause along any line or lines parallel to the longitudinal centre line of the trial length.

b) The maximum number of permitted irregularities of pavement surface shall comply with the requirements of Clause 902.4. Shorter trial lengths shall be assessed pro-rata based on values for a 300 m length.

602.11.5.2 Joints

a) Alignment of dowel bars shall be inspected in any two consecutive transverse joints. If the position or alignment of the dowel bars at one of these joints does not comply with requirement, if that joint remains the only one that does not comply after the next 3 consecutive joints of the same type have been inspected, then the method of placing dowels shall be deemed to be satisfactory. In order to check sufficient joints for dowel bar alignment without extending the trial length unduly, the Contractor may, by agreement with the Engineer, construct joints at shorter intervals than the normal spacing required in the Contract.

b) If there are deficiencies in the first expansion joint that is constructed as a trial, the next expansion joint shall be a trial joint. Should this also be deficient, further trial expansion joints shall be made as part of the trial length which shall not form part of the permanent works, unless agreed by the Engineer.

602.11.5.3 Density

In-situ density in trial length shall be assessed as described in Clause 903.5.2.2 from at least 3 cores drilled from each part of the trial length when the concrete is not less than 7 days old. Should any of the cores show honey-combing in the concrete, the trial length shall be rejected and the construction in the main carriageway shall not be permitted until further trials have shown that modification has been made which would result in adequate compaction.

602.11.5.4 Strength

Minimum of thirty (30) beams for flexural strength and thirty (30) cubes for compressive strength shall be prepared from the concrete delivered in front of the paving plant. Each pair of beams and cubes shall be from the same location/batch

but different sets of beams and cubes shall be from different locations/batches. Compressive and flexural strength shall be tested after 28 days water curing in the laboratory.

At the age of 28 days, thirty (30) cores with diameter 150 mm shall be cut from the pavement slab when the thickness of PQC is more than 300 mm. In case the PQC thickness is less than 300 mm, the dia of core shall be 100 mm. The cores shall be suitably cut at both ends to provide a specimen of plain surface on both ends. The dia to height ratio of core shall be 1 to 2. (for cylindrical specimen of PQC of dia 150 mm, the variation in dia shall be + 0.5 mm, a tolerance on height shall be + 1 mm for a specimen of cylindrical height 300 mm or more). The test shall be conducted as per IS:516.

Concrete in the member represented by a core test shall be considered acceptable, if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength (characteristic strength) of the grade of the concrete specified for the corresponding age (28 days) and no individual core has a strength less than 75 percent.

602.11.6 Approval and acceptance

602.11.6.1 Approval of the materials, plant, equipment and construction methods shall be given when the trial length complies with the Specifications. The Contractor shall not proceed with normal working until the trial length has been approved. If the Engineer does not notify the Contractor of any deficiencies in any trial length within 10 days after the completion of that trial length, the Contractor may assume that the trial length, and the materials, plant, equipment and construction methods adopted are acceptable after accepting the 28 days strength test cubes and cores extracted from trial length.

602.11.6.2 When approval has been given, the materials, plant, equipment and construction methods shall not thereafter be changed, except for normal adjustments and maintenance of plant, without the approval of the Engineer. Any changes in materials, plant, equipment, and construction methods shall entitle the Engineer to require the Contractor to lay a further trial length as described in this Clause to demonstrate that the changes will not adversely affect the permanent works.

602.11.6.3 Trial lengths which do not comply with the Specifications, with the exception of areas which are deficient only in surface texture and which can be remedied in accordance with Clause 602.9.11.6 shall be removed immediately upon notification of deficiencies by the Engineer and the Contractor shall construct a further trial length.

602.11.7 Inspection of dowel bars

602.11.7.1 Compliance with Clause 602.6.5. for the position and alignment of dowel bars at construction and expansion joints shall be checked by measurements relative to the side forms or guide wires.

602.11.7.2 When the slab has been constructed, the position and alignment of dowel bars and any filler board shall be measured after carefully exposing them in the plastic concrete across the whole width of the slab. When the joint is an expansion

joint, the top of the filler board shall be exposed sufficiently in the plastic concrete to permit measurement of any lateral or vertical displacement of the board. During the course of normal working, these measurements shall be carried out in the pavement section at the end of day's work by extending slab length by 2 m. After sawing the transverse joint groove, the extended 2 m slab shall be removed carefully soon after concrete has set to expose dowels over half the length. These dowels can be tested for tolerances.

602.11.7.3 If the position and alignment of the bars in a single joint in the slab is unsatisfactory then the next two joints shall be inspected. If only one joint of the three is defective, the rate of checking shall be increased to one joint per day until the Engineer is satisfied that compliance is being achieved. In the event of non-compliance in two or more successive joints, the Contractor shall revert to the construction of fresh trial lengths and make any necessary alteration to concrete mix, paving plant or methods until the dowel bar position and alignment are satisfactory.

602.11.7.4 After the dowel bars have been examined, the remainder of the concrete shall be removed over a width of 500 mm on each side of the line of the joint and reinstated to the satisfaction of the Engineer. The dowels shall be inserted on both sides of the 1 m wide slab by drilling holes and grouting with epoxy mortar. Plastic sheath as per Clause 602.6.5.5 shall be provided on dowels on one of the joints. The joint groove shall be widened and sealed as per Clause 602.11.

602.11.8 Inspection of Tie Bars

To check the position of the tie bars, one metre length 0.5 m on either side of the longitudinal joint shall be opened when the concrete is green (within 20 to 30 minutes of its laying). The pit shall be refilled with the fresh concrete of same mix after checking.

602.12 Measurement of Texture Depth – Sand Patch Method

602.12.1 The following apparatus shall be used:

- i) A cylindrical container of 25 ml internal capacity;
- ii) A flat wooden disc 64 mm diameter with a hard rubber disc, 1.5 mm thick, next to one face, the reverse face being provided with a handle;
- iii) Dry natural sand with a rounded particle shape passing a 300 micron IS sieve and retained on a 150 micron IS sieve.

602.12.2 Method

The surface to be measured shall be dried, any extraneous mortar and loose material removed and the surface swept clean using a wire brush both at right angles and parallel to the carriageway. The cylindrical container shall be filled with the sand, tapping the base 3 times on the surface to ensure compaction, and striking off the sand level with the top of the cylinder. The sand shall be poured into a heap on the surface to be treated. The sand shall be spread over the surface, working the disc with its face kept flat in a circular motion so that the sand is spread into a circular patch with the surface depressions filled with sand to the level of peaks.

602.12.3 The diameter of the patch shall be measured to the nearest 5 mm. The texture depth of concrete surface shall be calculated from $31000/(D \times D)$ mm where D is the diameter of the patch in mm.

602.12.4 Measurement of Texture Depth – Tining.

602.12.4.1 The following apparatus shall be used :

i) Tire Tread Depth Gauge

A stainless steel tire tread depth gauge with graduations with least count of 1.0 mm. The gauge end may be modified to measure depth of tine texture.

ii) A stainless steel calipper to measure spacing of tines. If necessary the calipper may be modified to measure the spacing and width of tine texture. The gauge shall be used after making necessary calibration.

iii) Wire brush

iv) Coborundum stone

v) Steel straight edge to remove snots etc. sticking to be surface. The straight edge may be of 6 x 25 x 300 mm size.

602.12.4.2 Test Section

A unit of testing shall be 75 m per lane. If the length of construction is less than 75m it shall be taken as one unit.

602.12.4.3 Test Procedure

In each 75 m section, along the diagonal line, 10 points shall be selected for making checks of depth, width and spacing of tine grooves. The surface where tests are to be conducted shall be cleared carefully with a wire brush or a steel straight edge or using a corborundum to remove any upward projection of concrete. When the base plate of the gauge is in contact with the concrete surface, the gauge shall be pressed to the bottom of groove shall also be measured and recorded at this location. At the same location, the spacing of tines shall be measured to verify whether the pattern recommended in Clause 602.9.11.1 is complied or not.

The average of depth and width at 10 locations shall be calculated and recorded to the nearest 1mm. The spacing of spectrum measured at 10 locations shall be recorded separately.

602.12.4.4 The average depth shall be within 3 to 4 mm. When the depth is less than 2.5mm and in excess of 4.5 mm, the Contractor shall stop concreting till he corrects his tine brush or replaces it. The sensors associated with work shall be

again calibrated to achieve the required texture. The textured groove less than 2.5 mm shall be re-grooved using concrete saw at the cost of Contractor variation in texture width in the range of 3+1 mm and 3 - 0.5 mm will be acceptable. Variation of width in excess of this range, the contractor shall stop his work to correct his brush and technique. When the spacing of spectrum is not satisfactory, the contractor shall replace the entire brush.

602.13 Opening to Traffic

No vehicular traffic shall be allowed to ply on the finished surface of a concrete pavement within a period of 28 days of its construction and until the joints are permanently sealed. The road may be opened to regular traffic after completion of the curing period of 28 days and after sealing of joints is completed including the construction of shoulder, with the written permission of the Engineer.

602.14 Acceptance Criteria in Quality and Distress

i) Tolerances for Surface Regularity, Level, Thickness and Strength :

The tolerances for surface regularity, level, thickness and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

ii) Tolerances in Distress :

The acceptance criteria with regard to the types of distresses in rigid pavement shall be as per IRC:SP-83. "Guidelines for Maintenance, Repair and Rehabilitation of Cement Concrete Pavements". The cracks (of severity rating not more than 2) which may appear during construction or before completion of Defect Liability Period shall be acceptable with suggested treatments as given in IRC: SP-83 .

Cement Concrete Pavement slabs having cracks of severity rating more than 2 i.e. cracks of width more than 0.5 mm for single discrete cracks, multiple and transverse cracks and cracks of width more than 3 mm in case of longitudinal cracks and of depth more than half of the PQC slabs, shall be removed and replaced.

The payment for reinstatement of concrete road will be made on sq.mt. basis of the work carried out as per the design and direction of engineer –in-charge

1.4 Penalty for incomplete reinstatement work shall be recovered @ 1.5 times the actual expense incurred by Bhavnagar Municipal Corporation

ITEM No General

Re-instatement of Bituminous Roads including clearing and grubbing road, earth work of 0.6m thickness and erosion control work, providing, laying, spreading, compacting granular sub base of 0.15 m thickness and base coarse (Non Bituminous and Bituminous) of 0.25 m thickness, providing and applying DGBM of 0.06m thickness and Bituminous concrete of 0.05m thickness, applying primer coat and tack coat as per tender scope and directed by engineer in charge.

1.0 SCOPE

1.1 GENERAL

The scope includes the reinstatement of **Bituminous** road of design thickness crossing the sewerage pipelines.

1.2 REINSTATEMENT

1. The scope includes the reinstatement of asphalt road of design thickness crossing the sewerage pipelines.
2. After the work of laying and jointing of pipeline is completed, the earthwork, murrum surface and asphalt surface will be reconstructed by matching the existing level and line as per the designed thickness.
3. The scope includes, work of providing following layers of given thickness
 - a) **Earthwork for embankment including breaking clods, dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C. to required dry density including filling the depression which occur during the process using power roller 8T to 10T.(B) From Borrow area within 0.5KM. lead (more than 10 ton)**

Thickness = 0.6 m

Materials & Workmanship

1. The land width on which the earth work is to be done shall be cleared of all trees having a girth 30 cm. and less, loose stones; vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be the property of Government. Useful material shall be arranged in convenient stacks along the road boundary or as directed at places within 50 metres lead, and handed over to the department in convenient section. Unsuitable materials shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance; inconvenience or damage to the works property or people in the neighborhood. In all cases, the materials shall be disposed off in a neat manner.

2. After clearing; the site, the alignment of the road shall be properly set out true to line, curves, slopes, grades and sections as shown on the plan or directed

3. When an existing, embankment is to be widened, continuous, horizontal

benches, each at least 0.3 metre wide shall be cut into the existing slope for ensuring adequate bond with the fresh embankment materials to be added. The material obtained from the cutting of benches can be utilized in the widening of the embankment. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment. .

4. The soil to be used for embankment shall be free from trees stumps, roots, rubbish or any other objectionable materials. Only material considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from road-side borrow pits on either side with all lead and all lifts and within land width in the manner specified in Para 11 below. The road, if any required for the purpose of haulage of earth by men, animals or vehicles will be constructed. (If not existing) and maintained by the contractor at his own cost.

5. Department will extend all necessary co-operation in helping contractor to get borrow area from nearby Government of Panchayat land; if available. However, department is not responsible if not such area is made available to the contractor and in the case contractor will have to make his own arrangement to get borrow area for borrowing earth of the quantity even by making temporary arrangement with the private land owners.

6. The embankment shall be constructed in uniform layers not exceeding 250 mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment, unless otherwise directed by the Engineer-in charge.

All clods of hard lumps of earth shall be broken to have maximum size of 15 cm: when being placed in the embankment and a maximum of size 5 cm when being placed in the top 45 cm of the embankment, the work of next

layer shall be allowed only after the first layer below it has been thoroughly compacted.

7. Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface.

Where the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5 cm. so as to provide ample bond between the old and new material. However when the embankment is to be placed over an old concrete pavement and lies within 1 metre of new sub grade level, the pavement shall be broken up in pieces not to exceed 0.1 m and may be left under the new embankment. If the existing road surface is of granular or bituminous type and lies within 1 mt of the new sub grade level, the same shall be scarified to a depth of minimum 50 mm. so as to provide ample bond between the old and the new material.

8. To avoid interference with the construction of abutment, wing walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the bridge work. Unless directed otherwise, the filling ground culverts, bridge and other structures up to a distance of twice the height of the embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given by the Engineer-in-charge but in any case not until the concrete or masonry has been in position for 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item.

9. The embankment shall be finished in conformity with the alignment,

levels, and cross sections and dimension shown on the plans or as directed by Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer in-charge may direct. Finishing operations shall include the work of shaping and dressing the shoulders, road bed and the side slopes to conform the cross section.

10. The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic metres by average area method. The contractor shall sign day to day levelling work and also original cross sections, longitudinal section etc, in token of his acceptance.

The working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual work has started. The contractor or his authorised representative shall attend day to day levelling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement, the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint will be taken merely not signing of level book shall not be deemed as disagreement. The Executive Engineer shall also verify levelling work to the extent of 5°% before commencement of earth work and on finalization. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage etc to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be taken on compacted earth work. Deduction of 15% for shrinkage shall be made from gross measured quantity is measured before first monsoon and 10% if measured after one or more monsoon have been passed over the earth embankment. However the contractor shall have to bear loss of deformations etc. if any due to all settlements as well as other type of deformations etc. if any that might have taken place at the time of taking final measurement of item.

11. If usable approved material is available within the land width of road, the same shall be permitted for use in the road embankment subject to the following conditions:

(i) The borrow pits will be so excavated as to from a road side longitudinal

gutter to drain the water, interrupted by such gutter.

(ii) The width of the drain shall be restricted to 1.5 Mts. only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.

(iii) If there is top layer of black cotton or other objectionable soils; the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor choose to utilize this material.

(iv) The drain should be aligned along the boundary of the land width of the road. Not pit, other than this drain, shall be dug within 5 metres of toe to the final section of the road embankment.

(v) No borrow pits shall be allowed in the length in which earth obtained from cutting is specified to be used in embankment.

12. For spreading materials in layers and bringing the appropriate moisture

content, the embankment materials shall be spread uniformly over the entire width of the embankment in layers not exceeding 250mm in loose thickness. Successive layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down hereunder:

Moisture content of the materials shall be checked at the source of supply and if found less than the specified for compaction, the same, shall be made good either at the source or after spreading the soil in loose thickness for compaction. In the latter case, water shall be sprinkled directly from a hose line or from a truck mounted water tank; and flooding shall not be permitted under any circumstances. If the materials delivered to the road bed is too wet it shall be dried, by evaporation and exposure to the sun, till the moisture content is brought down to acceptable level for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required level by the above procedure, work of compaction shall be suspended:

Moisture content of each layer of soil shall be checked in accordance with IST 2720 (Part-11) and unless otherwise mentioned shall be so adjusted, making due allowance for evaporation losses, that at the time of the compaction it is in the range of 1 percent to 2 percent below the optimum moisture content determined in accordance with IS; (Part-VI1). Highly expansive clays shall however be compacted at 2 to 4 percent above the optimum moisture content.

After nodding the required amount of water, the soil shall be processed by means of horrows, rotary mixers or as otherwise approved until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have maximum size to 150mm when being placed in the lower layers of the embankment and a maximum size of 60mm when being placed in the top 0.5 metre portion of the embankment below the sub grade.

Hauling equipment shall be moved uniformly over entire surface of the previously constructed layer to minimize cutting of uneven compaction.

Where the embankment is to be constructed on low area ground that will not support the weight of truck of other hauling equipment, the lower part of the fill should be constructed by dumping successive loads in a uniformly distributed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers.

13. COMPACTION: Refer Clause 406.3.5 MORTH specifications

Only compacting equipment approved by the Engineer-incharge

After the mix has been laid to the required thickness, grade and crossfall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly overlapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop. In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled. Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected" at once as

specified and/or removed and made good. Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted. Rolling should not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or subgrade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and crossfall. In no case should the use of unmixed material be permitted to make up the depressions. Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (Part -8) After completion, the surface of any finished layer shall be wellclosed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and recomputed

b) Granular Sub-Base with Coarse Graded Material (Table:- 400- 2) (Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete for Grade - III Material.

Thickness = 0.15 m

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross -sections shown on the drawings or as directed by the Engineer.

MATERIALS

1. The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer. The material shall be free from organic or other deleterious constituents and conform to gradings given in (MORTH specifications) Table 400-1, and physical requirements given in 400-2. For further detailed specifications refer Clause 401.2 MORTH specifications.

Refer Table 400-1 & 400-2 in MORTH specifications.

CONSTRUCTION OPERATIONS

1. Preparation of subgrade : Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 (MORTH specifications) as applicable shall be prepared by removing all vegetation and other Sub-Bases, Bases (Nor-Bituminous) and Shoulders Section 400 extraneous matter, lightly sprinkled with water if necessary and rolled with two passes of 80 -100 kN smooth wheeled roller.
2. Spreading and compacting : Refer clause 401.3.2 MORTH specifications

Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902 (MORTH specifications). Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 (MORTH specifications).

Arrangements for Traffic

During the period of construction, arrangement of traffic shall be maintained in accordance with Clause 112 (MORTH specifications).

- c) Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers in subbase / base course on well prepared surface and compacting with vibratory roller to achieve the desired density as per MoRTH clause 406.**

Thickness = 0.25 m

Scope

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subgrade/sub -base/base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross - sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

Materials

1. Aggregates

i. Physical requirements: Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 per cent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400 -12 (refer MORTH specifications).

ii. Grading requirements: The aggregate shall conform to the grading given in Table 400-13 (Refer MORTH specifications).

Materials finer than 425 micron shall have Plasticity Index (PI) not exceeding 6. The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

Construction Operations

1. Preparation of base: Clause 404.3.1. (MORTH specifications) shall apply.

i. Provision of lateral confinement of aggregates: While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 404.3.3 (MORTH specifications).

2. Preparation of mix : Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pugmill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Refer points (i) to (vii) from MORTH specifications Clause 406.3.3.

Optimum moisture for mixing shall be determined in accordance with IS:2720 (Part -8) after replacing the aggregate fraction retained on_22A mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, dup allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

3. Spreading of mix : Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared subgrade/sub- base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted. The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade. The paver finisher shall be self-propelled, having the following features :

- a) Loading hoppers and suitable distribution mechanism
- b) The screed shall have lamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
- c) The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

Compaction:

Refer Clause 406.3.5 MORTH specifications.

Setting and drying:

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

Opening to Traffic

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course laid.

Surface Finish and Quality Control of Work

1. Surface evenness: The surface finish of construction shall conform to the requirements of Clause 902 (MORTH specifications),
2. Quality control: Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 (MORTH specifications).

Rectification of Surface Irregularity

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premised material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3 (MORTH specifications). The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines,

Arrangement for Traffic

During the period of construction, arrangement of traffic shall be done as per Clause 112 (MORTH specifications),

- d) **Providing and applying primer coat with cationic bitumen emulsion SS1 grade conforming to IS:8887 on prepared surface of wet mix macadam including clearing of Wet mix macadam surface with air compressor to remove all loose material other foreign material. The primer shall be sprayed uniformly at the rate of 0.70-1.0 kg/sqm. It shall be applied by a self-propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. No dilution or heating at site of RS1 bitumen emulsion shall be permitted.**

SCOPE

This work shall consist of the application of a single coat of low viscosity liquid bituminous material to a porous granular surface preparatory to the superimposition

of bituminous treatment or mix. The work shall be carried out on a previously prepared granular/stabilized surface to clause 501.8 MORTH specification.

MATERIALS : REFER CLAUSE 502.2 FROM MORTH SPECIFICATIONS

WEATHER AND SEASONAL LIMITATIONS

Bituminous primer shall not be applied to a wet surface (see 502.3 MORTH specifications) or during a dust storm or when the weather is foggy, rainy or windy or when the temperature in the shade is less than 10°C. Surfaces which are to receive emulsion primer should be damp, but no free or standing water shall be present.

CONSTRUCTION

1. Equipment: The primer distributor shall be a self-propelled pi or towed bitumen pressure sprayer equipped for spraying the material uniformly at specified rates and temperatures. Hand spraying of small & areas, inaccessible to the distributor, or in narrow strips shall be sprayed with a pressure hand sprayer, or as directed by the Engineer.
2. Preparation of road surface: The surface to be primed shall be prepared in accordance with Clauses 502.4.2 (MORTH specifications) as appropriated Immediately prior to applying the primer the surface shall be carefully swept clean of dust and loose particles, care being taken not , to disturb the interlocked aggregate. This is best achieved when the surface layer is slightly moist (lightly sprayed with water and the surface allowed to dry) and the surface should be kept moist until the primer is applied.
3. Application of bituminous primer: After preparation of road surface as per clause no 502.4.2 MORTH specification, the bituminous primer shall be sprayed uniformly in accordance with Clause 501 (MORTH specifications).The method for application of the primer will depend on the type of equipment to be used, size of nozzles,pressure at the spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.
No heating of dilution of bitumen emulsion shall be permitted at site. Temperature of cutback bitumen shall be high enough to permit the primer to be sprayed effectively through the jets of the spray and to cover the surface uniformly.
4. Curing of primer and opening to traffic: A primed surface shall be allowed to cure for at least 24 hours or such other period as is found to be necessary to allow all the volatiles to evaporate before any subsequent surface treatment or mix is laid.

Any unabsorbed primer shall first be blotted with an application of sand, using the minimum quantity possible. A primed surface shall not be opened to traffic other than that necessary to lay the next course. A very thin layer of clean sand may be applied to the surface of the primer, to prevent the primer picking up under the wheels of the paver and the trucks delivering bituminous material to the paver.

QUALITY CONTROL OF WORK

For control of the quality of materials supplied and the works carried out, the relevant provisions of Section 900 (MORTH specifications) shall apply.

ARRANGEMENTS FOR TRAFFIC

During construction operations, arrangements for traffic shall be made in accordance with the provisions of Clause 112 of the Ministry's Specification for Road and Bridge Works (third revision) 1995.

- e) Dense Graded Bituminous Macadam (Providing and laying dense bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ min 4.5% by weight of total mix, transporting the hot mix to work site, laying with a self-propelled paving machine equipped with an electronic sensing device to the required grade, level and alignment, rolling with 8-10 tonne static weight or vibratory roller or with a pneumatic tyre roller of 12 to 15 tonne weight to achieve the desired compaction as per approved design mix. for Grading-II (26.5 mm nominal size) Spec.No: As per MORTH specification fifth edition clause No. 507 and IRC-SP-97-2013**

Thickness = 0.06 m

SCOPE

This clause specifies the construction of Dense Graded Bituminous Macadam, (DBM), for use mainly, but not exclusively, in base/binder and profile corrective courses. DBM is also intended for use as road base material. This work shall consist of construction in a single or multiple layers of DBM on a previously prepared base or sub-base. The thickness of a single layer shall be 50mm to 100mm.

MATERIALS

1. Bitumen: The bitumen shall be paving bitumen of Penetration Grade complying with Indian Standard Specifications for "Paving Bitumen" IS: 73, modified bitumen complying with clause 501.2.2 (MORTH specifications), or as otherwise specified in the Contract.

2. Coarse aggregates: The coarse aggregates shall consist of crushed rock, crushed gravel or other hard material retained on the 2.36 mm sieve. They shall be clean, hard, durable, of cubical shape, free from dust and soft or friable matter, organic or other deleterious substances. Where the Contractor's selected source of aggregates have poor affinity for bitumen, as a condition for the approval of that source, the bitumen shall be treated with an approved anti-stripping agent, as per the manufacturer's recommendations, without additional payment. Before approval of the source, the aggregates shall be tested for stripping. The aggregates shall satisfy the physical requirements specified in Table 500- 8 (MORTH specifications), for dense bituminous macadam. Where crushed gravel is proposed for use as aggregate, not less than 90% by weight of the crushed material retained on the 4.75 mm sieve shall have at least two fractured faces.

3. Fine aggregates: Fine aggregates shall consist of crushed or naturally occurring mineral material or a combination of the two, passing the 2.36mm sieve and retained on the 75 micron sieve. They shall be clean, hard, durable, dry and free from dust, and soft or friable matter, organic or other deleterious matter.

The plasticity index of the fraction passing the 0.425 mm sieve shall not exceed 4. when tested in accordance with IS: 2720 (Part 5)

Refer TABLE 500-8. PHYSICAL REQUIREMENTS FOR COARSE AGGREGATE FOR DENSE GRADED BITUMINOUS MACADAM (MORTH specifications)

4. Filler: Filler shall consist of finely divided mineral matter such as rock dust, hydrated lime or cement approved by the Engineer. The filler shall be graded within the limits indicated in Table 500-9.

Refer TABLE 500-9. GRADING REQUIREMENTS FOR MINERAL FILLER (MORTH specifications)

The filler shall be free from organic impurities and have a Plasticity Index not greater than 4. The Plasticity Index requirement shall not apply if filler is cement or lime. When the coarse aggregate is gravel, 2 per cent by weight of total aggregate, shall be Portland cement or hydrated lime and the percentage of fine aggregate reduced accordingly. Cement or hydrated lime is not required when the limestone aggregate is used. Where the aggregates fail to meet the requirements of the water sensitivity test in Table 500-8, then 2 per cent by total weight of aggregate, of hydrated lime shall be added without additional cost.

5. Aggregate grading and binder content: When tested in accordance with

IS:2386 Part 1 (wet sieving method), the combined grading of the coarse and fine aggregates and added filler for the particular mixture shall fall within the limits shown in Table 500-10, for dense bituminous macadam grading 1 or 2 as specified in the Contract. The type and quantity of bitumen, and appropriate thickness, are also indicated for each mixture type.

Refer TABLE 500-10. COMPOSITION OF DENSE GRADED BITUMINOUS MACADAM PAVEMENT LAYERS (MORTH specifications)

MIXTURE DESIGN

1. Requirement for the mixture: Apart from conformity with the grading and quality requirements for individual ingredients, the mixture shall meet the requirements set out in Table 500-11.

Refer TABLE 500-11. REQUIREMENTS FOR DENSE GRADED BITUMINOUS MACADAM (MORTH specifications)

2. Binder content: The binder content shall be optimised to achieve the requirements of the mixture set out in Table 500-11 (MORTH specifications) and the traffic volume specified in the Contract. The Marshall method for determining the optimum binder content shall be adopted as described in The Asphalt Institute Manual MS-2, replacing the aggregates retained on the 26.5 mm sieve by the aggregates passing the 26.5 mm sieve and retained on the 22.4 mm sieve, where approved by the Engineer. Where 40 mm dense bituminous macadam mixture is specified, the

modified Marshall method described in MS-2 shall be used. This method requires modified equipment and procedures; particularly the minimum stability values in Table 500-11 (MORTH specifications) shall be multiplied by 2.25, and the minimum flow shall be 3 mm.

3. Job mix formula: The Contractor shall inform the Engineer in writing, at least 21 days before the start of the work, of the job mix formula proposed for use in the works, and shall give the following details:

- (i) Source and location of all materials;
- (ii) Proportions of all materials expressed as follows where each is applicable:
 - (a) Binder type, and percentage by weight of total mixture;
 - (b) Coarse aggregate/Fine aggregate/Mineral filler as percentage by weight of total aggregate including mineral filler;
- (iii) A single definite percentage passing each sieve for the mixed aggregate;
- (iv) The individual gradings of the individual aggregate fractions, and the proportion of each in the combined grading.

- (v) The results of mix design such as maximum specific gravity of loose mix (G_{mm}), compacted specimen densities, Marshall stability, flow, air voids, VMA, VFB and related graphs and test results of AASHTO T 283 Moisture susceptibility test;
- (vi) Where the mixer is a batch mixer, the individual weights of each type of aggregate, and binder per batch,
- (vii) Test results of physical characteristics of aggregates to be used;
- (viii) Mixing temperature and compacting temperature.

While establishing the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mixture and its different ingredients satisfy the physical and strength requirements of these Specifications. Approval of the job mix formula shall be based on independent testing by the Engineer for which samples of all ingredients of the mix shall be furnished by the Contractor as required by the Engineer.

The approved job mix formula shall remain effective unless and until a revised Job Mix Formula is approved. Should a change in the source of materials be proposed, a new job mix formula shall be forwarded to the Engineer for approval before the placing of the material.

4. Plant trials - permissible variation in job mix formula:

Once the laboratory job mix formula is approved, the Contractor shall carry out plant trials at the mixer to establish that the plant can be set up to produce a uniform mix conforming to the approved job mix formula. The permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used shall be within the limits as specified in Table 500- 13 (MORTH specifications). These variations are intended to apply to individual specimens taken for quality control tests in accordance with Section 900 (MORTH specifications).

TABLE 500-13. PERMISSIBLE VARIATIONS FROM THE JOB MIX FORMULA (MORTH specifications)

Once the plant trials have demonstrated the capability of the plant, and the trials are approved, the laying operation may commence. Over the period of the first month of production for laying on the works, the Engineer shall require additional testing of the product to establish the reliability and consistency of the plant.

5. Laying Trials: Once the plant trials have been successfully completed and approved, the Contractor shall carry out laying trials, to demonstrate that the proposed mix can be successfully laid, and compacted all in accordance with Clause 501 (MORTH specifications). The laying trial shall be carried out on a suitable area which is not to form part of the works, unless specifically approved in writing, by the Engineer. The area of the laying trials shall be a minimum of 100 sq.

m. of construction similar to that of the project road, and it shall be in all respects, particularly compaction, the same as the project construction, on which the bituminous material is to be laid. The Contractor shall previously inform the Engineer of the proposed method for laying and compacting the material. The plant trials shall then establish if the proposed laying plant, compaction plant, and methodology is capable of producing satisfactory results. The density of the finished paving layer shall be determined by taking cores, no sooner than 24 hours after laying, or by other approved method. Once the laying trials have been approved, the same plant and methodology shall be applied to the laying of the material on the project, and no variation of either shall be acceptable, unless approved in writing by the Engineer, who may at his discretion require further laying trials.

CONSTRUCTION OPERATIONS

1. Weather and seasonal limitations: The provisions of Clause 501.5.1 (MORTH specifications) shall apply.
2. Preparation of base: The base on which Dense Graded Bituminous Material is to be laid shall be prepared in accordance with Clauses 501 and 902 (MORTH specifications) as appropriate, or as directed by the Engineer. The surface shall be thoroughly swept clean by a mechanical broom, and the dust removed by compressed air. In locations where-mechanical broom cannot access, other approved methods shall be used as directed by the Engineer.
3. Geosynthetics: Where Geosynthetics are specified in the Contract this shall be in accordance with the requirements stated in Clause 703 of the Ministry's Specification for Road and Bridge Works (MORTH specifications).
4. Stress absorbing layer: Where a stress absorbing layer is specified in the Contract, this shall be applied in accordance with the requirements of Clause 517 (MORTH specifications).
5. Prime coat: Where the material on which the dense bituminous macadam is to be laid is other than a bitumen bound layer, a prime coat shall be applied, as specified, in accordance with the provisions of Clause 502 (MORTH specifications), or as directed by the Engineer.
6. Tack coat: Where the material on which the dense bituminous macadam is to be placed is a bitumen bound surface, a tack coat shall be applied as specified, in accordance with the provisions of Clause 503 (MORTH specifications), or as directed by the Engineer.
7. Mixing and transportation of the mixture: The provisions as specified in

Clauses 501.3 and 501.4 shall apply (MORTH specifications).

8. Spreading: The provisions of Clauses 501.5.3 and 501.5.4. shall apply (MORTH specifications).

9. Rolling: The general provisions of Clauses 501.6 and 501.7 (MORTH specifications) shall apply, as modified by the approved laying trials. The compaction process shall be carried out by the same plant, and using the same method, as approved in the laying trials, which may be varied only with the express approval of the Engineer in writing.

OPENING TO TRAFFIC

The newly laid surface shall not be open to traffic for at least 24 hrs after laying and completion of compaction, without the express approval of the Engineer in writing.

SURFACE FINISH AND QUALITY CONTROL OF WORK

The surface finish; of the completed construction shall conform to the requirements of Clause 902. All materials and workmanship shall comply with the provisions set out in Section 900 (MORTH specifications).

ARRANGEMENTS FOR TRAFFIC

During the period of construction, arrangements for traffic shall be made in accordance with the provisions of Clause 112 of the Ministry's Specification for Road and Bridge Works (fifth revision).

f. Providing and applying tack coat with VG-10 Grade bitumen using bitumen pressure distributor at the rate of 0.20 kg/sqm on the existing bituminous surface cleaned with Air Compressor.

For detailed specification refer 5th revision of MORTH (2013) & also ammendment shall be applicable to the latest versions.

g. Bituminous Concrete (Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with bituminous binder @ min. 5.4 % of mix, transporting the hot mix to work site, laying with a self-propelled paving machine equipped with an electronic sensing device to the required grade, level and alignment, rolling with 8-10 tonne static weight or vibratory roller or with a pneumatic tyre roller of 12 to 15 tonne weight to achieve the desired compaction as per approved design mix. for Grading-I (13 mm nominal size).

Thickness = 0.05 m

For detailed specification refer 5th revision of MORTH (2013) & also ammendment shall be applicable to the latest versions..

- 1.3 **The payment for reinstatement of Bituminous road payment will be made on sq.mt. basis of the work carried out as per the design and direction of engineer –in-charge**
- 1.4 Penalty for incomplete reinstatement work shall be recovered @ 1.5 times the actual expense incurred by Bhavnagar Municipal Corporation

Item

Excavation of trench for Pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chieilling only for finishing with all safety Provisions (including dewatering and re-filling of trench) for depth from 0.0 to 1.5 mtr.

Specification same as Item no.1 except Rate shall be paid per Rmt. Rate is included cost of dewatering and refilling of pipeline trenches after lying of Pumping Main.

Item

Providing and supplying D. I. K-9 grade pipe of specified dia with internal cement mortar lining including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete. (IS - 8329 / 2000 and upto dated amendments) and lowering, laying and jointing Mortarlined D. I. Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including hydraulic testing etc. complete as directed by engineer in charge.

1.1 Applicable Codes:

The manufacturing testing, supplying, at work sites of Ductile Iron pipes shall comply with all currently applicable statutes, regulations, standards and codes.

In particular, the following standards, specified herein shall be referred. In all cases, the latest revision of the codes shall be referred to. If requirements of specifications conflict with the requirements of the codes and standards, this specification shall govern.

IS: 8329 Specification for Centrifugally Cast (spun) Ductile Iron pressure pipes for water, gas and sewage specification.

IS: 1387 General requirements for supply of metallurgical materials.

IS: 1500 Methods for Brinell hardness test for metallic materials.

IS:9523 Ductile Iron fittings for pressure pipes for water, gas and sewage.

IS: 12820 Dimensional requirements. of rubber gaskets for mechanical Joints and push on joints for use with cast Iron pipes and fittings for carrying water, gas and sewage.

ISO: 4179 Ductile iron pipes for pressure and no pressure-Centrifugal cement mortar lining - General requirements.

ISO: 2531 Ductile iron pipes, fitting and accessories for pressure pipe lines.

IS: 12288 - Code of practice for use & laying of Ductile iron pipes.

1.2 Manufacturing:

1.3 General

DI pipes shall be systematically checked for any manufacturing defects by experienced supervisors and a very high standard quality shall be maintained.

- 1.3.1 Owner / Engineer shall at all reasonable times have free access to the place where the pipes are manufactured for the purpose of examining and testing the pipes and for witnessing the test and manufacturing.
- 1.3.2 All tests specified either in this specification or in the relevant Indian Standards shall be performed by the supplier/contractor at his own cost and in presence of Owner/Engineer if desired. For this, sufficient notice before testing of the pipes shall be given to Owner/Engineer.
- 1.3.3 If the test is found unsatisfactory, Owner/Engineer may reject any or all pipes of that lot. The decision of Owner/Engineer in this matter shall be final and binding of the contractor and not subject to any arbitration or appeal.

1.4 Materials

- 1.4.1 The general requirements relating to the supply of material shall be as per IS:1387.

1.5 Dimensions:

- 1.5.1 The internal diameter, thickness and length of barrel, dimensions of pipes shall be as per the relevant tables of IS.8329/IS: 9523 for different class of pipes.
- 1.5.2 The tolerances for pipes regarding dimensions and deviations from straight line shall be as per relevant IS codes.
- 1.5.3 The standard weight of uncoated pipes and the permissible tolerances shall be as per relevant IS codes.

1.6 Workmanship and Finish

- 1.6.1 The pipes shall be stripped, with all precautions necessary to avoid warping or shrinking defects. The pipes shall be free from defects, other than any unavoidable surface imperfections which result from the method of manufacture and which do not affect the use of the pipes in the opinion of Engineer.
- 1.6.2 The pipes shall be such that they could be cut, drilled or machined. The hardness of the external unmachined surface shall not exceed 230 HBS.
- 1.6.3 In the case of spigot and socket pipes and fittings for lead joints, the socket shall be without the centering ring.
- 1.6.4 In the case of flanged pipes the flanges shall be at the right angles to the axis of the pipe and machined on face. The bolt holes shall be drilled and located symmetrically off the center line. The bolt hole circle shall be eccentric with the bore and bolt holes equally spaced. The flanges shall be integrally cast with the pipes and fittings and the two flanges of the pipes shall be correctly aligned.

1.7 Testing

1.7.1 Mechanical Tests:

Mechanical tests shall be carried out during manufacture of pipes as specified in relevant IS codes. The results so obtained shall be considered to represent all the pipes and fittings of different sizes manufactured during that period and the same shall be submitted to Owner/Engineer. The method for tensile tests and the minimum tensile strength requirement for pipes shall be as per relevant IS codes.

1.7.2 Brinell Hardness Test

For checking the Brinell hardness, the test shall be carried out on the test ring or bars cut from the pipes used for the ring test and tensile test in accordance with IS 1500.

1.7.3 Retests

If any test piece representing a lot fails in the first instance, two additional tests shall be

made on test pieces selected from two other pipes from the same lot. If both the test results satisfy the specified requirements, the lot shall be accepted. Should either of these additional test pieces fail to pass the test, the lot shall be liable for rejection.

1.7.4 Hydrostatic Test

For hydrostatic test at works, the pipes shall be kept under test pressure as specified in relevant IS codes for 15 seconds, shall be struck moderately with a 700 g hammer for confirmation of satisfactory sound. They shall withstand the pressure test without showing any leakage sweating, or other defect of any kind. The hydrostatic test shall be conducted before coating the pipes.

1.8 Coating

- 1.8.1 All D.I. pipes shall be delivered with internal lining and external coating.
- 1.8.2 Coating shall not be applied to any pipe unless its surface is clean dry and free from rust.
- 1.8.3 All DI pipes shall be mortar lined on internal surface as specified in ISO: 4179 and externally coated with bituminous paint as specified in IS: 8329.

1.9 Marking

- 1.9.1 Each pipe shall have cast stamped or legibly and indelibly painted on it with the following appropriate marks:
 - a) The nominal diameter.
 - b) Class reference.
 - c) Mass of pipe.
 - d) Date of manufacture and
 - e) Manufacturer's name, initials or identification mark.
- 1.9.2 Marking shall be done as per IS: 8329.

1.10 Transporting of Pipes

All pipes manufactured in the factory and temporarily stacked in the Contractor's yard shall be transported to the site of laying after cleaning them internally etc. The item of transport covers the cost of loading in the factory, transporting to the site of laying or to stacking yard selected by the Engineer in its vicinity and unloading and stacking them carefully in such a manner that the material so kept is not easily disturbed or rolled away from the place of stacking. The loading in the factory shall be carried out by means of either a crane, gantry or shear legs, so as not to cause any damage to the finished material. Similarly, while unloading and stacking, great care shall be taken to ensure that the material is not damaged or dented. The contrivances to be used for unloading will be different in different situations and in each case the one approved by the Engineer shall be adopted. The material stacked at site shall be jointly inspected by the Engineer and the Contractor and defect or damage noticed shall be repaired to the satisfaction of the Engineer before payment is admitted.

The stacking ground, both in the Contractor's yard and at the site of laying shall be selected in such a way as not to get waterlogged during monsoon. If this cannot be done, the pipes shall be supported on sleepers to avoid contact with wet earth.

As explained in earlier paragraphs, materials such as pipes, tapers, etc. may be transported to the site of laying as soon as the material is finished in all respects with the permission of the Engineer.

1.11 Procedure for Receiving DI Pipes:

1.11.1 Handling of Pipes,

It is essential to avoid damage to the pipes, or their coatings at all stages during handling. The pipes shall be handled in such a manner as not to distort their circularity or cause any damage to their surface treatment. Pipes shall not be thrown down from the trucks nor shall they be dragged or rolled along hard surfaces. Slings of canvas or equally non-abrasive materials of suitable width of special attachment shaped to fit the pipe ends shall be used to lift and lower coated pipes to prevent damage to the coating.

Great care shall be taken in handling the pipe right from the first operation of manufacture until they are delivered to the store. No defective or damaged pipe shall be allowed in the work without rectification/replacement to the satisfaction of the Engineer. Any damage to the coating shall be repaired by the Contractor at his own cost to the satisfaction of the Engineer.

1.12 Laying of Ductile Iron Pipes and Fittings / Specials

1.12.1 Scope

The specification covers laying of DI pipes and DI fittings/specials for over ground/underground works.

1.12.2 Applicable codes

The laying of pipes and fittings/specials shall comply with all currently applicable status, regulation, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred to. In all cases, the latest revision of the standards/codes shall be referred to. If requirements of this specification conflict with the requirements of the standards/codes, this specification shall govern.

1.12.3 Codes of practice

- IS:8329 Centrifugally cast (spun) Ductile Iron pressure pipe for water, gas and Sewage.
- IS:3764 Excavation Work - Code of Safety.
- IS:12288 Code of Practice for use and laying of Ductile iron pipes.

1.12.4 Carting & handling

Pipes and fittings/specials shall be transported from the factory to the work sites at places along the alignment of pipeline as directed by Owner/Engineer and as specified by manufacturer. Contractor shall be responsible for the safety of pipes and fittings/specials in transit, loading/unloading. Every care shall be exercised in handling pipes and fittings/specials to avoid damage. While unloading, the pipes and fittings/specials shall not be thrown down from the truck on to hard surfaces. They should be unloaded on timber skids with steadying ropes for by any other approved means. Padding shall be provided between coated pipes, fittings/specials and timber skids to avoid damage to the coating. Suitable gaps between pipes should be left at intervals in order to permit access from one side to the other. in case of spigot socket pipes, care should be taken regarding orientation of pipes while unloading. As far as possible pipes shall be unloaded on one side of the trench only. All pipes shall be checked for any visible damage (such as broken edges, cracking or spalling of pipe) while unloading and shall be sorted out for recantation. Any pipe which shows sufficient damage to preclude it from being used shall be discarded. Dragging of pipes and fitting/specials along concrete and similar pavement with hard surfaces shall be

prohibited.

1.12.5 Storage

Each stack of pipes shall contain only pipes of same class and size, with consignment or batch number marked on it with particulars of suppliers wherever possible. Storage shall be done on firm level and clean ground and wedges shall be provided at the bottom layer to keep the stack stable. The stack shall be in pyramid shape or the pipes laid lengthwise and crosswise in alternate layers. The pyramid stack shall be made for smaller diameter pipes for conserving space in storing them. The height of the stock shall not exceed 1.5m. Fittings/specials, shall be stacked under cover and separated from pipes.

Rubber rings shall be stored in a clean, cool store away from windows, boiler, electrical equipment and petrol, oils or other chemicals. Particularly in the field where the rubber rings are being used it is desirable that they are not left out on the ground in the sun or overnight under heavy frost or snow conditions.3

1.12.6 Laying

.12.6.1 Excavation

Before excavating trench the alignment of pipeline shall be approved by Engineer. The excavation shall be carried out in accordance with the specifications mentioned under Section 4, Parts 1 and shall be done such that it does not get far ahead of laying operations. To protect persons from injury and to avoid damage to property, adequate barricades, construction signs, red lanterns and guards as required shall be placed and maintained during the progress of the construction work and until it is safe for the traffic to use the roadways. The relevant Indian standards and the rules and regulations of local authorities in regards to safety provisions shall be observed.

Suitable fencing shall be provided along the sides of trenches and pits. The posts of fencing shall be of timber securely fixed in the ground not more than 3 in apart and they shall not be less than 75 mm in diameter or less than 1.2 m above surface of the ground. There shall be two rails, one near the top of the post and the other about 450 mm above the ground and each shall be from 50 mm to 70 mm in diameter and sufficiently long to run from post to post to which they shall be bound with strong rope. The method of projecting rails beyond the post and tying them together where they meet will not be allowed on any account. All along the edges of the excavation trenches a bank of earth about 1.2m high shall be formed where required by Owner/Engineer for further protection.

The road metal and also the rubble packing shall first be stripped off for the whole width of the trench/pit and separately deposited in such place or places as may be determined by

Owner/Engineer.

During excavation, large stones and rubble shall be separated and removed from the excavated soil and stacked separately. The material from excavation shall be deposited on either side of the trench leaving adequate clear distance from the edges of the trench and pit, or as may be necessary to prevent the sides of the trench pit to slip or fall, or at such a distance and in such a manner as to avoid covering fire hydrants, sluice valves, manholes covers etc. and so as to avoid abutting the wall or structure or causing inconvenience to the public and other service organisations or otherwise as Owner/Engineer may direct.

Contractor shall take into account additional excavation if any as Owner/Engineer may require in order to locate the position of water pipes, drains, sewers etc. or any other works which may be met with, in or about the excavation of trenches/pits while quoting the rates for excavation of trenches/pits while quoting the rates for excavation. Such service lines if met with during excavation shall be properly maintained by Contractor, by means of shoring, strutting, planking over, padding or otherwise as Owner/Engineer may direct, and shall be protected by the Contractor from damage during the progress of the work. All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipe line of water, gas, sewage etc.

If the work for which the excavation has been made is not completed by the expected date of the setting of monsoon or the setting in of rain whichever is earlier, or before the day fixed by Owner/Engineer for filling in any excavation on account of any festival or special occasion, Contractor shall backfill such excavation and consolidate the filling.

Utmost care shall be taken to see that the width of the trench upto ground level is not more than that specified in 'Data sheet – B'. If any extra width is provided in the pipezone, the Contractor shall have to provide remedial measures in the form of lime concrete or rubble masonry otherwise at the discretion and to the satisfaction of Owner/Engineer. If rock is met with, it shall be removed to 15 cm below the bottom of pipes and fittings/specials and the space resulting shall be refilled with granular materials and properly consolidated. Bottom of trenches/pits shall be saturated with water well rammed wherever Owner/Engineer may consider if necessary to do so.

Wherever a socket or collar of pipe or fitting/special occurs, a grip is to be cut in the bottom of the trench or concrete bed to a depth of at least 75 mm below the bed of the pipe so that the pipe may have a fair bearing on its shaft and does not rest upon its socket. Such grip shall be of sufficient size in every respect to admit the hand all around the socket in order to make the joint, and the grip shall be maintained clear until the joint has been approved by Owner/Engineer.

When welding is to be carried out with the pipes and specials in the trench, additional excavation of not more than 60 cm in depth and 90 cm in length shall be made at joints in

order to facilitate welding.

The excess excavated material shall be carried away from site of works to a place upto a distance as directed by Owner/Engineer. This shall be done immediately so as not to cause any inconvenience to the public or traffic. If the instructions from Engineer are not implemented within seven days from the date of instructions to cart the materials and to clear the site, the same shall be carried out by Owner/Engineer and any claim or dispute shall not be entertained in this respect.

The contractor shall make proper provision for protecting the work by fencing, watch and ward lighting at right on in an other manner as may be directed by Engineer.

.12.6.2 De-watering

During the excavation, if subsoil water is met with Contractor shall have to provide necessary equipment and laborers for dewatering the trenches/pits by bailing out water or water mixed with clay if pumping out subsoil water is found to be necessary, Contractor shall provide sufficient number of pumps for the same. In both the above cases the excavation shall be done to the required level and the pipes shall be laid to proper alignment and gradient. Contractor shall also make necessary arrangement for the disposal of drained water to nearby storm water drain or in a pit if allowed by Owner/Engineer. In no case the water shall be allowed to spread over the adjoining area. Before discharging this water into public sewer/drain, Contractor shall take necessary permission from the local authorities.

.12.6.3 Special foundation in poor soil

Where the bottom of the trench and subgrade is found to consist of material which is unstable to such a degree that in the opinion of Owner/Engineer, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the pipes, consisting of piling, limbers or other materials, in accordance with relevant drawings and as instructed by Owner/Engineer shall be constructed.

.12.6.4 Bedding

The type of bedding for pipes shall be as per Data Sheet - B.

DATA SHEET – B

Sr. No.	Item No.	Specification
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1	Width of trench	
	OD – Outer Diameter of pipeline in m	OD + 0.9 m
2	Bedding for pipes	As per drawing

1.12.7 Laying of Pipes and Fittings/Specials

All precautions shall be taken during excavation and laying operations to guard against possible damage to any existing structure/pipeline of water, gas, sewage etc. After excavation of trenches, pipes shall not be lowered unless the dimensions of trenches and bedding work for pipes at the bottom of the trenches are approved and measured by Owner/Engineer. Pipes and fittings/specials shall be carefully lowered in the trenches. Special arrangements such as cranes, tripods with chain pulley block for lowering the pipes and fittings/specials shall be made by Contractor. In no case pipes and fittings/specials shall be dropped. Slings of canvas or equally non-abrasive material of suitable width or special attachment to fit the ends of pipes and fittings/specials shall be used to lift and lower the coated pipes and fittings/specials. The pipes and fittings/specials shall be inspected for defects and be rung with a light hammer preferably while suspended to detect cracks. If doubt persists, further confirmation shall be done by pouring a little kerosene/dye on the inside of the pipe at the suspected spot. No sign of kerosene/dye should appear on the outside surface. Pipes and fittings/specials damaged during lowering or aligning shall be rejected by Owner/Engineer. Manufacturers recommendations are to be followed for laying pipes.

All the pipes are to be laid perfectly true both in alignment and to gradient specified. In case of spigot and socket pipe the socket end of the pipe shall face upstream, except when the pipeline runs uphill in which case the socket ends should face the upgrade. The laying of pipes shall always proceed upgrade of a slope. After placing a pipe in the trench, the spigot end shall be centered in the socket and the pipe forced home and aligned to required gradient. The pipes shall be secured in place with approved backfill material tamped under it except at the socket. pipes and fittings/ specials which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipes and fittings/specials of proper dimensions to ensure such uniform space. Precautions shall be taken to prevent dirt from entering the jointing space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by Owner/Engineer. During the period that the plug is on, the Contractor shall take proper precautions against floating of the pipe owing to entry of water into the trench. Wherever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions or

where long radius curves are permitted the deflection allowed at joints shall not exceed $2\ 1/2^\circ$. In case of pipes, with joint to be made with loose collars, the collars shall be slipped on better the next pipe is laid. The pipes shall be laid such that the marking on pipes appears at the top of the pipes.

The cutting of pipe for inserting valves, fittings or specials shall be done in a neat and workman like manner by using tools and taking precautions as per manufacturers' recommendations without damage to the pipe so as to leave a smooth end at right angles to the axis of the pipe. For this purpose, pipe cutting machine shall be used.

1.12.8 Repairs of Damaged Cement Mortar Linings

The mortar lining is strongly bonded with the pipe wall at all places. However, near the spigot end due to rough handling of pipes or on account of incidental shock loads the mortar lining may get damaged over a small area. Such damages if taken place shall be immediately identified and repaired before installation. When repairing damaged cement-mortar-lining, the following shall be adhered to:

.12.8.1 Materials required

- (a) Standard Cement (of the same quality as in the lining)
- (b) Argillaceous Sand (size of coarse grains max. 1.6 mm)
- (c) Acrylic Emulsion for cement mortar
- (d) Potable water

.12.8.2 Preparation of the areas to be repaired

The damaged lining shall be removed with hammer and chisel, with due care without disturbing the surrounding lining. Contractor shall supply protective spectacles for workmen to prevent penetration of cement fragments into their eyes.

.12.8.3 Composition of repair mortar

The proportion of the materials will be as follows:

.12.8.4 Dry mixture of mortar:

One part of cement

One part of sand

.12.8.5 Emulsions:

One part of acrylic emulsion

Four parts of potable water

Firstly the dry sand and the dry cement shall be mixed separately. The acrylic emulsion shall be added to the water stirring constantly (The container for acrylic emulsion should be resealed at once after use and stored in a cool place) Small quantities of the treated water shall be gradually added to the cement and sand mixture mixed thoroughly. Care shall be taken not to prepare too large quantity of cement to avoid premature hardening.

Any loose sand from the areas to be repaired shall be brushed off. Moisten the areas under repair and surrounding areas with water but avoid water accumulations. Mortar is to be applied to cleaned areas and the lining surface is to be smoothed.

.12.8.6 After - Treatment of repaired areas

In order to ensure faultless hardening of cement it is recommended that the repaired area to be covered temporarily with plastic sheet. In the case of diameters exceeding DN 300 it is possible that after cutting off a piece the new spigot end has become out of round. On account of the elastic and plastic properties of ductile iron, it is possible to re-round these pipe ends. This shall be done on site by means of a hydraulic or mechanical jack, acting from inside and pressing outwards or by using a press acting from outside the pipe and pressing inwards by the contractor.

In order to avoid damage to the cement mortar lining it is recommended that hardwood ads of a shape to match the pipes internal diameter be used. The re-rounding device should remain in place during assembly. If necessary the manufacture may be consulted for resounding.

1.12.9 Thrust Blocks

Thrust blocks shall be provided, to counteract hydraulic thrust, at requisite places as per design as directed by Engineer In-charge.

1.12.10 Jointing

Jointing for pipes and fittings/specials shall be done in accordance with the relevant specifications for DI pipes and DI fittings and as recommended by manufacturer.

The recommended bolting torque to be followed for assembling flanges as specified in manufacturer instructions.

1.12.11 Testing And Commissioning

Testing and commissioning of pipes shall be done in accordance with the relevant specification.

1.12.12 Backfilling

Trenches shall be backfilled with approved selected excavated material only after the successful testing of the pipeline as directed by engineer. The tamping around the pipe shall be done by hand or other hand-operated mechanical means. The water content of the soil shall be as near the optimum moisture content as possible. Filling of the trench shall be carried out simultaneously on both side of the pipe in such a manner that unequal pressure does not occur. Backfilling shall be done in layers not exceeding 30 cm. Each layer shall be consolidated by watering, ramming, care being taken to avoid damage to the pipeline. Where timbers are placed under the pipeline to aid alignment, these timbers shall be removed before backfilling.

1.12.13 Reinstatement Of Road/Footpath

Reinstatement of road/footpath shall be done as per the requirements of local authorities and the relevant specifications after completion of work.

1.12.14 Clearing Of Site

All surplus materials, and all tools and temporary structures shall be removed from the site as directed by Owner/Engineer and the construction site left clean to the satisfaction of Owner/Engineer.

1.12.15 Cleaning, Disinfecting And Commissioning Of The Pipeline

Upon completion of newly laid main, the main shall be disinfected as directed by the Engineer.

The main shall be flushed prior to disinfection except when the tablet method is used. After initial flushing, the hypochlorite solution shall be applied to the water main with mechanically or electrically powered chemical feed pump designed for feeding chlorine solutions. For small applications, the solution may be fed with a hand pump.

In the case of main of large diameter, water from the existing distribution system or other approved source of supply shall be made to flow at a constant measured rate into the newly laid pipeline. The water shall receive a dose of chlorine also fed at constant measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 300 mg/l. The chlorine shall be applied continuously and for a sufficient period to develop a solid column of 'slug' of chlorinated water that will as it passes along the line expose all interior surfaces to a concentration of at least 300 mg/l for atleast 3 hours. As the chlorinated water flows past tees and crosses related valves and hydrants shall be operated so as to disinfect the appurtenances.

In the case of newly laid mains in which scrupulous cleanliness has been exercised the tablet method can be adopted and in this method, the initial flushing is dispensed with. The calcium hypochlorite tablets are placed in each section of pipe and also in hydrants, hydrant branches and other appurtenances. The tablets shall be attached by an adhesive and must be at the top of the main. The main shall then be filled with water and the water shall remain in the pipe for atleast 24 hours.

After the applicable retention period, the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the mains is not higher than that generally prevailing in the system or less than 1 mg/l.

After final flushing and before the water main is placed in service, a sample (s) of water shall be collected from the end of the line and tested for bacteriological quality and shall show the absence of coliform organisms. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory, samples are obtained before the main is placed in service.

The Contractor is expected to carry out the disinfection work as a part of laying the pipes and his rates for laying the pipes should include the disinfection and other connected works till the main is placed in service, unless otherwise specified in the schedule.

1.12.16 Method of Measurement

The measurement shall be recorded in running meter of pipe length laid along the centerline of axis of pipeline including specials surcharge tee, enlarge, reducer and bend, correct up to 0.01 m length.

1.12.17 Payment

As per payment schedule in price bid.

Item D.I pipe

Supplying and installing Ductile Iron fittings like, bends, tees, reducers or any other specials as per IS-9523-2000 (as per latest amendment) use with D.I.Pipes manufactured as per IS:8329/1994 (With external bitumen & zink coating & internal cement mortar lining) Socket & Spigot Type

1. DI Specials with all types of diameters suitable of K9-K7 grade pipes with inner cement mortar lining
2. The necessary DI Specials required during the lowering & lying of Ductile Iron Pipe shall be supplied by the agency and shall be as per standard specification. And per IS specification
3. It shall be of best quality as per requirement Rate shall be including loading, unloading, carting, insurance and labour charge etc. complete.
4. M S Specials of required thickness with 3 coats of approved make epoxy paint with inside and outside
5. The necessary MS Specials required during the lowering & laying of MS/AC/DI & PVC Pipe shall be supplied by the agency and shall be as per standard specification.
6. MS specials included Air valves risers, Flanges, Tailpiece etc.
7. It shall be of best quality as per requirement. Rate shall be including loading, unloading, carting, insurance etc. complete.

The payment shall be made on kg. basis.

Item sluice valves

Providing and supplying ISI mark CI D/F Sluice Valves , Butterfly Valves & Reflux Valves of following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete

Sluice Valve: Refer Vol IIIB (Part 3) Mechanical Specification.

Item Air valve

Providing and supplying C. I. Air valve of 80 mm dia of approved make & quality of following class and diameter including all taxes, Insurances, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental

stores, stacking etc. complete.

Refer Vol IIIB (Part 3) Mechanical Specification.

Item Valves

Lowering, laying and jointing valves in position following C.I. / D/F Reflux valves, Butterfly valves, Sluice valves and Air valves including cost of all labor, jointing material, including nut bolts and giving satisfactory hydraulic testing, etc. complete.

Sluice Valve:

Lowering and jointing in position

1.1 Supply of Material

1.1.1 Cast iron double-flanged sluice valve with two tailpieces suitable to pipe conforming to the latest

relevant IS shall be supplied and carted by the contractor to the site of work including loading, unloading and stacking at site.

1.1.2 The sluice valve and tailpieces shall be examined before laying for cracks and other flaws. They shall

be undamaged in all respect.

1.1.3 The sluice valves shall be cleaned before laying.

1.1.4 All grits and foreign materials shall be removed from the inside of the valves before placing.

1.1.5 All the four faces shall be thoroughly cleaned and coated with a thin layer of mineral grease.

1.1.6 The tightening of gland shall be checked with a pair of inside-calipers. Clearance between the top of stuffing box and the underside of the gland shall be uniform all the sides.

1.2 Jointing Material

1.2.1 The contractor shall provide all necessary jointing materials such as nuts bolts, rubber packing, white

zinc, jute, lead wool etc.

1.2.2 All tools and instruments, which are to be required for installation of sluice valve shall be provided by the contractor.

1.2.3 All jointing materials shall be got approved from the engineer-in-charge before use
The nuts and bolts shall conform to the relevant IS.

The rubber packing shall conform all specifications as narrated in respective IS.

1.3 Installation

1.3.1 The sluice valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.

1.3.2 If necessary tailpieces shall be fitted with sluice valve first outside the trench and then lowered in to the trench.

1.3.3 The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the sluice valve bore. It shall be even at both the inner and outer edges.

1.3.4 The flange faces thoroughly greased.

1.3.5 If flange faces are not free, the contractor shall use thin fibers of lead wool.

1.3.6 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.

1.3.7 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.

1.3.8 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.

1.3.9 The sluice valve shall be installed in such a way that its Spindle shall remain in truly vertical position.

1.3.10 The other end of tailpiece shall be fitted with pipes so that continuous lines can work.

1.3.11 Extra excavation required for facility of lowering and fixing sluice valve shall not be paid for.

1.4 Testing

1.4.1 After installation of sluice valve the same is tested to 1½ times of its test pressure.

1.4.2 The joints of sluice valve shall withstand the test pressure of pipelines.

1.4.3 Defects noticed during test and operation of sluice valve shall be rectified by the contractor at his own cost without any extra claim to the entire satisfaction of the Engineer-in-charge.

2 Measurement and payment:

The rate shall be paid per number of valves fixed and tested as directed.

Air Valve:

3.1 The air valve shall be lowered in to the trench carefully, so that no part is damaged during lowering operation.

3.2 The rubber packing shall be three ply and of approved thickness. The packing shall be of full diameter of the flange with necessary holes and the air valve bore. It shall be even at both the inner and outer edges.

- 3.3 The flange faces thoroughly greased.
- 3.4 If flange faces are not free, the contractor shall use thin fibers of lead wool.
- 3.5 After placing the packing, nuts and bolts shall be inserted and tightened to make the joint.
- 3.6 The valve shall be tightly closed when being installed to prevent any foreign materials from getting in between the working parts of the valve.
- 3.7 Each flange bolt shall be tightened a little at a time taking care to tighten diametrically opposite bolts alternatively.
- 3.8 Extra excavation required for facility of lowering and fixing air valve shall not be paid for.

17 MODE OF MEASUREMENT AND PAYMENT

Measurement shall be paid on number basis as per relevant dia of the item in schedule 'B' of the tender

Item Thrust block

Thrust Blocks: Providing and casting in situ C.C. in grade M-20 (proportions as per mix design or as per table 9 of IS 456 2000 in masses by weigh batching) using granite, quartzite trap metal of size 6 mm to 20 mm for RCC work, including scaffolding centering, formwork, needle vibrated consolidation, curing complete up to 6 meter depth or height (excluding cost of reinforcement and neat finishing) with centering and shuttering etc. complete for structure other than water retaining.

Supplying cutting bending binding and placing in position steel as per plan and design and as per ISS 2502 incl. cost of steel and binding wire for reservoirs/ structures only including lift up to 6 meter height or depth below GL for all diameters.

-do- Thermo mechanically treated (TMT) bars Fe415 / Fe500 grade for all diameters.

Thrust Block of pipe shall be carried out in cement concrete M-20 using trap metal as per instructions of the engineer in charge. Materials and workmanship shall be as per specification of concrete.

Payment for Concrete shall be made of Cum. basis and Payment for Steel shall be of MT basis. Reinforcement bars shall be measured and recorded with three digits after decimal point.

Item Valve chambers

Construction of valves chambers in brick or bela stone masonry, locally available in C. M. 1:6. Foundation concrete 150 mm thick in C. C. 1:4:8 of trap metal size 25 mm to 40 mm thick, inside cement plaster in C. M. 1:3 and cement pointing outside in C. M. 1:3 and top cover of precast RCC slab 100 mm thick (with key hole in two parts, each with handles or MS Bar etc. complete as give size) Up to 1 Mt. depth from G. L. to pipe invert level incl. complete civil works but excl. cost of excavation and refilling With cast in situ RCC slab in one single piece with fixing of CI-MH Frame and cover (excl. cost of CI-MH Frame and cover) with 23 cm. thk. BM wall in C.M. 1:6.

CHAMBER

Materials such as Cement, sand, coarse aggregate, bricks, reinforcement, water etc. to be used for this work shall be confirming to specification laid down in material section.

1.1 Location

Chamber shall be constructed at places approved by the Employer's Representative. Where valves are provided for maintenance of the pipeline.

1.2 Excavation / P.C.C.

Excavation, shoring, dewatering/ P.C.C. etc. for the pits of chambers, laying of pipes and fittings/specials shall be done in accordance with Employer's Requirements described elsewhere in the document.

1.2 Bed Concrete

The bed concrete 150 mm thick for chamber shall be done in C.C. 1:4:8 as directed by the Engineer-in-charge using trap metal of 25 mm to 40 mm.

13 Bricks

Bricks used for construction of manholes shall conform to the relevant Indian Standards. They shall be sound, hard, and homogeneous in texture, well burnt in kiln without being vitrified, table molded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square and parallel faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing ungrounded particles, which absorb water more than 1/6th of their weight when soaked in water for twenty-four hours, shall be rejected. Over burnt or under burnt bricks shall be liable to rejection. The bricks shall give a clear ringing

sound when struck and shall have a minimum crushing strength of 50 kg/sq.cm. The class and quality requirements of bricks shall be as laid down in IS: 1077.

The size of the brick shall be 23.0 x 11.5 x 7.5 cm. unless otherwise specified; but tolerance upto 3 mm in each direction shall be permitted. Only full size brick shall be used for masonry work. Brick bats shall be used only with the permission of Employer's Representative to make up required wall length or for bonding. Sample bricks shall be submitted to the Employer's Representative for approval and bricks supplied shall conform to approved samples. If required by the Employer's Representative, brick sample shall be tested as per IS: 3495 by Contractor. Bricks rejected by the Employer's Representative shall be removed from the Site within 24 hours.

1.4 Cement Mortar

Mortar for masonry shall be as per IS: 2250. Chambers shall be constructed in brick masonry with cement mortar (1:6) unless otherwise specified. Gauge boxes for sand shall be of such dimensions that one bag containing 50 kg. of cement forms one unit. The sand shall be free from clay, shale, loam, alkali and

organic matter and shall be of sound, hard, clean and durable particles. Sand shall be as approved by the

Employer's Representative. If required by the Employer's Representative sand shall be thoroughly washed till it is free of any contamination.

For preparing cement mortar, the ingredients shall first be mixed thoroughly in dry conditions. Water shall

then be added and mixing continued to give a uniform mix of required consistency. Cement mortar shall be used within 25 minutes of mixing. Mortar left unused in the specified period shall be rejected.

The Contractor shall arrange for tests on mortar samples if so required by Employer's Representative. Re-tempering of mortar shall not be permitted.

1.5 Brick Masonry

All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work of Chambers shall be in the proportion specified in drawing.

Brick work 230 mm thick and over shall be laid in English Bond unless otherwise specified. 115 mm thick brick work shall be laid with stretchers. For laying bricks, a layer of mortar shall be spread over the full width of suitable length of the lower course. Each brick shall be

pressed into the mortar and shoved

into final position so as to embed the brick fully in mortar. Bricks shall be laid with frogs uppermost.

All brickwork shall be in plumb and square/ circular unless otherwise shown on drawing and true to dimensions shown. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be leveled. The thickness of brick courses shall be kept uniform. For walls of thickness greater than 230 mm both faces shall be kept in vertical planes unless otherwise specified. All interconnected brickwork shall be carried out at nearly one level so that there is uniform distribution of pressure on the supporting structure and no portion of the work shall be left more than one course lower than the adjacent work. Where this is not possible, the work shall be raked back according to bond (and not saw toothed) at an angle not exceeding 45 degrees. But in no case the level difference between adjoining walls shall exceed 1.25 M. Workmanship shall conform to IS: 2212.

Brick shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joints shall be raked to a minimum depth of 12 mm by raking tools daily during the progress of work when the mortar is still green, so as to provide a proper key for the plastering to be done. When plastering is not required to be done, the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top. If mortar in the lower courses has begun to set, the joints shall be raked out to a depth of 12 mm before another course is laid.

1.5.1 Cement Plaster

All joints in masonry shall be raked to a depth of 12 mm with hooked tool made for the purpose when the mortar is still green and in any case within 48 hours of its laying. The surface to be rendered shall be

washed with fresh clean water free from all dirt, loose material, grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be rendered will however be kept dry. The wall should not be too wet but only damp at the time of plastering. The damping shall be uniform to get uniform bond between the plaster and the wall.

The proportion of the cement mortar shall be as approved on relevant drawings. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a

workable consistency. The quality of water, sand and cement shall be as per relevant I.S. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to remain for more than 25 minutes after mixing with water.

Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days.

Plastering shall be done on inner face of brick masonry in cement mortar (1:3) and 15 mm thick unless otherwise specified.

Cement pointing in C: M (1:3) shall be done on outside the chamber including racking out joints, curing etc. complete as directed by the engineer-in-charge.

1.5.2 Cement Concrete Block

The C.C. blocks for the chamber shall be constructed in cement concrete of M15 grade to take care of weight of valves.

1.5.3 Pipe Entering or Leaving Chamber

Whenever a pipe enters or leaves a chamber, bricks on edge must be cut to a proper form and laid around the upper end of the pipe so as to form an arch. All around the pipes, there shall be a joint of cement mortar (1:2) 13 mm thick between it and the bricks.

1.5.4 Precast Reinforced Cement Concrete Slab with key holes

Precast Reinforced cement concrete top slab shall be casted in pieces for covering the chamber. Necessary

keyholes shall be provided at appropriate place for operation of spindle of valve. The minimum thickness of slab shall be 100mm and same shall be casted in C.C. of M20 grade. The required reinforcement shall be provided. The top & bottom surface of precast slab shall be finished with cement mortar 1:3. Measurement and Payment

The items of the work shall be measured and paid on the number basis complete in all respects including all materials, labours, jointing materials, tools, transportation, taxes and other including items for completion of work.

Item General Encasing

Providing C.C. M-100 for encasing of pipe using trap metal size 40mm to 50mm including form Work curing consolidation etc. complete.

In general the work shall be carried out as per the standard specifications of P.W.D. / C.P.W.D/ GWSSB. relevant drawings and as per the instructions of Engineer in Charge. Work shall be carried out as per item description.

Specification for Encasing of Pipe is as under:

The designation ordinary C.C. M-100 specified as per I.S. Corresponding approximately to 1:3:6 nominal mix of concrete by volume respectively.

The ingredients required for cement concrete containing one beg of cement of 50 Kg. by weight (0.0342 Cu.M.) for proportion of mix shall be as under : Grade of Concrete : M-100 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 300 Liters.

Proportion of fine aggregate to coarse aggregate – Generally 1:2 for fine aggregate to coarse aggregate by volume but subject to and upper limit of 1:1/2 and lower limit 1:3

Quantity of water per 50 Kgs. of cement maximum – 34 Ltr.

The water cement ratio shall not more than those specified as above. The cement content of the mix specified as above shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water – cement – ratio specified as above is not exceeded.

Workability of the concrete shall be controlled by maintaining a water – cement – ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

The maximum size of coarse aggregate shall be as large as possible within the time limits specified but in no case greater than one fourth 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.

For concrete work, trap metal size nominal 12 to 50mm to be used.

Workmanship shall be given in concrete section and directed by Engineer-in-charge

The Rate shall be paid per Cum Basis

MAINTANANCE AND REPAIRES

➤ **Operation and maintenance and repairing of all the components executed under this tender mainly Sewer Collecting Network, pumping machinery, pumping station, Inlet Chamber, Screen Chamber, Rising Main, Including establishment charges and all materials on repairing of pipe line and other civil works and pumping machinery as per detailed specification & obligatory requirement**

1.0 GENERAL CONDITION

Details of O & M to be done by the contractor is as under,

2.0 Scope of the work

The Tender includes following work already completed to be operated and maintained by agency.

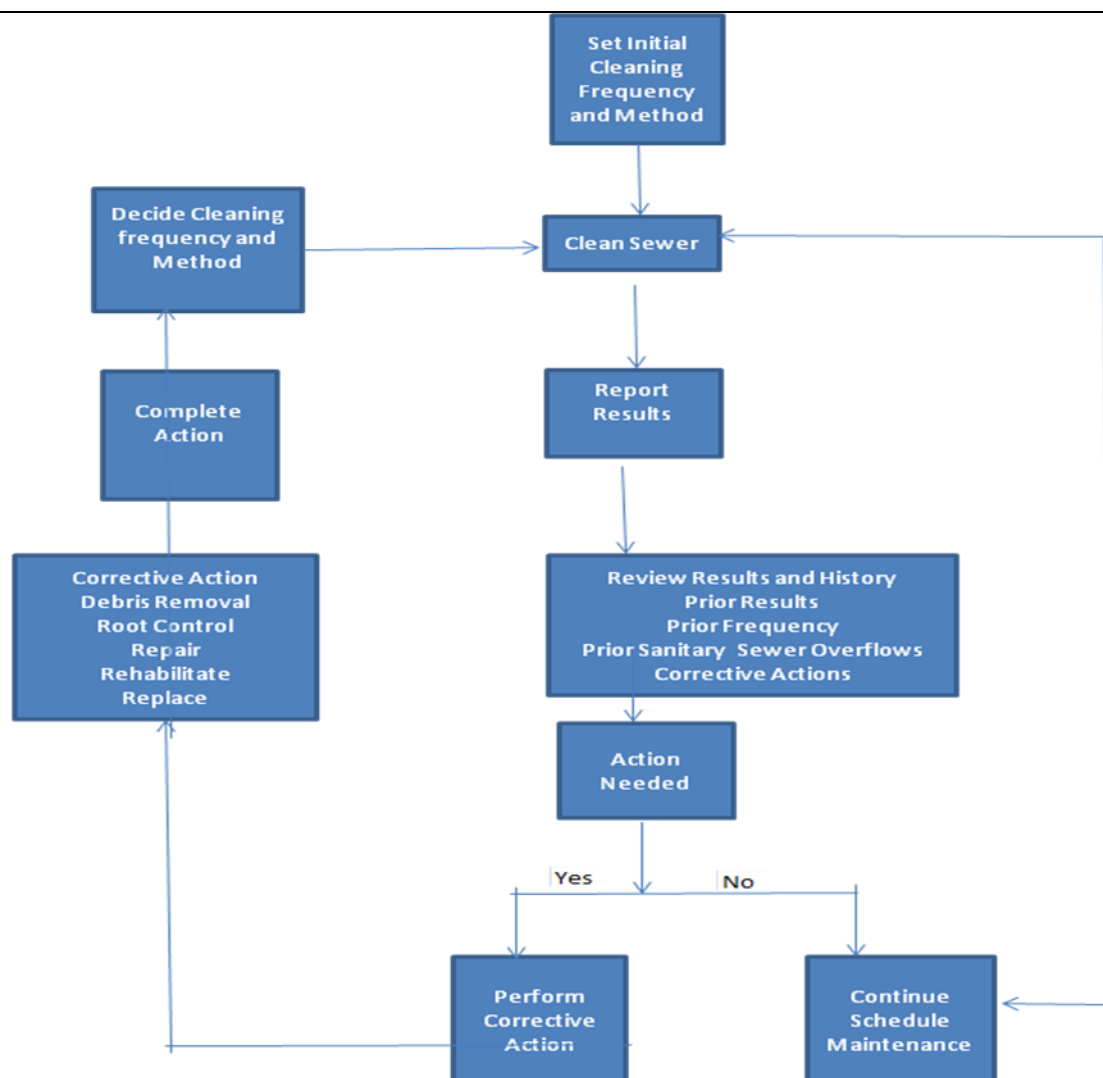
2.1 Sewer Collecting Network System:

Basic maintenance of sewer collection system broadly includes physical inspection to identify maintenance needs followed by hydraulic cleaning, mechanical cleaning, and/or root control depending on the corrective action required. The operation and maintenance department should have a clear understanding regarding the quantity and quality of physical resources available with them. Information should be well documented and readily available for any reference or emergency purpose.

The highest priority cleaning needs take precedence over regularly scheduled routine maintenance activities. These should particularly focus on,

1. Emergency cleaning to clear blockage & relieve a surcharge condition.
2. Sewer pipes at risk of collapse.
3. Sewer lines prone to frequent blockages and requiring regular periodic cleaning.
4. Sewer lines contributing to Dry Weather Sanitary Sewer Overflows or building backups.
5. Daily scheduled routine cleaning.

The general procedure for maintenance planning, sewer cleaning, and sewer repair is given in the following figure.



2.2 Allied Work: House Connection Chamber and Manhole and toilet blocks, compound wall have to be maintained for day-to-day functioning.

2.3 Pumping station: Inlet Chamber, Screen Chamber and Pumping Machinery including all electro mechanical components is to be maintained for day-to-day functioning.

2.4 Road Works (Concrete roads) : Any defects including cracks will have to be repair and/or filled and surface rendered to match with the RCC in 14 days.

2.4 Road Work (Bituminous work): Repairs and maintenance of Bituminous surface including filling cracks, settlements of road, pot holes and patch repairs etc as and when required within 14 days.

3.0 GENERAL CONDITIONS FOR O & M:

- (a) The sewer collecting network pipes, Manhole, HC Chambers which are completed by agency is to be maintained for day-to-day smooth functioning. The details given are as per schedule of quantity.
- (b) The pumping machineries shall be run by the contractor as per the requirement (With full efficiency and as per GEB power Factor)
- (c) If the pumping machinery fails due to any reason, the contractor has to repair or replace the pumping machinery at his own cost and pumping of sewage should be restored within next two hours of period The Record for disposal of sewage should be maintained by contractor and record should be maintained by the contractor.
- (d) Pumping Machinery, Electrical items to be maintained as per requirement of manual.
- (e) The Record for disposal of sewage should be maintained by contractor.
- (f) The maintenance of rising main should be done by the contractor, if any leakage found it should be repaired within next 2 hours.
- (g) If the sewage cannot be pumped due to failure of pipe line /pumping machinery and if pumping is not restore within time limit than the contractor has to pay penalty at the rate of Rs10 per 1000 lit. of average sewage not pumped and pay any compensation due to health Hazards.
- (h) Minimum Staff pattern required for O & M to run this scheme will be as per para 3. Carry out regular and frequent sampling to be carried out and to be send to authorized laboratory for analysis and result recording of raw and treated sewage as per the procedure laid out by the owner and in conformity with standard method in comply with the GPCP norms.
- (i) The disposal of the foreign particle like sand, dead animal etc from all the unit to suitable place as shown by the employer is in the scope of contractor.
- (j) Employ appropriate and skilled man power; provide all tools, tackles, equipments, instruments etc required for effective implementation for services.
- (k) All building, bathroom, toilets, to be kept swept clean and washes daily. Consumable requirement for cleaning such as acid, harpic, phenyl, air freshener, washing powder, wire brush, duster, etc shall be provided and use as required.
- (l) All ventilators, door window to be clean and keep in good aesthetic condition. To keep watch on overflowing of any unit if such over flow take place the agency shall have to bare the damages caused to surrounding properties.
- (m) Contactor shall submit five copies of O & M manual for approval of employer which may be modified if required by employer and two copies would be return by employer duly approved and sign.

- (n) The contractor shall hand over the project back to owner/employer/local body on expiry of this contract in fully working condition satisfying the requirement

4.0 PREVENTIVE MAINTENANCE CHECKS

- 4.1** The Contractor shall adopt a preventive maintenance check's schedule as agreed mutually between the Contractor and the Employer.

- 4.2** The following checks to be performed daily by the Contractor's personnel

- 4.3** Whether there is a change in the sound of a running pump, abrupt changes in bearing temperature and seal leakage?

- a) The pump capacity, pressure, power consumption and vibration level to check if outage is required to address deterioration of specified performance values.
- b) Rise in temperature of bearings in motor, in moving parts and other units, etc.
- c) Working of gauges, sensors and other flow measuring devices
- d) Average power factor, kVARH, kWH consumed

- 4.4** The following checks to be performed weekly by the Contractor's personnel

- a) Pipeline and valve leakage
- b) Functioning of non-return valve
- c) Tightness of all electrical connections of all unit panel etc.
- d) Tightness all cable connections
- e) Temperature rise due to loose connections
- f) Operation of valves and sluice gates.
- g) Current and voltages in all electrical equipment
- h) Average power factor, kVARH, kWH consumed

- 4.5** The following checks to be performed monthly by the Contractor's personnel

- a) Battery voltage, battery charger, topping of distilled water, tightness of terminations etc.
- b) Gland packing
- c) Wear and tear of moving parts
- d) Adoption of Electrical energy conservation methods and energy consumption
- e) Electrical contacts
- f) Motors
- g) Meggering of electrical equipment

h) Watering of earthing pits

4.6 The following checks to be performed quarterly by the Contractor's personnel

- a) Relay testing and calibration if possible of meters, gauges, instruments
- b) Speed of motors
- c) Level gauges and flow meters signals
- d) Cleaning, checking/tightening of L.T. Circuit / Panel
- e) Tightening of PMCC components
- f) Auxiliary DB, Capacitor bank
- g) Battery and Battery charger

4.7 The following checks to be performed bi-annually by the Contractor's personnel

- a) Free movement of stuffing box glands, gland bolts to be cleaned & lubricated and packing to be inspected to determine whether it requires replacement.
- b) Pump and motor alignment should be checked and corrected if necessary.
- c) Grease lubricated bearings should be checked to see that they contain the correct amount of grease and that it is still of suitable consistency.

4.8 The following checks to be performed annually by the Contractor's personnel

- a) Vibration should be reviewed. If the pump is tending towards unacceptable vibration levels:
 - i. The bearing should be removed, cleaned and examined for flaws and wear.
 - ii. The bearing housing should be carefully cleaned.
 - iii. Rolling element bearings should be examined for scratches and wear.
 - iv. Immediately after cleaning, rolling element bearings that are considered acceptable for reinstallation should be coated with grease. If the bearings are damaged it shall be replaced with new bearing of the correct size and type as per O&M manual.
- b) Shaft sleeve and shaft should be examined for wear.
- c) When coupling halves are disconnected for an alignment check, the vertical shaft movement of a pump with sleeve (journal) bearing should be checked at both ends with packing or seals removed. Any movement exceeding the original design clearance should be investigated to determine the cause. Endplay allowed by bearings should also be checked. If it exceeds that recommended by the manufacturer, the cause should be determined and corrected.

- d) Stuffing boxes should be repacked and the pump & motor should be realigned and reconnected
- e) Overhauling requirement of all equipment
- f) Improvement required if any in operation of plant
- g) Testing and Calibration of all instruments
- h) Transformer cleaning, checking silica gel, oil checking filtering/replacing

4.9 This work is also inclusive of painting of plants as per following schedule and paint shall be of the same specification as described in respective unit/ mechanism as per original specification of the executed work.

Sr. No.	Item	Duration
1	Civil work	Once in three years i.e after the 3rd year of O &M
2	Doors and windows	—do—
3	Shutters, grills, collapsible gate etc	—do—
4	All H.T./ L.T. panels	—do—
5	All process equipment with its accessories and GI railings etc.	—do—
6	Street / flood light pole	—do—
7	Pump sets, valves, C.I. fittings, sluice gate, etc.	—do—

Note: However, if any unit mechanism will found to have some defect in paint work at any time, the Contractor has to repaint the same under the instruction of City Employer.

5.0 MINOR REPAIR GENERALLY ENCOUNTERED IN THE PROJECT UNIT:

The minor repairs which have been most often encountered are as given below:

5.1 Electrical works

a) For H.T. Installations

- i) Replacement of jumpers
- ii) Replacement of insulator (Porcelain)
- iii) Replacement of Air-Break Switch

b) For Both H.T. & L.T. Installations

- i) Replacement of no-volt coil for VCB

- ii) Replacement of Cable lugs including terminations
- iii) Replacement of burnt out HRC fuses
- iv) Replacement of moving and fixed contacts or contractors
- v) Repairs to isolators and switch fuse units and replacement of it and fuse base units.

5.2 Pump sets

- a) Replacement of coupling bolt and nuts including rubber bushes
- b) Replacement of worn out impeller nut
- c) Replacement of spindle nut in the sluice valve.
- d) Replacement of terminal plate in the motor
- e) Replacement of faulty/dead spares in the battery charger and battery control panel.
- f) Replacement of gland packing, graphite packing from the pump sets.

6.0 ADDITIONAL SCOPE OF WORK:

For other incidental additional work, if any, the Contractor on authorization in writing from the Employer shall execute which is not specifically mentioned in the scope at present.

7.0 ELECTRIC POWER AND WATER:

Employer shall directly pay all the power bills and same amount will be reimbursed by the client/owner but the Contractor will be required to furnish Electricity Consumption in the Schedules provided. If the average power factor in the PGVCL (GEB) BILL IS LESS THAN 0.96, the PENALTY /CHARGE FOR THE SAME WILL BE RECOVERED FROM CONTRACTOR/THEIR BILL.

8.0 MINIMUM STAFF PATTERNS FOR O & M.:

As per Volume II, General Condition of Contract

9.0 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.

10.0 VEHICLES:

Vehicles such as Mini trucks. tankers with tractor Jeep, Motor cycles, Rickshaw, cycles etc. required for maintenance and repairs of various components, and for

conveyance of message in respect of power or machinery failures or routine instructions etc. shall be arranged by the contractor to attend the site immediately for not to hamper the water supply indefinitely. All the required vehicles should be got available at head work sites in ready to use condition or to be hired as and when required.

No extra payment shall be made for transportation required for maintenance and repairs from one site to another. or to repair work shop.

Contractor has to provide necessary accommodation to their labours & engineers at his own cost.

11.0 ELECTRICITY SUPPLY:

Contractor should keep good liaison with Gujarat State Electricity Board (GEB) for power supply in case of GEB power failure (break down/shut down) it will be the responsibility of the agency to inform all the concerns as well as to contact GEB authorities to restore the power supply. The vehicle kept at site by agency shall be provided for this purpose along with operation and maintenance staff in case of requirement as per direction of Engineer in charge or his representative without any claims.

Average power factor in Gujarat electricity bill must be greater than 0.96 and if any penalty/charge/levied due to low power factor, than it will be re covered from the contractor without any reason. All capacitor panels must be kept in working condition to keep GEB power factor more than 0.96 by the contractor any spares required to keep capacitor panel in working condition is in the scope of the contractor the spares required for LT capacitor panel must be procure and replace immediately if required. This include in the scope of contractor

12.0 POWER OF ATTORNEY:

In case the tenderer is a firm or a company, they should mention the names of partners and of the person who will hold the power of attorney, authorizing him to conduct the transactions on behalf of the firm or company and shall produce certified true copy of power of attorney and partnership deed along with the tender and original shall be produced for verification on demand.

The contractor shall have to maintain a register for day to day consumption of chemicals & materials used for the operations, break-down and repairs completed etc.

13.0 WORK ORDER BOOK:

A bound half sheet size work order book shall be provided by the contractor and handed over to the client 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 should take prompt action as per the instruction/orders of the department and necessary compliance should be recorded against each instruction/order.

14.0 ELECTRICAL INSTALLATIONS:

All electrical work shall be carried out as per the provisions of Indian Electricity Act, Indian Electricity Rules, Instructions and requirement of authority/authorities i.e. Electrical Inspector and Gujarat State Electricity Board.

15.0 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, failing which it may be paid by CLIENT on behalf of the bidder from the amount payable to him. Contract or shall also be fully responsible for any loss to any individual or public property occurred due to his or his workers negligence under the scope of this contract.

16.0 USE OF SITE:

The contractor shall not unreasonably encumber the site with materials and equipment. The contractor should not use land for his private purpose.

17.0 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 the responsibilities of the contractor against any claim or liability arising from violation of above.

18.0 HANDLING OF CHEMICALS:

Safety and facilities to the staff for handling of chemicals and equipments 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.

19.0 ACCOMODATION FOR STAFF:

Contractor will have to make his own arrangement for accommodation for his employers/staff.

20.0 TRANSPORTATION:

Contractor will have to make his own arrangement for conveyance his staff at his own cost. No facility will be provided by the Dept.

21.0 MEDICAL:

Contractor has to provide medical facility First-Aid Box to his staff at his own cost.

22.0 CONTRACTOR STAFF & THEIR CONDUCT ETC.:

22.1 NATIONLTY & ADDRESS:

All employees should be Indian Nationality and it will be contractor's responsibility to give temporary and permanent address. Convicted or penalized person should not be employed.

22.2 SALARY TO EMPLOYESS:

Contractor should strictly follow labour laws and should also ensure regular monthly salary payment to his staff. The department will not take any liability of any of his employees appointed for operation and maintenance under this contract. Contractor should submit monthly certification for full payment to his staff on or before 10th of every month. Department reserves the right to conform the contents of the certificate from contractor's employee for there last pay. The Department will not be responsible for any delayed payment/compensation/overtime or any other claims by employees of contractor during the tender period and after even the tender period.

22.3 IDENTIFICATION DRESS CODE WITH BADGE WITH IDENTITY CARD:

Contractor will have to provide special dress code with identification badge with title name plate strip to be displayed on shoulders or front pocket to each staff as approved by Engineer in charge along with Identity Card etc.

22.4 HOLIDAYS AND LEAVE:

Holidays and leaves should be given to staff as per relevant labour rules. During holidays/causal leave/earned leaves etc. and contractor shall arrange for the substitute. The board shall not make any separate payment of overtime for these substitutes provided by the contractor during above periods.

22.5 CONDUCT:

All employees of the contractor should follow the instruction of Engineer in charge. If any employee misbehaves with Engineer in charge he/she should be immediately removed from duty and substitute for that should be employed by the contractor. If contractor fails to do so, non refundable penalty of Rs. 200/- (Rupees Two hundred only.) per day per such case will be recovered from the bill.

22.6 VISITORS:

The plant is one of its own kinds. Visitors are expected to visit this plant. It is expected that all staff and Engineers be present and follow the directives of Engineer in charge.

23.0 MAINTENANCE AND SUBMISSION OF RECORD TO CLIENT:

The contractor shall maintain various records as per prescribed format by Department and submit the same once in a week. The details are as below:

1. Log book of Sewage Pump
2. Daily power factor report at Pumping Stations sites.
3. Total MLD of Sewage Pump
4. Routine/Preventive Maintenance.
5. Breakdown maintenance.
6. Major Repairs.
7. Unit Cleaning
8. Complain attendance Register.

During O & M period constructor shall conduct regular inspection to obtain general information concerning the condition of each component. Information that will be included but not limited is the depth, construction material, depth of flow, visible leakage, condition of roads and need to repair. All findings shall be documented accordingly forms found in Appendices. Corrective maintenance may be scheduled immediately after inspection activities reveal an imminent problem that must be corrected to avoid an emergency situation. The completed work will be reported on the Sewer Line Maintenance Repair Report (Appendix 2). Emergency maintenance

cannot be scheduled, but a procedure for responding to and remediating the emergency situation must be developed. The completed work will be reported on the Sewer Line Maintenance Repair Report (Appendix 2). Information received from a citizen reporting a sewer complaint must be recorded on the Sewer Complaint Report (Appendix 3). Response to a sewer complaint may require that immediate corrective or emergency maintenance be conducted to correct the situation. If such maintenance is conducted, the Sewer Response Report (Appendix 4) shall be completed

24.0 LOSS OR DAMAGES AND IDENTITY:

The contractor shall be responsible during the progress as well as maintenance for any liability imposed by law for any damages to tile work or any part thereof or to any of the materials or other things used in performing the work of injury to any person or person or for any property damaged in or outside the works limit. The contractor shall indemnify and hold the owner and the Engineer harmless against any and all liability, claims, loss or injury including cost expenses and attorney's fees incurred in the defense of same arising from any allegations, whether groundless or not, or damage or injury to any person or property, resulting from the performance of the work or from any material used in the work or from any condition of the work site or from any causes whatever during the progress and maintenance of the work. The agency has to properly maintain all registers and other records as per labour act and factory act other Governing laws/rules by laws. The agency should produce all such records as and when required (even after within three years from the completion of work)

25.0 PUMPING MACHINERY:

Operation and maintenance of sewage pump with all other relevant electrical and mechanical equipments is as per data given para 1.5:

Contractor shall initiate and take adequate actions to ensure smooth & satisfactory performance / running the pumping machineries of the project on a 24 hours round the clock basis strictly in presence of pump operators.

26.0 EXTENT OF WORK:

Under this item the work of

- (1) Operation periodical maintenance,
- (2) Cleaning, check-up,
- (3) Testing for serviceability and

(4) Routine rectification of the equipment under.

Operational Schedule:

- A. Periodical maintenance schedule is included. The operation of sewage pumping should be in 3 shifts and maintenance, routine rectification, check-up, testing and repairs will be carried out in first shift (except in emergency).
- B. The staff operation is prescribed at annexure

OPERATON SCHEDULE:

Pumping machinery shall be as per Scope of the Work

Principal and Procedure for operation should be as under:

- Pumps are operated in such a manner that operation hours for pumps are maintained in proportion 1:1 for Non Clog Sewage Submersible pumps.
- Starting and stopping shall be kept to minimum
- Running the number of pumps in three shifts for disposal of sewage water shall be as per requirement.
- Checking all operations of gantry shall be carried out at least once in a day during non-operation period.
- Maximum efficiency should be maintain.

A. 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.

TESTING:

Tests should be carried out to ensure service utility and proper performance of the equipment

i. Pump Motor Sets :

Performance test shall be carried out once in 6 months. The tests include determination of discharge and efficiency of the pump motor set. The discharge shall be measured by increasing level in Wet Well and power by watt meter. The testes shall be conducted by running one pump or pumps in combination. Ali the test equipment required except watts meters and CTS shall be arranged by the

contractor. The observations and results of test shall be submitted in triplicate to the department.

ii. Relays:

The Relays shall be tested for proper operation once in a month after isolating trip circuit. The operation shall be checked for following conditions.

- I. Motor bearing temperatures
- II. Motor winding temperatures
- III. Short Circuit.

iii. Earthling System:

1. The earthling system shall be checked quarterly for following conditions values (A) Continuity (B) Earth Resistance

iv. Routine Rectification

1. Minor rectification works listed below and similar minor works shall be included in routine rectification.
2. Topping up of oil/lubricants of bearings gear box auto transformers etc.
3. Tightening of lugs and checking glands of 440 V Cable.
4. Rectifying loose connections.
5. Repairs/Replacement of pilot lamps, annunciation windows.
6. Replacement of fuses including D.O. Fuse.
7. Cleaning and replacement of contacts.
8. Cleaning and replacement of bearings...
9. Replacement of pressure gauge.
10. Replacement of coupling pin and bushes of flexible coupling.
11. Spot welding and brazing and soldering.
12. Replacement of limit switches of crane and valve actuator.

ADDITIONAL SPECIFICATION:

1. All meters such as volt meter, amp. Meter, frequency meter, power factor meter and all other such meters including the meters used as tools by the

agency shall be calibrated once in six months and the calibration certificate shall be produced.

2. The relay testing shall be carried out from reputed professionals approved by the Engineer in charge once in a year and the test certificate shall be produced.
3. The agency shall submit the statement of machinery under repairs every month along with probable repairs required with his monthly bill.
4. The agency shall submit all works done as against work scheduled during the shutdown taken in the month.

MODE OF PAYMENT:

1. It shall be paid based on schedule of payment; however, quantity of Sewage Pump.
2. If the sewage cannot be pumped due to failure or line/ pumping machinery or any other reason, the contractor has to pay penalty at the rate of Rs. 10.00 per 1000 liter of sewage not pumped.
3. Payment will be paid only after receipt of necessary daily/weekly/monthly report duly certified by Engineer in charge or his representatives.
4. If contractors fail to employ the minimum staff or if staff remains absent, penalty will be imposed at double rate than the wage paid.
5. The item also includes to calculate the daily power factor of head works site and to maintain the power factor as 0.95, which agency has to operate the capacitor provided by contractor where the pump are in running condition. If capacitor fails, then the agency should inform the same in writing to the dept. on the same day, otherwise in case of due to non maintenance the power factor, if GEB charges any penalty for the same will be recoverable from the operation and maintenance agency. Also GEB approved & certified make capacitors should be replaced within 24 hours.
6. The agency has to submit the license as per contract labour act within one month from the date of work order otherwise, a penalty of Rs. 5,000/- per month will be imposed.
7. The agency has to submit the documentary proof of CPF/ESIS contribution within one month from date of work order otherwise an amount of Rs. 5,000/- per month will be recovered.

The item includes all major and minor repairs such as replacement of machinery and spares, fuses etc. cleaning of electric components and keeping them neat and tidy, however major

repairs requiring special attention services are also included in the scope of this item.
Opening and refitting of these parts is to be assisted by the contractor at his cost.

Checklist

Appendix 1. House Connection Chamber& Pipe Inspection Comments

Sr No	Date	Downstream MH no/ Location	Maintenance rating	Repair required (Rate by no)	Additional Comments	Inspection by

Maintenance rating:		
1	No work required	Repair required
2	Damaged but not severe. Schedule for repairs.	1 Repair cracks/holes
3	Damaged Severe. Immediate repair required.	2 Seal Interior walls
4.	Leakage in Pipe	3 Replace Frame and Cover
5	Pipe damaged	5 Reconstruct chamber
		6 Seal wall/base joint
		7 Repair pipe connections
		8 Replace Pipe

Appendix 2. Sewer Maintenance log

Sr No	Date	Location	Downstream Manhole no.	Maintenance Performed	Inspection by

Appendix 3. Sewer Complaint Report

1. Complaint no:

2. Date of Report:

3. Issuer of Complaint:

4. Contact no:

5. Physical Location:

6.Complaint:

Signature

Appendix 4. Sewer Response Report

1. Complaint no:

2. Date of Report:

3. Respondent/Investigator:

5. Physical Location:

6. Problem

Description: _____

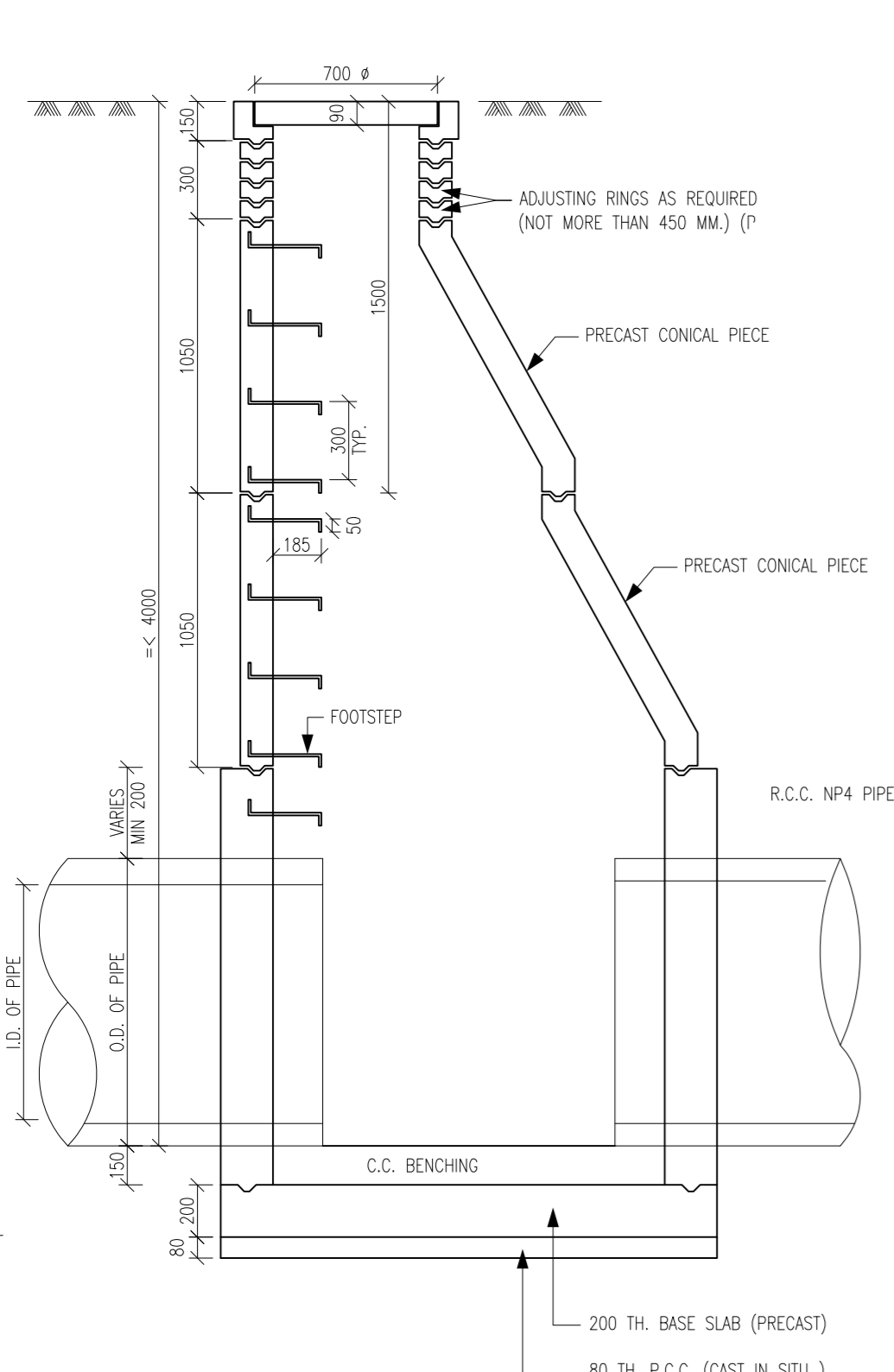
7. Did any sewage spill onto the ground? ___ Yes ___ No

6.Action Taken:

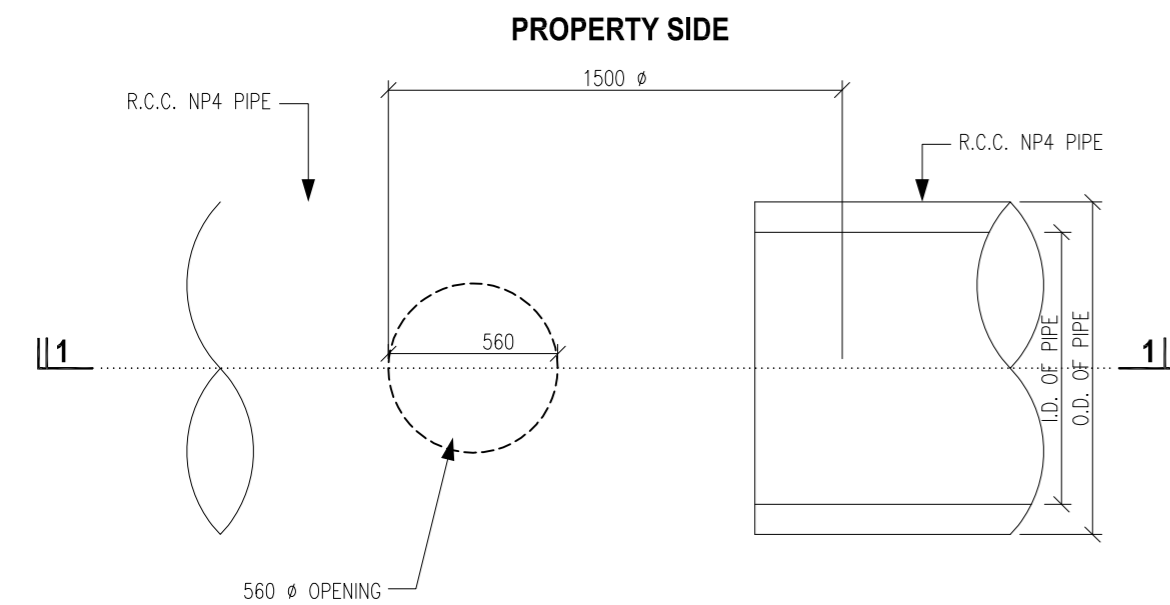
7. Was the problem solved? ___ Yes ___ No

Signature

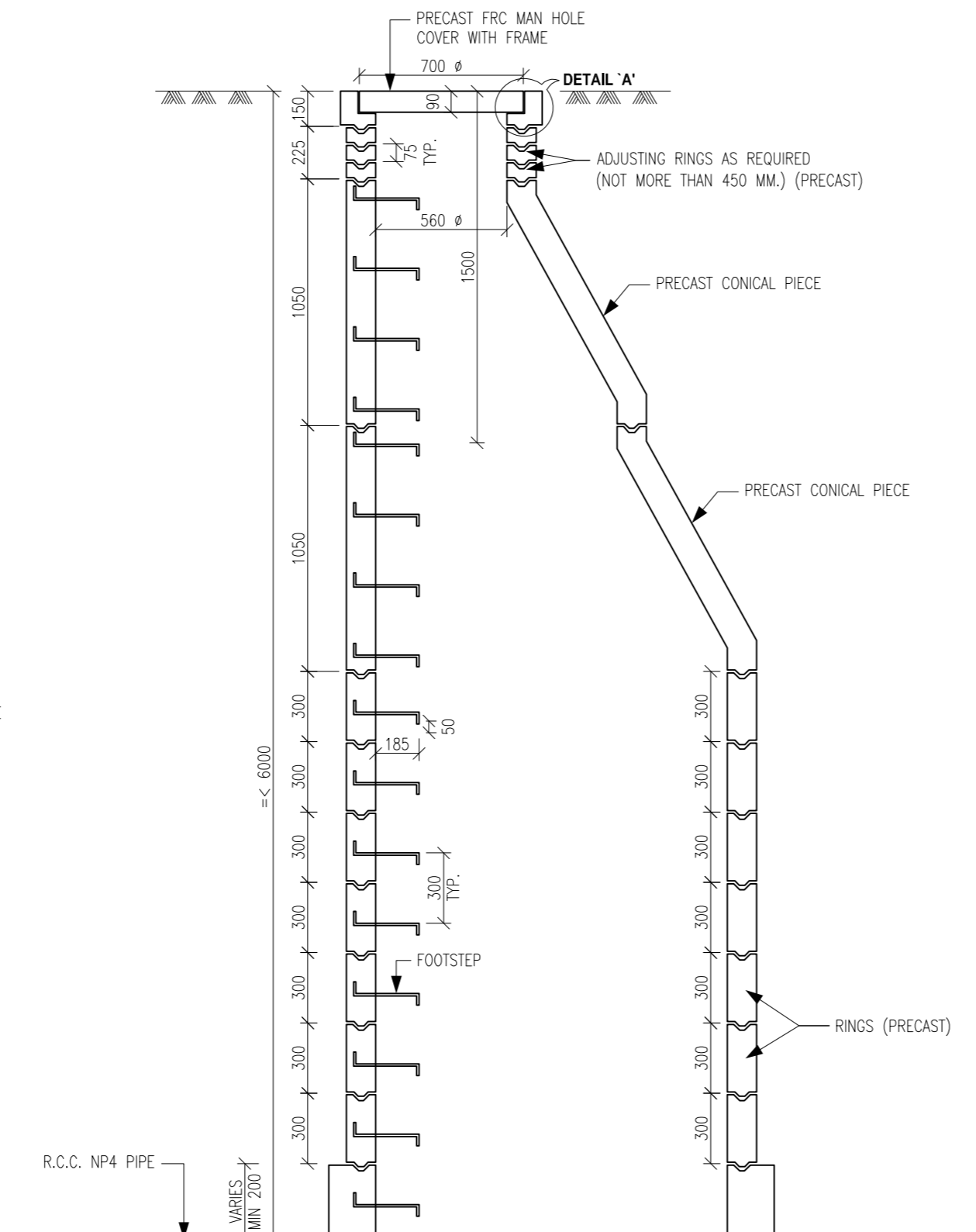
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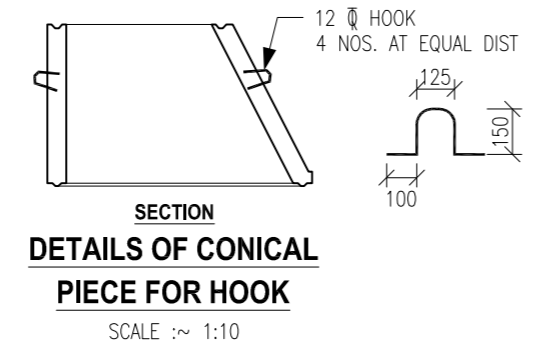
SEC. 1-1 FOR 4000 DEPTH MANHOLE
SCALE ~ 1:25



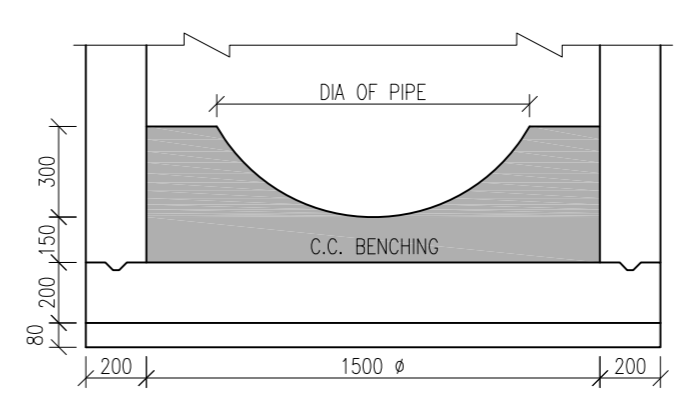
ROAD SIDE PLAN FOR PRECAST MAN HOLE
SCALE ~ 1:25



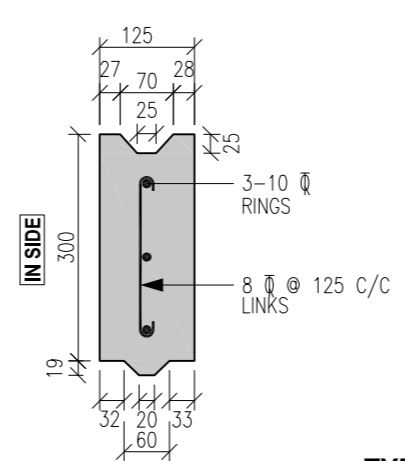
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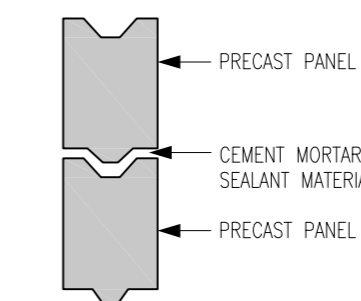
SECTION DETAILS OF CONICAL PIECE FOR HOOK
SCALE ~ 1:10



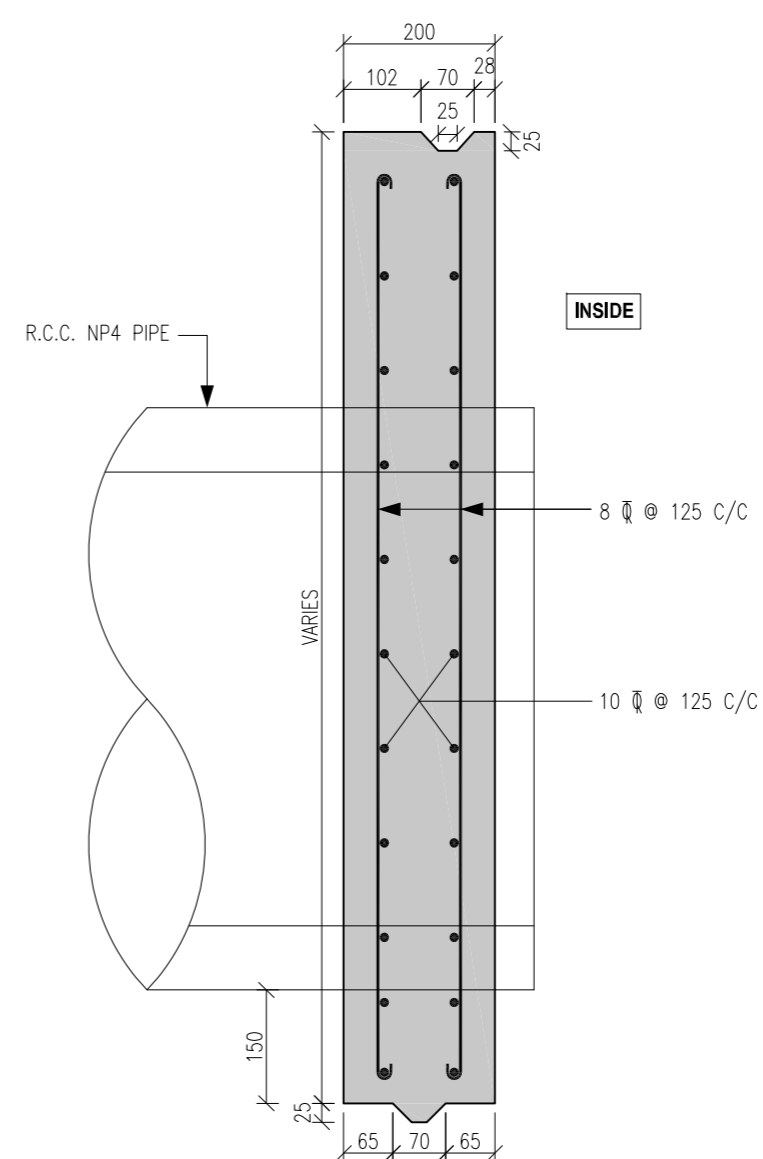
SECTION DETAILS OF C.C. BENCHING
SCALE ~ N.T.S.



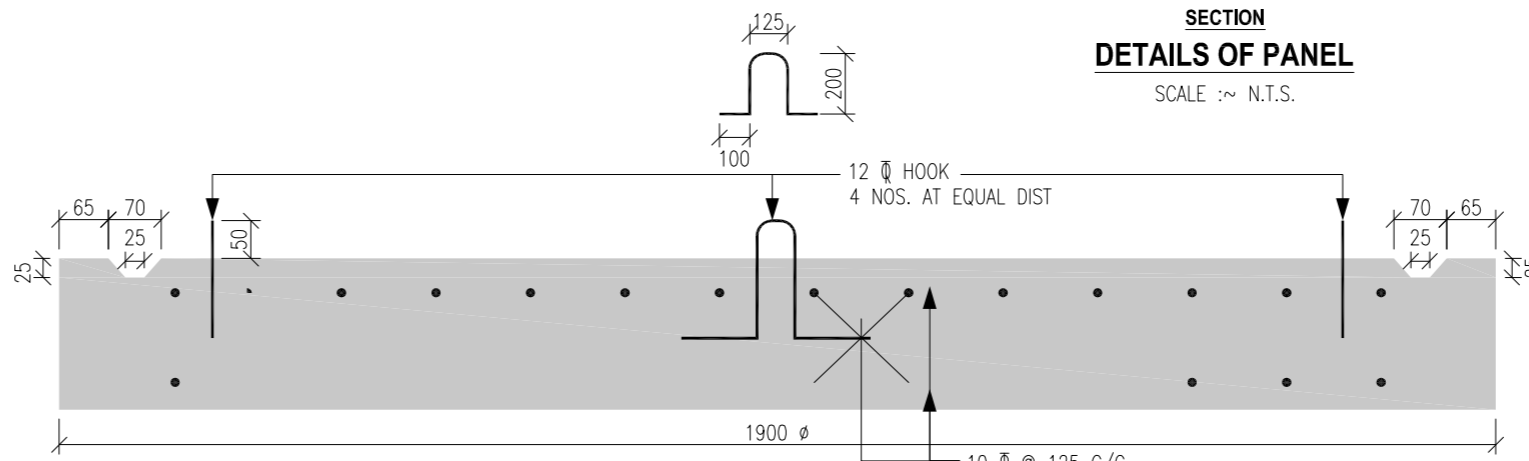
SECTION DETAILS OF RING
SCALE ~ 1:10



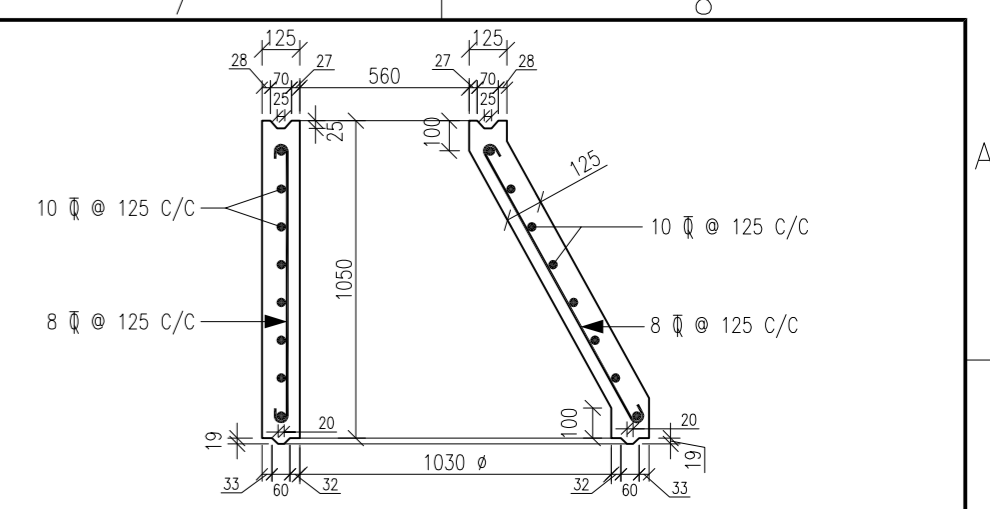
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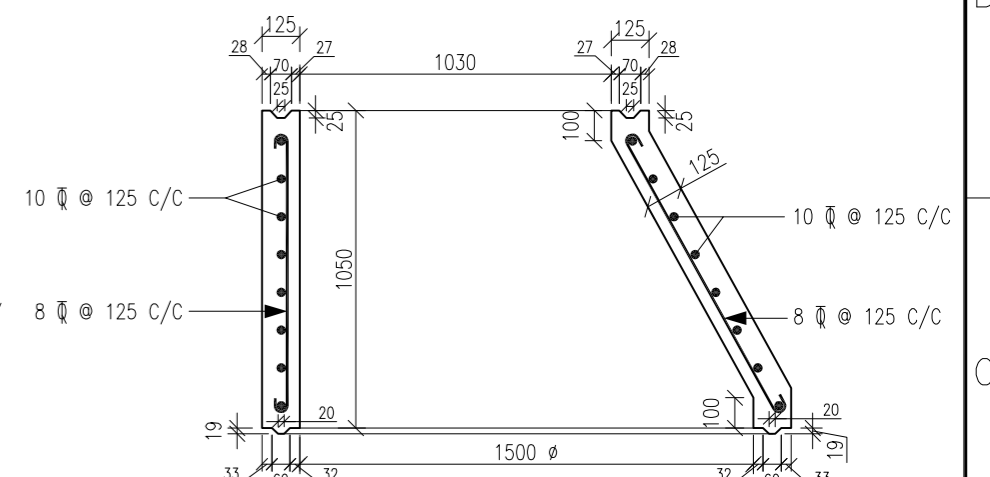
SECTION DETAILS OF PANEL
SCALE ~ N.T.S.



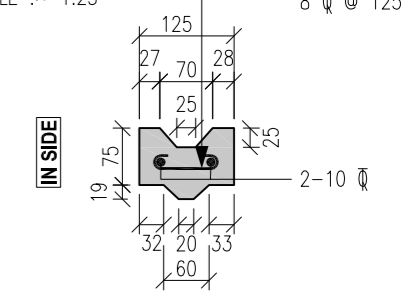
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SCALE ~ 1:10



SECTION DETAILS OF PRECAST CONICAL PIECE
SCALE ~ 1:25

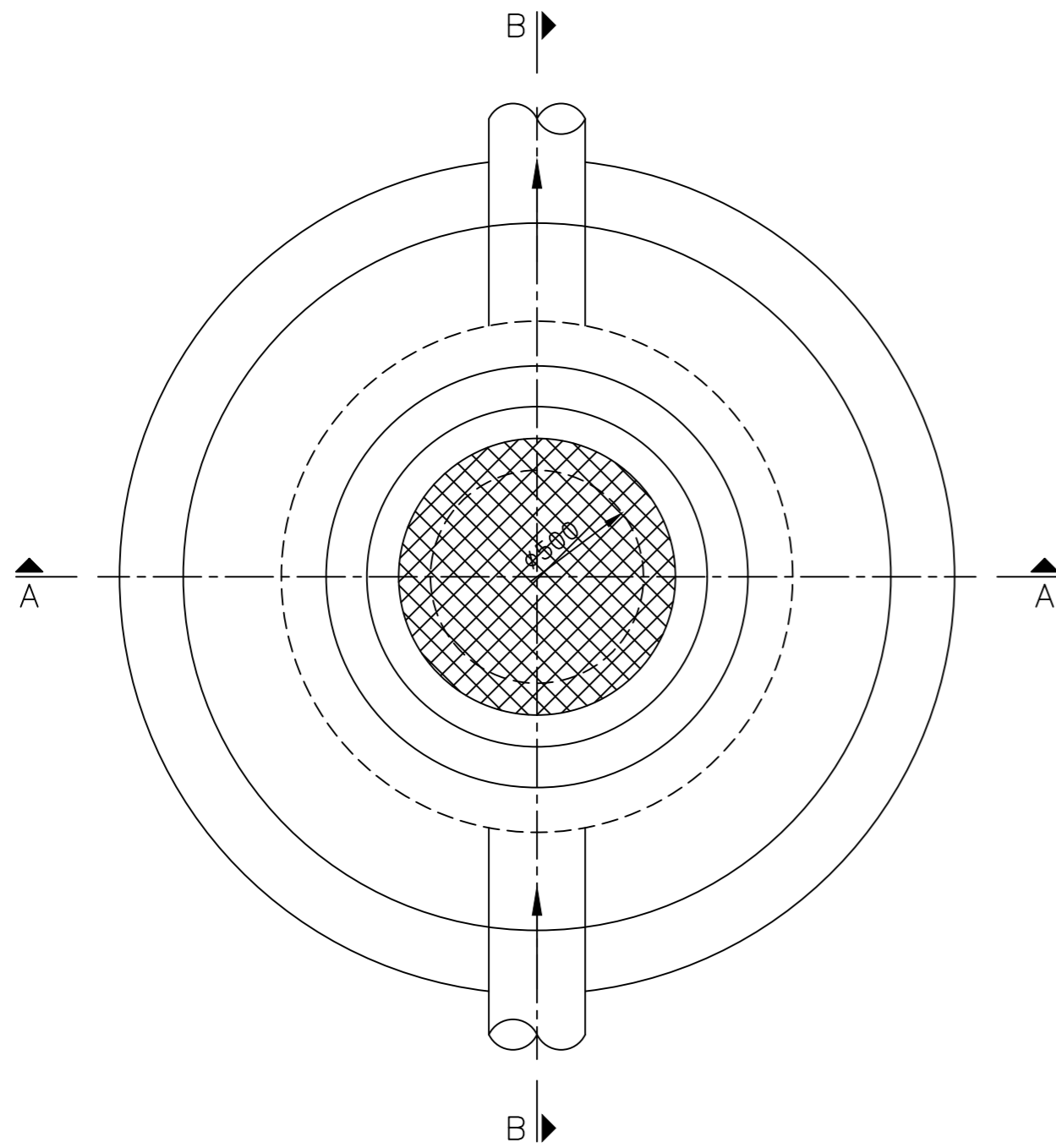


SECTION ENLARGE DETAIL AT 'A'
SCALE ~ 1:10

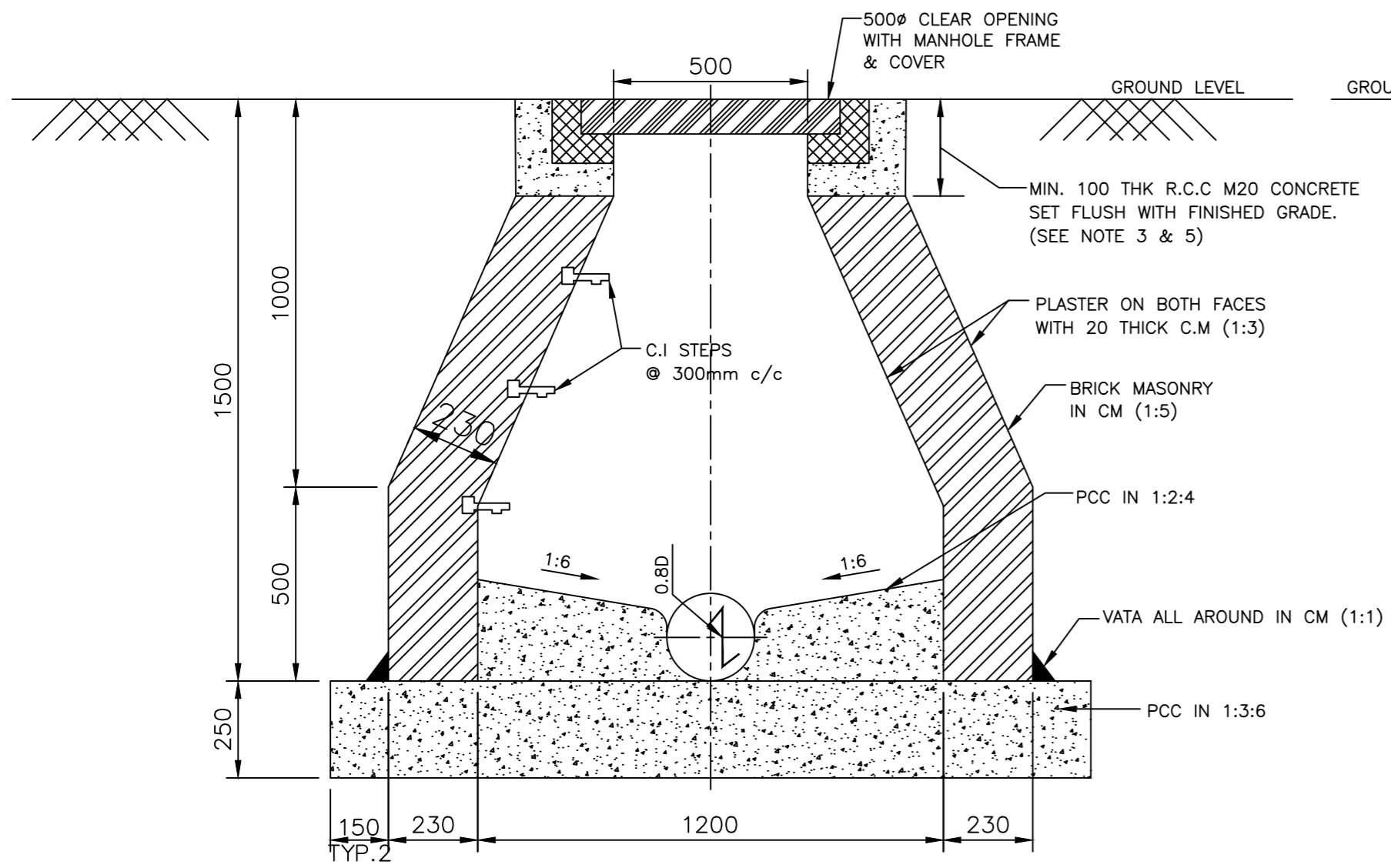


SECTION ADJUSTING RING DETAILS
SCALE ~ 1:10

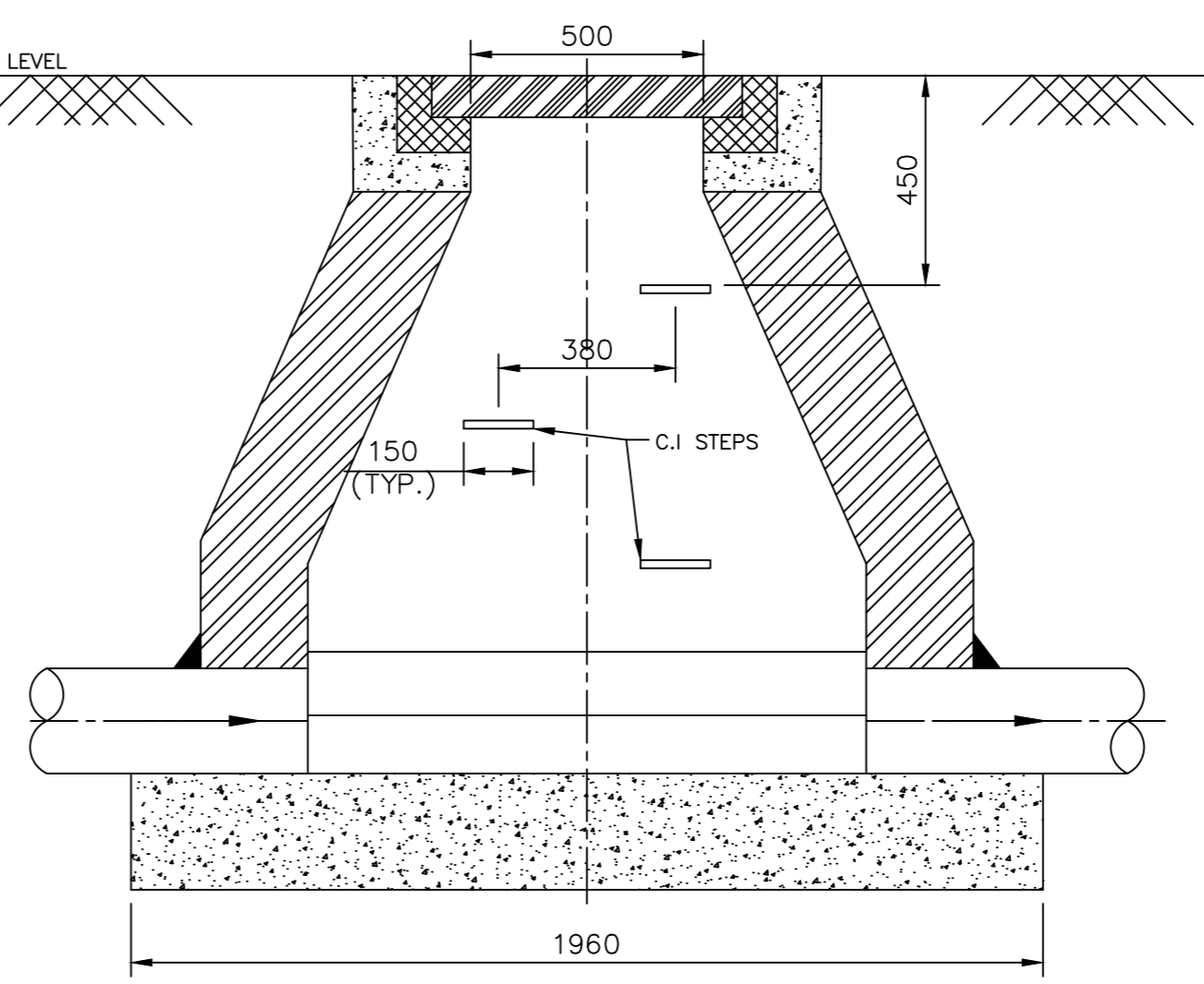
- NOTES ~**
- ALL DIMENSIONS ARE IN MILLIMETRE.
 - DO NOT SCALE THIS DRAWING.
 - ALL PLAIN AND REINFORCED CONCRETE SHALL CONFORM TO IS:456-2000, IS:3370. CEMENT FOR ALL R.C.C. WORK TO BE ORDINARY PORTLAND CEMENT CONFIRMING TO IS:269, IS:456.
 - ALL STRUCTURAL WORK SHALL BE CARRIED OUT AS PER RELEVANT INDIAN STANDARDS.
 - CONCRETE GRADE OF R.C.C. FOR ALL STRUCTURE = M40, AND FOR P.C.C. = M15.
 - Ø INDICATE TOR STEEL (TMT Fe 500) CONFORMING TO IS 1786.
 - COVER TO BE PROVIDED AT TOP & BOTTOM IN
 BASE SLAB = 40 MM.
 FLAT SLAB = 25 MM.
 CONICAL PIECE = 25 MM.



PLAN
SCALE 1:15



SECTION A-A
SCALE 1:15



SECTION B-B
SCALE 1:15

'A' TYPE CIRCULAR MANHOLE
FOR 150mm ϕ TO 600mm ϕ (DEPTH UP TO 1.5M)

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN MM.
2. 'D' IS DIA. OF SEWER PIPELINE.
3. 100 THICKNESS OF CONCRETE CAN BE VARIED TO FLUSH MANHOLE COVER AND FRAME WITH ROAD SURFACE.
4. CI STEP FIXED WITH CEMENT MORTAR 1:3.
5. SFRC MANHOLE FRAME & COVER AS PER I.S. 12592-2002.
6. THE BENCHING AT THE SIDE OF THE CHANNEL SHALL START FROM BASE AND THEN RISE WITH A SLOPE OF 1 IN 6 TOWARDS THE SIDE OF THE MANHOLE. SEMICIRCULAR PORTION WILL BE ACHIEVED IN CEMENT CONCRETE FINISHING ITSELF.
7. INTERNAL PLASTERING SHALL BE SULPHATE RESISTANT CEMENT (SRC).

0	03-04-2023	FOR APPROVAL
REV	DATE	SUBMISSION
SCALE	NTS	TITLE : TYPICAL DETAILS OF MANHOLE FOR TYPE - A TYPE - B TYPE - C
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	22-03-2023	
DRAWING NO.	SHEET NO.	
027-CE-HYD-DWG-06	01 OF 01	
SHEET A2	JOB NO. 027	

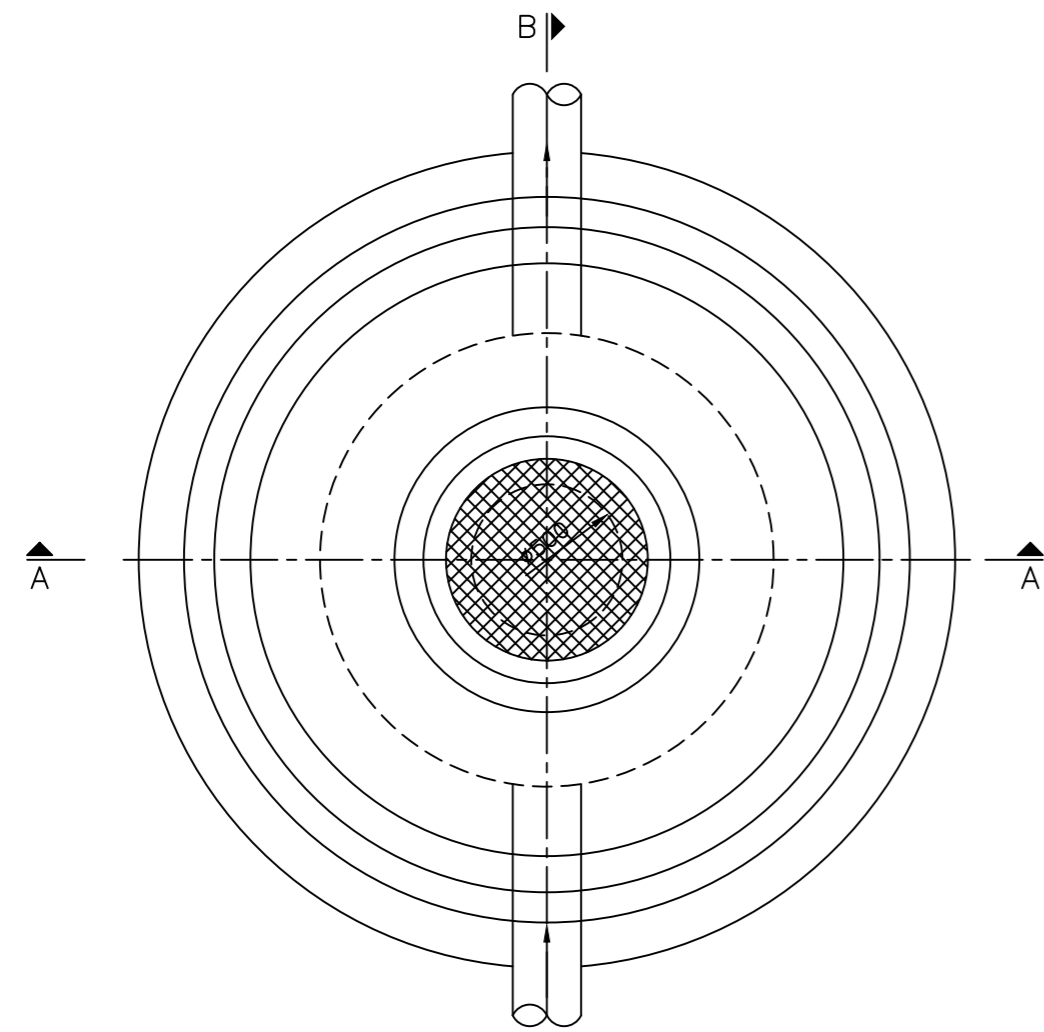
PROJECT :
PREPARATION OF DETAILED PROJECT REPORT ON
UPGRADATION OF SEWER NETWORK DESIGN OF
VARIOUS AREA OF BHAVNAGAR



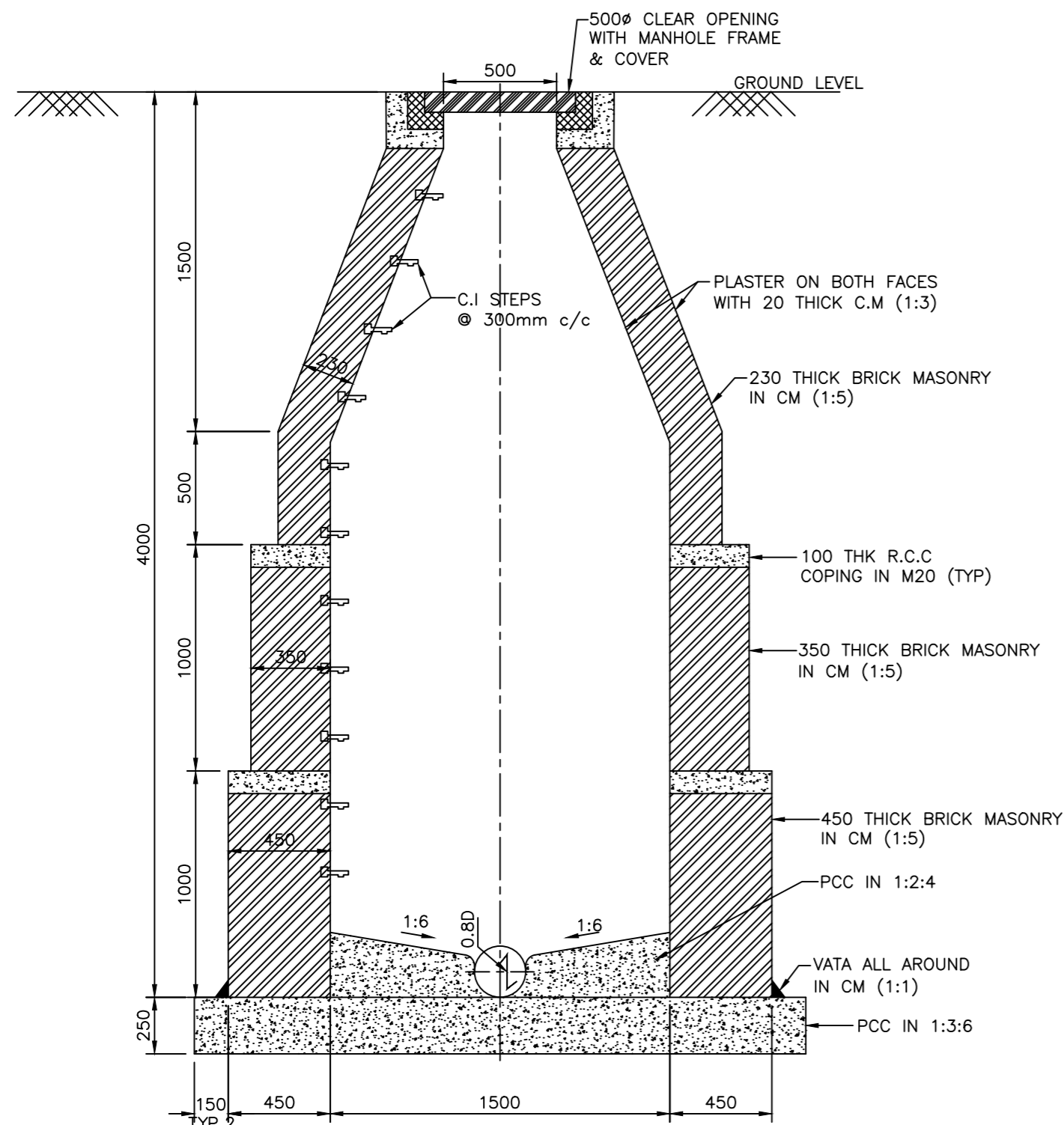
BHAVNAGAR MUNICIPAL
CORPORATION (BMC)

CONSULTANT: **technomen**
consultants

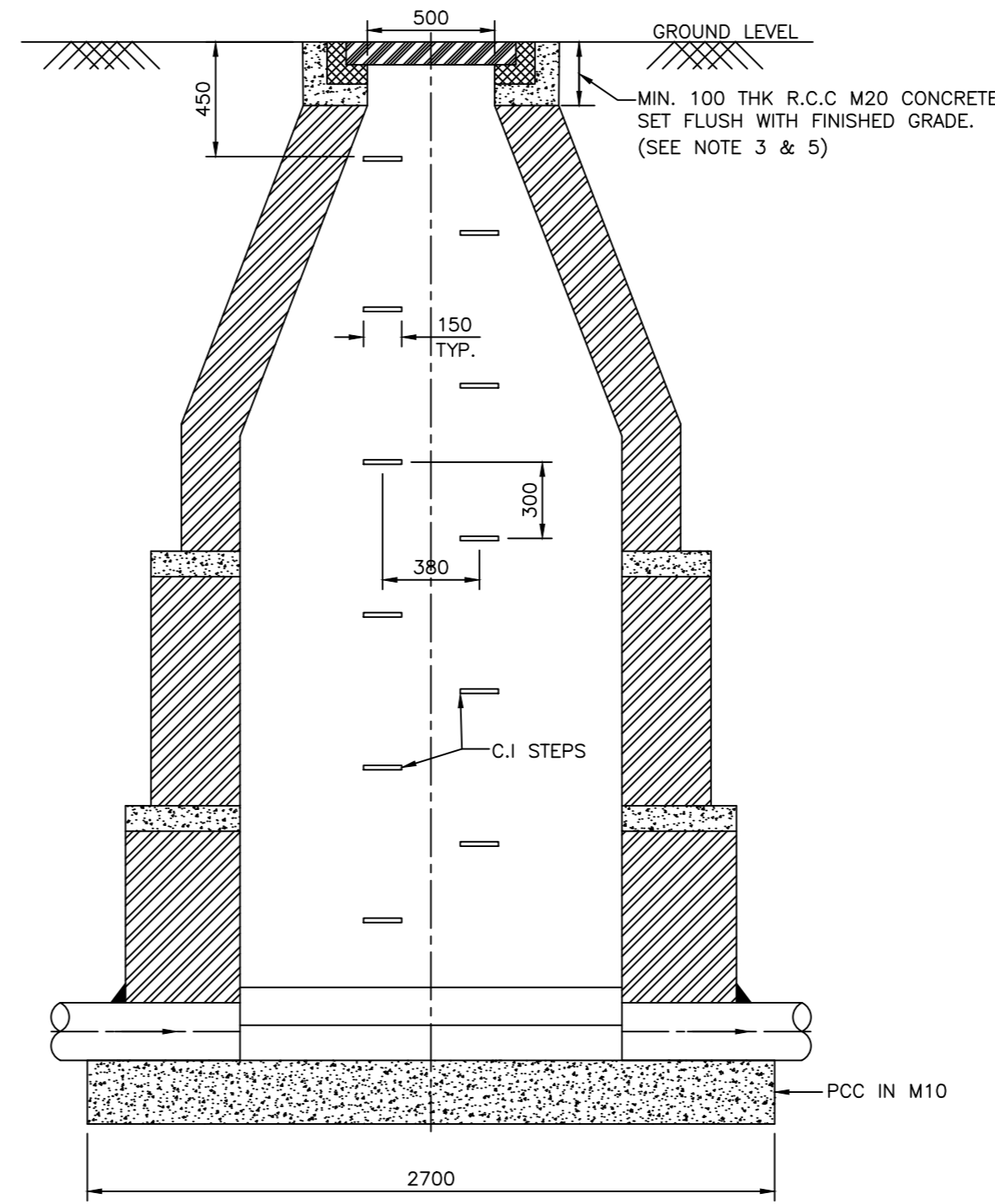
TECHNOMEN CONSULTANTS
223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
Koba-Gandhinagar Road, Kudasar, Gandhinagar - 382421,
Gujarat, India.



PLAN
SCALE 1:25



SECTION A-A
SCALE 1:25



SECTION B-B
SCALE 1:25

'B' TYPE CIRCULAR MANHOLE
FOR 150mm ϕ TO 600mm ϕ (DEPTH 1.5M TO 4.0M)

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN MM.
2. 'D' IS DIA. OF SEWER PIPELINE.
3. 100 THICKNESS OF CONCRETE CAN BE VARIED TO FLUSH MANHOLE COVER AND FRAME WITH ROAD SURFACE.
4. CI STEP FIXED WITH CEMENT MORTAR 1:3.
5. SFRC MANHOLE FRAME & COVER AS PER I.S. 12592-2002.
6. THE BENCHING AT THE SIDE OF THE CHANNEL SHALL START FROM BASE AND THEN RISE WITH A SLOPE OF 1 IN 6 TOWARDS THE SIDE OF THE MANHOLE. SEMICIRCULAR PORTION WILL BE ACHIEVED IN CEMENT CONCRETE FINISHING ITSELF.
7. INTERNAL PLASTERING SHALL BE SULPHATE RESISTANT CEMENT (SRC).

0	03-04-2023	FOR APPROVAL
REV	DATE	SUBMISSION
SCALE	NTS	TITLE : TYPICAL DETAILS OF MANHOLE FOR TYPE - A TYPE - B TYPE - C
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	22-03-2023	
DRAWING NO.	SHEET NO.	
027-CE-HYD-DWG-06	01 OF 01	
SHEET A2	JOB NO. 027	

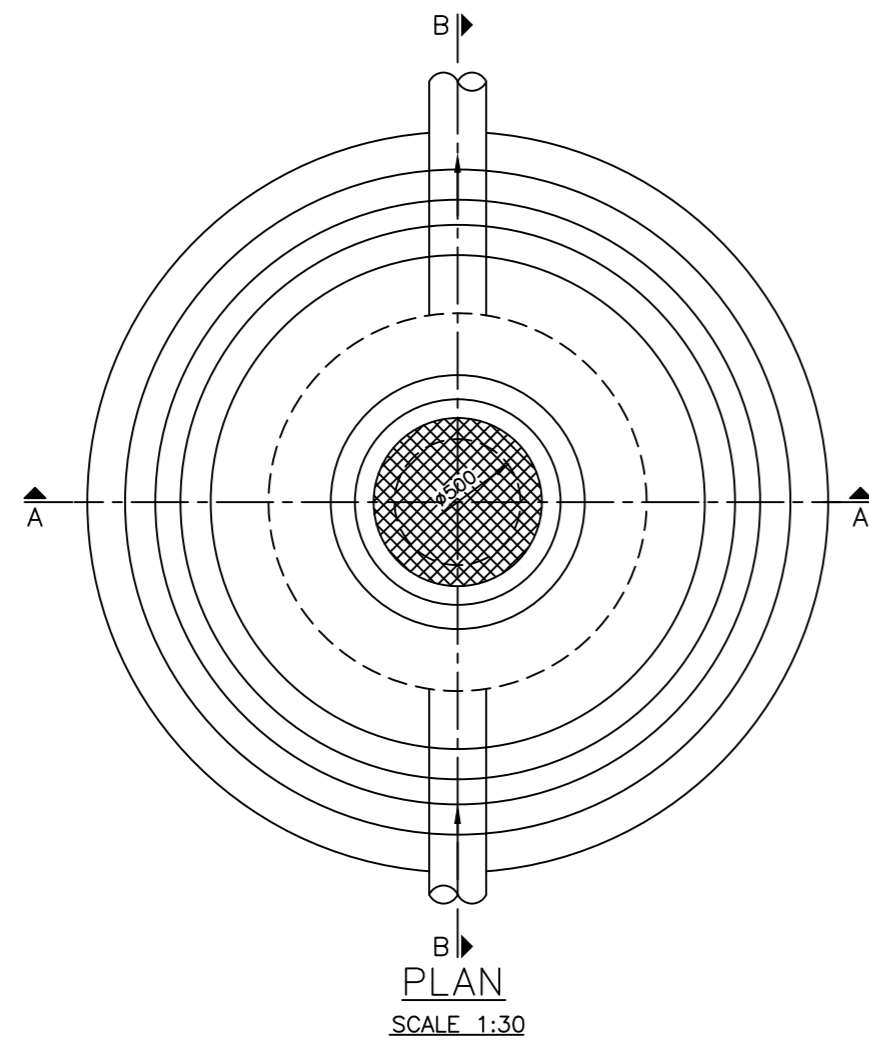
PROJECT :
PREPARATION OF DETAILED PROJECT REPORT ON
UPGRADATION OF SEWER NETWORK DESIGN OF
VARIOUS AREA OF BHAVNAGAR



BHAVNAGAR MUNICIPAL
CORPORATION (BMC)

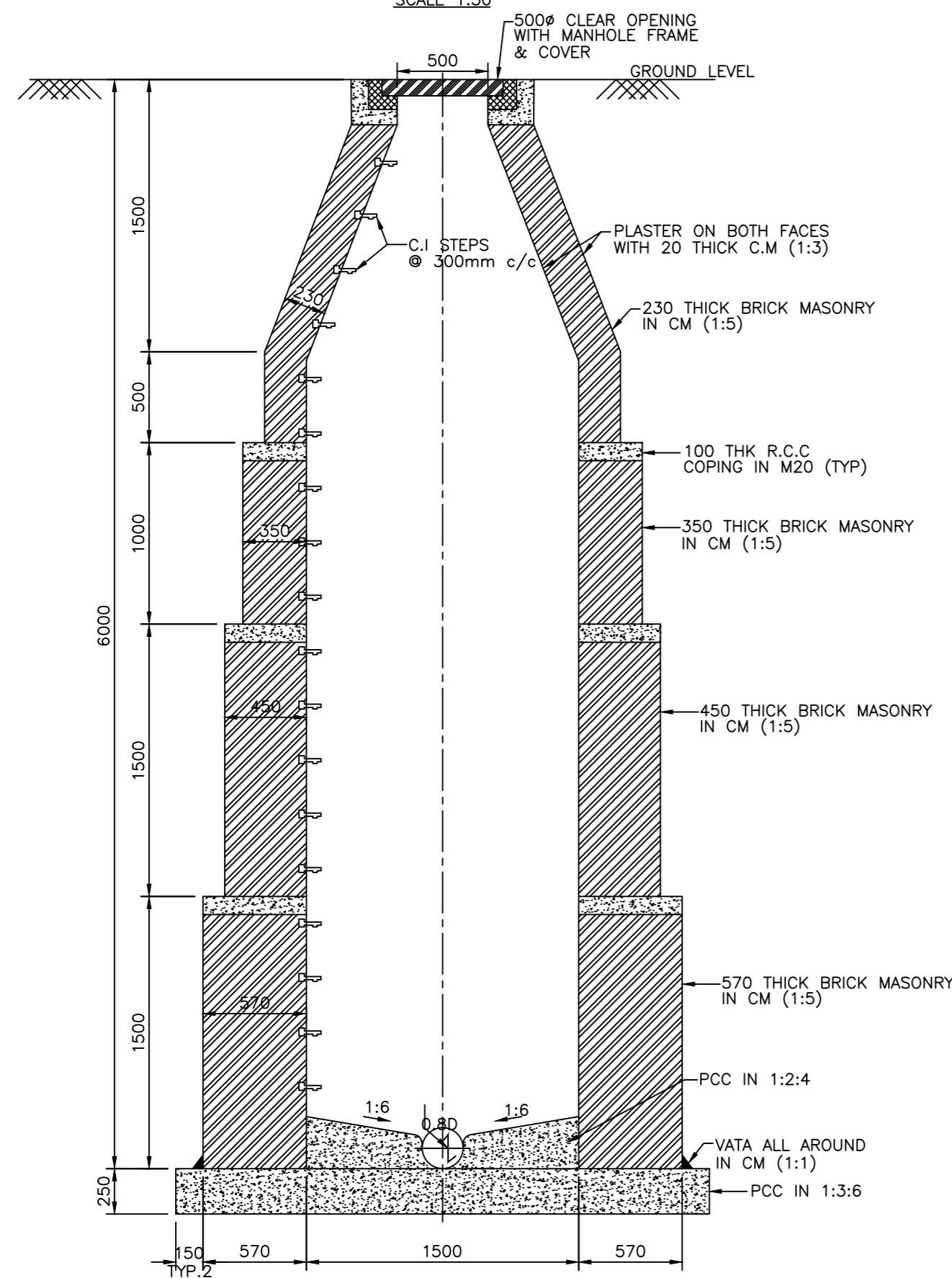
CONSULTANT: **technomen**
consultants

TECHNOMEN CONSULTANTS
223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
Koba-Gandhinagar Road, Kudasán, Gandhinagar - 382421,
Gujarat, India.



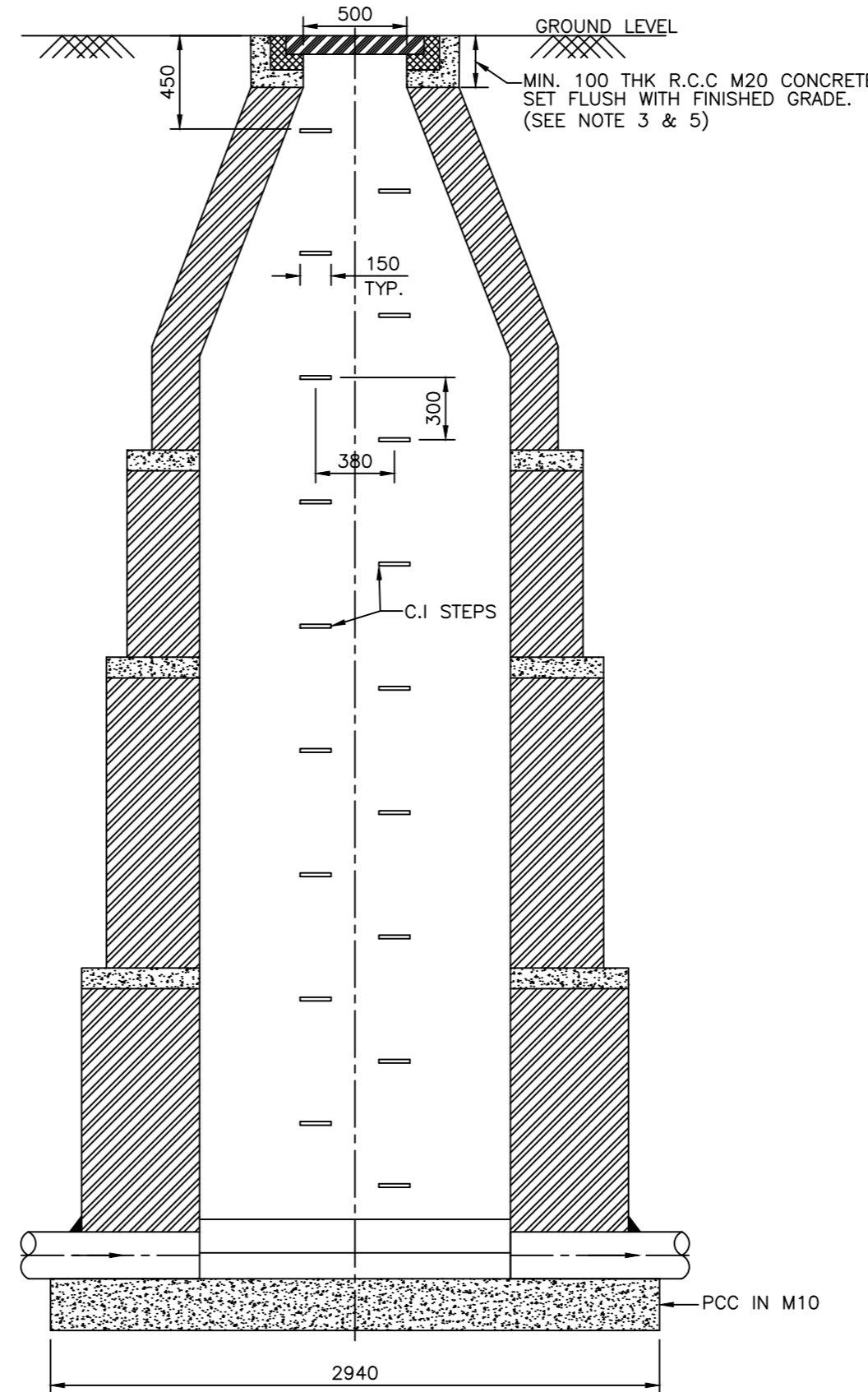
PLAN

SCALE 1:30



SECTION A-A

SCALE 1:30



SECTION B-B

SCALE 1:30

'C' TYPE CIRCULAR MANHOLE
FOR 150mm ϕ TO 1500mm ϕ (DEPTH 4.0M TO 6.0M)

GENERAL NOTES :

1. ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT OTHERWISE STATED.
2. 'D' IS DIA. OF SEWER PIPELINE.
3. VATA IN C.M.(1:1) SHALL BE PROVIDED ALL AROUND THE PIPE ENTERING AND LEAVING THE MANHOLE AND ALSO AT THE JUNCTION OF BRICK MASONRY AND CONCRETE BASE SLAB.
4. 100 THICKNESS OF CONCRETE CAN BE VARIED TO FLUSH MANHOLE COVER AND FRAME WITH ROAD SURFACE.
5. AT A GIVEN DEPTH THE THICKNESS OF BRICK MASONRY SHALL NOT BE LESS THAN THAT SHOWN IN THIS DRAWING.
6. THICKNESS SPECIFIED FOR BRICK MASONRY IS EXCLUDING THE THICKNESS OF CEMENT PLASTER ON BOTH FACES.
7. CHANNELS FOR MANHOLE ARE TO BE CONSTRUCTED DULY CONSIDERING THE DIRECTION OF FLOW AS WELL AS ALIGNMENT AND INVERT LEVEL OF PIPES ENTERING/LEAVING THE MANHOLE AND AS DIRECTED BY ENGINEER.
8. C.I. STEP FIXED WITH CEMENT MORTAR 1:3.
9. SFRC MANHOLE FRAME & COVER AS PER I.S. 12592-2002.
10. THE BENCHING AT THE SIDE OF THE CHANNEL SHALL START FROM BASE AND THEN RISE WITH A SLOPE OF 1 IN 6 TOWARDS THE SIDE OF THE MANHOLE. SEMICIRCULAR PORTION WILL BE ACHIEVED IN CEMENT CONCRETE FINISHING ITSELF.
11. INTERNAL PLASTERING SHALL BE SULPHATE RESISTANT CEMENT (SRC).

0	03-04-2023	FOR APPROVAL
REV	DATE	SUBMISSION
SCALE	NTS	TITLE : TYPICAL DETAILS OF MANHOLE FOR TYPE - A TYPE - B TYPE - C
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	22-03-2023	
DRAWING NO.	SHEET NO.	
027-CE-HYD-DWG-06	01 OF 01	
SHEET A2	JOB NO. 027	

PROJECT :
PREPARATION OF DETAILED PROJECT REPORT ON
UPGRADATION OF SEWER NETWORK DESIGN OF
VARIOUS AREA OF BHAVNAGAR



BHAVNAGAR MUNICIPAL
CORPORATION (BMC)

CONSULTANT: **technomen**
consultants

TECHNOMEN CONSULTANTS
223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
Koba-Gandhinagar Road, Kudasán, Gandhinagar - 382421,
Gujarat, India.

Bhavnagar Municipal Corporation

VOLUME – III (Part-3)

**MATERIAL SPECIFICATIONS, CODE OF PRACTICE
& GENERAL SPECIFICATIONS FOR CIVIL WORKS**

1. GENERAL SPECIFICATION OF MATERIALS

- (1) All materials to be used shall conform to the relevant specifications as per the latest edition of Indian Standard, unless otherwise stated in the detailed specifications of items of work.
- (2) Wherever a reference to any Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- (3) Test for material shall be invariably is carried out by the contractor, when the same are specified in the specifications. Tests shall also have to be carried out, even though the same are not specifically mentioned in the specifications but in the opinion of the Engineer-In-Charge, the same are required to be carried out. All such tests shall be carried out in Government Lab or laboratories approved by the Engineer-in-charge and cost there of shall be entirely borne by the Contractor.
- (4) No collection of materials shall be made before it is got approved from the Engineer-In-Charge.
- (5) 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 deterioration or intrusions of foreign matter and to ensure the preservation of their quality and fitness for the work.
- (6) Materials, if rejected by the Engineer-In-Charge, shall be immediately removed from the site of work. If they are not removed within twenty four hours of receiving such intimation, Engineer-In-Charge shall get the same removed at contractor's cost. The Engineer-In-Charge shall dispose off such materials in a manner as he chooses and the contractor shall not be entitled to any compensation for the cost of such materials.
- (7) Approval to the samples of various materials given by the Engineer-In-Charge will not absolve the contractor from the responsibility of replacing the 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 rejected by the Engineer-In-Charge.
- (8) The contractor shall be responsible for observing the laws, rules and regulations imposed under the "Mineral Acts" and such other laws and rules prescribed by Government from time to time

Sr. No.	Description
PART –I- MATERIALS	
M1	Water
M 2	Cement
M 3	Sand
M 4	Black Trap Grit(Stone Grit)
M 5	Black Trap Stone Coarse Aggregate for plain and Ordinary Reinforced Concrete
M 6	Black Trap Stone Coarse Aggregate for controlled Reinforced Concrete
M 7	Bricks Bat Aggregates
M 8	Bricks (A) I st Class (B) II nd Class
M 9	Stone for U.C.R. Masonry
M 10	Mild Steel Bars
M 11	TMT Steel Bars
M 12	C.R.S. Bars
M 13	Mild Steel Binding Wire
M 14	Structural Steel
M 15	Shuttering
M 16	Drawn Wire
M 17	Aluminum section
M 18	Teak Wood I ST Class and II nd Class Teak Wood
M 19	Non Teak Wood
M 20	Ply Wood
M 21	Flush Shutter
M 22	Glass
M 23	Fixtures and Fastening
M 24	Indian type Water Closet
M 25	Foot Rest
M 26	Paint
M 27	French Wood Polish
M 28	Rolling Shutter
M 29	Rough Kota Stone
M 30	Polished Kota Stone
M 31	Barbed Wires
M 32	Cement Mortar

1.1 WATER (M 1):

1.1.1 Water shall conform to IS: 456.

1.1.2 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis, salts, organic matter and other deleterious material, which will either weaken the mortar or concrete or cause efflorescence or attack the steel in RCC. Container for transport, storage and handling of water shall be clean.

1.1.3 If required by the GUDC it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests soundness time of setting and mortar strength as specified in IS-269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 percent 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.

1.1.4 Water fit for drinking will generally be found suitable for mortar or concrete.

1.1.5 Water for curing of mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free from elements, which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete or produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

1.1.6 Hard and bitter water shall not be used for curing. Potable water will generally be found suitable for curing of mortar or concrete.

1.2 CEMENT(M 2):

Cement shall be ordinary Portland cement as per IS 269 or Pozzolana cement as per IS 1489. The Grade of cement should be of 43 grade or higher grade.

The contractor shall take every precaution to store the cement properly so that it is not spoiled by dampness etc. Cement required for use shall be fresh as far as possible and stored on planks raised 15 to 20 cms above the floor and stacked 30 cms away from the wall in suitable closed weather proof godown at the site of work. Cement shall be stored in such a way so as to allow the removal and use of cement in chronological order of receipt i.e. first received being first used. Not more than 15 bags shall be stacked vertically in one pile and maximum width of the piles should not be more than 3 meters. Any cement, which has deteriorated, caked or which has been set or partially set shall not be used. When temporarily stored in open for use, it shall be kept on a suitable platform and suitably protected as necessary.

Different brands of cement or cement of the same brand from different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under double locking arrangements. A board indicating stock and daily transactions of cement shall be kept in each room of the cement store. Daily account of

receipt and use of cement bags shall be maintained by the Contractor in the preformed prescribed by the GUDC.

The cement shall be measured by no. of bags for all use in concrete (except otherwise stated) and masonry etc. In no case, cement shall be measured by boxes or other means for the volumetric proportion of concrete and mortar. For calculation for the proportion, the volume of the cement bag shall be taken as 0.0342 cu.m. (1.20 cft.) and measuring box of size of 30 cm x 30 x 38 cms for concrete works. If weigh-batch concrete is to be used, the cement shall have to be used as per actual weight and the contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any other reasons. The cement should be brought from Major Plants

1.3 SAND (M 3):

Sand shall be natural, clean, well graded, hard, strong, durable and gritty particles free from injurious amounts of dust, clay, kankar nodules, or of flaky portion, alkali, salts, organic matter, loam, mica or other deleterious substances and shall be got approved from the GUDC. If sand is covered with dust, it shall be washed with water to make it clean.

- (A) The sand to be used in cement mortar for masonry works and first coat of plaster should generally satisfy the following grading.

I.S. Sieve	Percentage by weight passing sieve
480	100
230	80-95
120	70-90
60	40-85
30	5-50
15	0-10

The fineness modulus shall not exceed 3.0

- (B) Sand to be used in cement mortar for lining work, pointing and second coat of plaster may have the following gradings:

I.S. Sieve	percentage by weight passing through
480	100
240	100
120	75-100
60	40-85
30	5-50
15	0-10

The fineness modulus shall not exceed 1.6

- (C) Sand to be used for concrete works shall of grades as specified in I.S. 383. Fineness modulus varying from 2.6 to 3.6 as per requirement.

1.4 BLACK TRAP GRIT (STONE GRIT) (M 4):

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 flaky elongated pieces shall be avoided. It shall generally comply with the provision of IS-383-1970. Unless special stone of particular quarries is mentioned, aggregate shall be broken from the best black trap stone as approved by the GUDC. Grit shall have no deleterious reaction with cement.

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

I.S. Sieve Designation	Percentage passing for sieve
12.50mm	100%
10.00mm	85-100%
4.75mm	0-20%
2.36mm	0-5 %

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

The necessary test for grit shall be carried out as per the requirements of IS: 2386 or as revised from time to time as per instructions of the GUDC.

1.5 BLACK TRAP STONE COARSE AGGREGATE FOR PLAIN AND ORDINARY REINFORCED CONCRETE (M 5):

Coarse aggregate shall be of machine crushed stone of black trap and be hard strong, dense durable, clean and free in skin and coating likely to prevent proper adhesion of mortar. 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 stone as approved by the GUDC. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete 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

TABLE - SIZE OF COARSE AGGREGATE

I.S. Sieve Designation	Percentage Passing for single and nominal sized aggregate		
	40 mm	20 mm	16 mm
40 mm	85-100	100	-
20 mm	0-20	85-100	100
16 mm	-	-	85-100
12.5 mm	-	-	-
10 mm	0.5	0-20	0-30
4.75 mm	-	0-5	0-5
2.36 mm	-	-	-

Note: This percentage may be varied somewhat by the GUDC who considered necessary for obtaining better density and strength of concrete.

Single size coarse aggregates confirming to the requirements in table No.1 above, or following nominal sizes shall be used at site with the other ingredients of concrete as indicated below. The mixing shall be in a mixture or on the 1:2:4 and C.C. 1: 1 ½:3 mixing with the other ingredient of concrete shall be done in the mixture only except for small work.

- | | | | |
|-----|--------------|---|---------------------------------|
| (1) | C.C. 1:5:10 | - | Nominal size of aggregate 40 mm |
| (2) | C.C. 1:4:8 | - | Nominal size of aggregate 40 mm |
| (3) | C.C. 1:3:6 | - | Nominal size of aggregate 40 mm |
| (4) | C.C. 1:2:4 | - | Nominal size of aggregate 20 mm |
| (5) | C.C. 1:1 ½:3 | - | Nominal size of aggregate 20 mm |

The grading test shall be taken in the beginning and at the change of the source of materials.

The necessary test indicated in IS – 383 and IS – 456 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner to prevent the inter-mixing of different aggregates. If the aggregates are covered with the dust, it shall be washed with water to make it clean. The course/aggregates for plain and reinforced concrete shall be measured by volume in the steel or wooden boxes prepared as per the direction of the GUDC.

1.6 BLACK TRAP STONE COURSE AGGREGATES FOR CONTROLLED REINFORCED CONCRETE (M 6):

Coarse aggregate shall be of machine-crushed stone of black trap and be hard / strong, dense, and durable clean and free from skin and coating likely to prevent proper adhesion of mortar. 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 stone as approved by the GUDC. Aggregate shall have no deleterious reaction with cement.

In proportion concrete, the quantity of coarse aggregates shall be determined by weight only. The grading of coarse aggregate shall be controlled by obtaining the aggregate in different sizes and blending them in the right proportions as per concrete mix design approved by the GUDC. The different sizes shall be stocked in separate stockpiles; the grading of aggregates shall be checked as frequently as possible. The frequency for verification of the grading shall be as directed by the GUDC to ensure that the grading is maintained uniform with that of the samples used in the preliminary tests.

The necessary test indicated in IS - 383 and IS - 456 shall have to be carried out to ensure the acceptability of the material.

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

1.7 BRICKS BAT AGGREGATES (M 7):

Brick bat aggregate shall be broken from well burnt or slightly over burnt and dies brick. It shall be homogeneous in texture roughly cubical shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm. to 50 mm. size unless otherwise specified in the item. The unborn or over burnt brick bats shall not be allowed. The brick bats shall be measured by volume by suitable boxes or as directed.

1.8 M-8 BRICKS (M 8):

(A) First Class Bricks

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 modules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform color.

The bricks shall be molded 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.

The size of modular bricks shall be 190 mm x 90 mm x 90 mm. The standard size of bricks shall be 8 $\frac{3}{4}$ " x 4 $\frac{1}{4}$ " x 2 $\frac{5}{8}$ ". Bricks conform to I.S. 1077 in respect of tolerance for sub-class A bricks.

The size of the conventional bricks shall be 225 mm x 110 mm x 75mm.

The crushing strength of the bricks shall not be less than 35 kg/sq.cm. The average water absorption shall not be more than 20 percent by weight. A necessary test for crushing strength and water absorption shall be carried out as per IS: 3495 (Parts I to IV) as directed by the GUDC

(B) Second Class Bricks

The second class bricks shall be similar to first class bricks except that they may be permitted to have slight distorted and rounded edges provided no difficulty shall arise on this account in laying of uniform courses.

1.8-A FLY-ASH LIME BRICKS :

The fly ash lime bricks shall conform to Grade-1 or Grade-2 of IS-3812-1981. The frog of the 80 to 100 mm x 40 mm x 10 to 20 mm size.

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

The size of conventional brick shall be 225 mm x 110 mm x 75 mm.

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

Length : + 3 mm

Width : + 3 mm

Height : + 2 mm

The physical characteristic of bricks shall be as follows.

The minimum compressive strength of fly ash lime bricks shall not be less than 75 Kg/Sq.Cm. and the test shall be conform to IS-3495 (Part-I):1992.

The average drying shrinkage of the brick when tested by the method described in IS 4139-1989 being shall not exceed 0.15 percent.

The averages water absorption not more than 20 percentage by mass and the test shall conform to IS-3495 (Part-3):1992.

1.9 UNCOURSED RUBBLE MASONRY (M 9):

Stone to be used for masonry work such as un-coursed course, R.R. Ashlars etc. shall be try, granite, and Ballast, and stone, etc. if any other type of good stone. Any good stone available in the region shall be utilized. The Building Stone shall be through hard, dense, sound, durable, resistance to weathering action reanobly fine grained, uniform in color and free from beams, creaks and other defects. The exposed face shall be free from discoloration.

Stones when immersed in water for 24 hrs. Shall not absorbs water more than 5% of its dry weight when tested according to I.S. 1124-1974 sand stone shall be fine grained good color and free from salt slabs and tiles of limestone shall confirm to I.S. 1128-1974.

Fare Stone shall be rashly quarried. With clean faces and short edges. It shall be of such character, that it can be brought to required line, carved surface etc. Rubble stone for hearting shall be approved quality. Free from regregnative etc. Royalist, composition, Octroi duties etc. payable in connection with securing stone shall be paid by the contractor.

The measurement shall be taken by volume length or number as the case may be with cubic meter, meter and one as the respective unit. In case rubble, the measurement shall be volume of stock, with cubic meter as unit without deduction of void.

In case of khandlides the measurement shall be numbers for specific size.

In case of stones such as quoins, the measurement shall be numbers for specific size.

In case of stones such as slabs coping stones etc. the measurement shall be by volume with cubic meter as unit for specified dimensions.

1.10 MILD STEEL BARS (M 10):

Mild steel bars reinforcement for R.C.C. work shall conform to IS. 432 and shall be of tested quality. It shall also comply with relevant part of IS. 456. All the reinforcement shall be clean and free from dirt, oil, paint, grease, mill scale or loose or thick rust at the time of placing.

Reinforcement steel shall be stored such as to avoid distortion and sags of long length and shall be protected as far as possible from surface deterioration. All bars of the same designation shall be stacked separately as far as possible and distinctly marked.

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.
(2)	8 mm	0.39 Kg/Rmt.
(3)	10 mm	0.62 Kg/Rmt.
(4)	12 mm	0.89 Kg/Rmt.
(5)	14 mm	1.21 Kg/Rmt.
(6)	16 mm	1.58 Kg/Rmt.
(7)	18 mm	2.00 Kg/Rmt.
(8)	20 mm	2.47 Kg/Rmt.
(9)	22 mm	2.98 Kg/Rmt.
(10)	25 mm	3.85 Kg/Rmt.
(11)	28 mm	4.83 Kg/Rmt.
(12)	32 mm	6.31 Kg/Rmt.
(13)	36 mm	7.99 Kg/Rmt.
(14)	40 mm	9.86 Kg/Rmt.

1.11 TMT BARS (M 11):

Scope of work:

The scope of work consists of providing and laying mild steel reinforcement and TMT reinforcement for RCC works of various components of the structure. This may be of

Tiscon, Sulekhan, SAIL or Punjab Rolling Mill or any other Approved make. This includes cuttings, bending, binding, placing, with all Equipments and labour required for the work as directed by the GUDC and all operations covered within the intent and purpose of the Specification.

Bending of Reinforcement:

Reinforcing steel shall conform accurately to the dimensions shown on relevant drawings and conforming to the relevant IS codes (latest revision) Bars shall be bent cold to the specified shape and dimensions or as directed by the GUDC using a proper bar bender, operated by hand or power to attain proper radii of bends. Bars shall not be bent or strengthened in a manner that will cause injury to the material. Bars bent during transport or handling shall be straightened before being used on work; they shall not be heated to facilitate bending.

The bending of the TMT bars shall be carried out as per the following:

Operation Size TMT Fe-415

- 1 Bend Up to 22 mm dia. 3d
- Over 22 mm dia. 4d
- 2 Rebend Up to 10 mm dia. 4d
- Over 10 mm dia. 5d

Placing of Reinforcement:

All reinforcing bars shall be accurately placed in the 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 conforming to IS : 280 and by using stays blocks or metal chairs, spacer, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars will not be Neither allowed to sag between supports nor displaced during concreting or any other Operation over the work. All devices used for positioning shall be of no corrodible material. Wooden and metal supports will not extend to the Surface of concrete, except where shown on the drawings, Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing will not be allowed. Pieces of broken stone, brick or 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 protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout. In the case of columns and walls, vertical bars shall be kept in normal position with timber templates having slots accurately cut in for bar position. Such templates shall be removed after the concreting has progressed up to a level just below them. Bars crossing each other, where required, shall be secured by binding wire

(annealed) of size not less than 1 mm and conforming to IS : 280 in such a manner that they do not slip over each other at the time of fixing and concreting. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the GUDC. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1 1/4 times the maximum size of the coarse aggregates whichever is greater, by concrete between them. Where this is not feasible, overlapping bars shall be bound with annealed steel wire, not less than 1mm thickness twisted tight in eight shapes around the lapped bars. The overlaps shall be staggered for different bars and located at fixed locations only along the span where neither shear nor bending moment is maximum.

Welding of Bars

33 per cent of the rods are welded. No pre-warming or post heat treatment is necessary. Interpose temperature should be limited to 200oC with low heat input and equivalent strength low hydrogen type electrode. Suitable means shall be provided for holding the bars securely in position Welding of TMT bars can be permitted if specified on the drawings, joints of Reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where 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 during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned property. Ends of the bars shall be cleaned of all loose scale, rust. Grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and frequency of tests shall be as directed by the GUDC.

1.12 C.R.S. BARS (M 12):

Scope of work:

The scope of work consists of providing and laying mild steel reinforcement and CRS Bars reinforcement for RCC works of various components of the structure. This may be of Ticon, Sulekhan, SAIL or Punjab Rolling Mill or any other Approved make. This includes cuttings, bending, binding, placing, with all Equipments and labour required for the work as directed by the GUDC and all operations covered within the intent and purpose of the Specification.

Bending of Reinforcement:

Reinforcing steel shall conform accurately to the dimensions shown on relevant drawings and conforming to the relevant IS codes (latest revision)

Bars shall be bent cold to the specified shape and dimensions or as directed by the GUDC using a proper bar bender, operated by hand or power to attain proper radii of

bends. Bars shall not be bent or strengthened in a manner that will cause injury to the material. Bars bent during transport or handling shall be straightened before being used on work; they shall not be heated to facilitate bending.

The bending of the CRS BARS shall be carried out as per the following:

Operation Size CRS BARS Fe-415

- 1 Bend Up to 22 mm dia. 3d
- Over 22 mm dia. 4d
- 2 Rebind Up to 10 mm dia. 4d
- Over 10 mm dia. 5d

Placing of Reinforcement:

All reinforcing bars shall be accurately placed in the 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 conforming to IS: 280 and by using stays blocks or metal chairs, spacer, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars will not be neither allowed to sag between supports nor displaced during concreting or any other Operation over the work. All devices used for positioning shall be of no corrodible material. Wooden and metal supports will not extend to the Surface of concrete, except where shown on the drawings, Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing will not be allowed. Pieces of broken stone, brick or 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 protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout. In the case of columns and walls, vertical bars shall be kept in normal position with timber templates having slots accurately cut in for bar position. Such templates shall be removed after the concreting has progressed up to a level just below them. Bars crossing each other, where required, shall be secured by binding wire (annealed) of size not less than 1 mm and conforming to IS : 280 in such a manner that they do not slip over each other at the time of fixing and concreting. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the GUDC. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1 1/4 times the maximum size of the coarse aggregates whichever is greater, by concrete between them. Where this is not feasible, overlapping bars shall be bound with annealed steel wire, not less than 1mm thickness twisted tight in eight shape around the lapped bars. The overlaps shall be staggered for different bars and located at fixed locations only along the span where neither shear nor bending moment is maximum.

Welding of Bars

33 per cent of the rods are welded. No pre-warming or post heat treatment is necessary. Interpose temperature should be limited to 200°C with low heat input and equivalent strength low hydrogen type electrode. Suitable means shall be provided for holding the bars securely in position. Welding of CRS BARS can be permitted if specified on the drawings, joints of Reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where 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 during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust. Grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. Welded pieces of reinforcement shall be tested. Specimens shall be taken from the actual site and their number and frequency of tests shall be as directed by the GUDC.

Chemical Composition

CRS Bars should have of grade Fe-415, IS:1786 grade.

Chemistry	Unit	IS:1786 Fe-415
Carbon	%	0.3 max
Carbon equivalent (C+Mn/6)	%	0.38 max
Sulphur	%	0.060 max
Phosphorous	%	0.060 max
S & P	%	0.110 max
Nitrogen	ppm	100 max

Mechanical Properties

Mech. Properties	Unit	IS:1786 Fe-415
Yield Stress	N/mm	415 min
Tensile Stress	N/mm ²	10% over YS
Elongation	% min	14.5 min

Bond Strength

The rib pattern of CRS bars has been specially designed to ensure that excellent bond strength exists between the bar and the surrounding concrete. The ribs are cut by automated milling machines which produce uniform and concrete ribs.

While the specification stipulates that bond strength should be 40% higher than that of Mild Steel plain bars.

Standard Sizes and Useful Data

Section (mm)	Nominal Weight (kg/meter)
8	0.395
10	0.617
12	0.888
16	1.58
20	2.47
25	3.85
28	4.83
32	6.31
36	7.99
40	9.85

1.13 MILD STEEL BINDING WIRE (M 13):

The mild steel wire shall be of 1.63 mm or 1.22 mm (16 or 18 gauge) diameter and shall conform to IS-280 or as revised from time to time.

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

Storage: The wire coils shall be stored such as to avoid deterioration.

Measurement: No measurement will be taken of the wire used for tying reinforcement bars. The rate for reinforcement steel and its fabrication shall include the cost of binding wire.

1.14 STRUCTURAL STEEL (M 14):

All structural steel shall conform to IS-226 and IS-800 or as revised from time to time. The steel shall be free from the defects mentioned in IS. 226 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 be conforming to IS-1148.

Structural steel shall be stored such as to avoid distortion of section of long length and shall be protected as far as practicable from surface deterioration. It should be so stored and handled that material will not be subjected to excessive stress and damages. All deformed structural material will be properly straightened by methods, which are not injurious prior or being, and off, punched or otherwise worked in the shop. Sharp kinds and bends shall be caused for rejection.

When the steel is supplied by the Contractor test certificate of the manufactures shall be produced, if so required by the GUDC. If further test be necessary, they will be done according to IS-226 and IS-23 or as revised from time to time.

1.15 SHUTTERING (M 15):

The shuttering shall be either of wooden planking of 30mm minimum thickness with or without steel sheet lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical bellies properly cross braced together so as to make the form work rigid.

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 not permit leakage of cement grout.

If at any stage of work during or after placing concrete in the structure the form work sags or budes out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequate rigid form work. The complete formwork shall be got inspected by and approved from the GUDC before the reinforcement bars are placed in position.

If wooden props are used, the props shall consist of bellies having 100 mm minimum diameter measured at mid length and 80 mm at thin end and shall be placed at 1 to 1.20m spacing. These shall rest squarely on wooden sole plates 40 mm thick and minimum bearing area of 0.10 sq.m. Lay on sufficiently hard base.

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

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

As far as practicable clamp shall be used to hold the forms together and use of nails and spikes avoided.

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 soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface.

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

The period that shall elapse after the concrete has been laid before easing and removal of centering and shuttering as under taken shall be as follows.

	Part of structure	Period
1.	Sides of Foundation, Columns beams & walls.	24 to 48 hours.
2.	Undersides of slabs up to 4.5 m span.	7 days.
3.	-do- above 4.50 m and underside of Beams and arches up to 6 m span.	14 days.
4.	-do- above 6 m span & up to 9 m. span	21 days.
5.	Inner sides of beams and arches over 9 m span.	28 days.
6.	Domes, shell & other structures of Special nature.	as per instruction

Work damaged through premature or careless removal of forms shall be reconstructed.

The period for striking the form work shall be 0.5 times more in case of Pozzolana Cement if used than that of the ordinary Portland cement and the contractor shall not entitle for any extra claim for the same.

1.16 DRAWN WIRE (M 16):

The Hard drawn steel wire should confirming to IS-432 (Part 2), Hard drawn steel wire shall be manufacture and its chemical composition should be as per para 3.0. The finished wire should be free from defects and finished in a workman like manner. Nominal sizes, Tolerances, Physical requirements are as per IS : 432 (Part-II) latest edition. Hard drawn steel wire should be tested as specified in IS : 432 (Part-II) latest edition.

1.17 ALUMINUM SECTION (M 17):

Aluminum alloy used in the manufacture of extruded window sections shall correspond to IS Designation HE-9-WP IS: 733-1956 Specification for wrought Aluminum and aluminum alloys, Bars, Rods and Section (for General Engineering Propose).Hollow Aluminum alloy section used shall conform to IS Designation HE-9-WP of IS: 1285-1958 Specification for Wrought Aluminum and Aluminum Alloys, Extruded Round Tube and Hollow Sections (For General Engineering Purposes).

Dimensions and Weight per meter run of the extruded sections shall be as given in Fig. 5

Coupling Section:

Aluminum alloy coupling sections used shall conform to IS Designation HV9-WP of IS: 1285-1958 Specification For Wrought Aluminum and Aluminum alloys, Extruded Round Tube and Hollow Section (For General Engineering Proposes). They shall conform to the dimensions show in Fig-5.

Glass Panes:

Glass Panes shall be weigh at least 7.5 kg/m³ and shall be free from flaws, speaks, or bubbles. All Panes shall have properly squared corners and straight edges. The sizes of the class panes for use in doors, Windows and Ventilators.

Note: The metal doors and windows industry has follow the practice of the glazing industry in specifying size of glass. Accordingly, in the metal doors and windows, the practice hitherto has been to specify building industry and in the case of timber doors and windows the practice is to specify width first and Height afterwards. The committee responsible for the preparation of standard has considered it desirable to unify the practice in this regard and has adopted the building industry practice that is, to specify width first and height afterwards.

Screws:

Screw threads of machine screw used in the manufacture of aluminum doors, windows, and ventilators shall conform to requirement of IS: 1362-1959 dimensions for screw threads for general propose (Diameter range 0.25 to 39 mm). Other threads shall be permissible if agreed to between the purchaser and vendor.

1.18 TEAK WOOD (M 18):

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.

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 of 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 or resins materials made to hide the defects shall render the pieces liable to rejection by the GUDC.

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

The tolerances in the dimensions shall be allowed at the rate of 1.5 m.m. per face to be planed.

a) First class teak wood:

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

b) Second Class Teak Wood:

No individual hard and sound knots shall be more than 15 Sq. cms. in size and aggregate area of such knots shall not-exceed 2% of the area of piece.

1.19 NON-TEAK WOOD (M 19):

The non teak-wood shall be chemically treated, seasoned as per IS 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, Kalali, Siras, Behda, Jamun, Sisoo will be used for door frames where as only Kalali, Siras, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be free from large, loose, and dead of cluster knots, flows, shakes warps bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free rots, decay harmful fungi and other defects of nature which 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 sawn in straight lines and planes in the direction of grain and uniform thickness.

The department will use the Agency to produce certificate from forest Department in event of Disputes and the decision of the Department shall be final and binding to the contractor.

The tolerance in the dimension shall be allowed as 1.5 mm. per face to be planed.

1.20 PLYWOOD (M 20):

The plywood for general purpose shall conform I.S. 303-1975. Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers 3,5,7,9 plies etc. The plies are placed so that grain of each layer is right angle to the grain in the adjacent layer.

The Chief advantages of plywood over a signal board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and grater resistance to cracking and splitting with change in moisture content.

Usually synthetic resins are used for gluing, pherolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates which maintain a temperature of 90 degrees C. to 140 degrees C. and a pressure of

11 to 14 kg/sq.cm. on the wood. The time of heating may be anything from 2 to 69 minutes depending upon thickness.

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 finished by plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

According to I.S. 303-1975 the plywood for general purpose shall be of three grades BWR, WWR and CWR, depending upon the adhesives used for bonding and 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, B and C, After pressing, the finished plywood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

Thickness of plywood Boards:

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply	3mm.	5 ply	5 mm.	7 ply	9 mm.	9 ply	16 mm.
	4mm.		6 mm.		13 mm.		19 mm.
	5mm.		8 mm.		16 mm.	11 ply	19 mm.
	6mm.		9 mm.	9 ply	13 mm.		22 mm.
							25 mm.

1.21 FLUSH SHUTTER (M 21):

The solid core type flush door shutters shall be 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.

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 hopping rebating opening of glazing, Venetian etc. shall be provided if specified in the drawing.

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

The shutters shall be tested for

(1) End immersion test:

The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no delimitation 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 elimination occurs in the glue lines in the plywood and if no single delamination 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, knots holes and other permissible wood defects shall not be considered in assessing the sample.

The tolerance in size of solid core type flush door shall be as under:

In Normal thickness +/- 1.2 mm. In Normal height +/- 3 mm.

The thick of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

1.22 GLASS (M 22):

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

a) Sheet Glass:

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 upto 600 mm x 600 mm.

For panes larger than 600 mm. x 600 mm. and upto 800 m. x 800 mm. the glass weighing not less than 8.75 Kg/Sq.m. shall be used. For bigger panes upto 900 mm. x 900 mm. glass weighing not less than 11.25 Kg/Sq.m. shall be used.

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.

b) Plate Glass.

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 6mm and a tolerance of 0.20mm shall be admissible.

c) Obscured Glass:

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.

d) Wired Glass:

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

1.23 FIXTURES AND FASTENINGS (M 23):

a) General

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 specifications.

They shall be of iron, bras, aluminum, chromium plated iron chromium plated brass, copper oxidized iron, and copper oxidized brass or anodized aluminum as specified.

The fixtures shall be heavy, Medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operation.

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

Brass and anodized aluminum fixtures and fastenings shall be bright finished.

b) Holdfasts:

Holdfasts shall be made from mild steel flat 30 cm. lengths 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 ends. The holdfast shall be forked and bent at right angles in opposite directions.

c) Butt hinges:

Railway standard heavy type butt hinges shall be used when so specified. The strap hinges shall be manufactured from M. S. Sheet.

d) Siding door bold (Aldrops):

43 The Aldrops as specified in the item shall be used and shall be got approved.

e) Tower bolts (Barrel Type):

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

f) Door Latch:

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

g) Bathroom Latch:

Bathroom latch shall be similar to tower bolt.

h) 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 size of the handle.

i) Door Stopper:

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

j) Door Catch:

Door catch shall be fixed as height of about 900 mm from the floor level so 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

fixate. The catch shall be fixed 20 mm inside the face of the door for easy operation of catch.

k) Wooden Door stops with highs:

Wooden door stop of size 100mm X 60 mm X 40 mm shall be fixed on the door frame with a high of 75 mm size at high of 900 mm from the floor level the wooden door stop shall be provided with 3 coats of approve oil paint.

l) Case meant window fastener:

Casement window fastener for single leaf window shutter shall be left or right handled as directed.

m) Casement stays (straight peg stay):

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 as directed. Size of the stay shall be 250 mm to 300 mm as directed.

n) Ventilator catch:

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

o) Pivot:

The base and socket plate shall be made form minimum 3 mm thick plate and projected pivot shall not be less than 12 mm length and shall be firmly riveted to the base plate in case of brass pivot.

1.24 INDIAN TYPE WATER CLOSET (M 24):

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 ring of suitable type with adequate number of holes alroung as directed to have satisfactory flushing. It shall also have inlet at back or front connecting flush pipe 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.

1.25 FOOT RESTS (M 25):

A pair of white glazed earthen ware rectangular foot rests of minimum size 250 mm. x 130 mm 20 mm. shall be provided with water closet.

1.26 PAINTS (M 26):

(A) Oil Paints:

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

All the paints shall meet following general requirements:

- (i) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curing, 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.

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

(B) Enamel Paints:

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

1.27 FRENCH POLISH (M 27):

The French polish of requirement and shape shall be prepared with the below mentioned ingredients and other necessary materials:

(I) Denatured sprit of approved quality (ii) Chandra's (iii) Shellac (iv) Pigment.

The French polish so prepared shall conform to I.S.: 348-1968.

1.28 ROLLING SHUTTER (M 28):

- a) The Rolling Shutter shall conform to I.S. 6248-1979. Rolling shutter be supplied of specified type with accessories. The size of rolling shutter Shall Be Specified In The Drawings .The shutter shall be constructed with interlocking lath sections formed cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutter up to 3.5mm., width not less than 1.25 mm. thick and 80 mm. wide for shutter 3.5mm in width and above unless otherwise specified.
- b) Guide channels shall be mild steel deep channel section and of rolled pressed or built up (fabricated) joint less construction. The thickness of sheet used not be less than 3.15mm.
- c) Hood covers shall be made of M.S. Sheets not less than 0.92 mm. thickness. For shutter having width 3.5 Meter and above the thickness of M.S. Sheet for the hood cover shall be not less than 1.25mm.
- d) The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutter in all position. The spring pipe shaft etc. shall be supported on strong M.S. Or Malleable C.I. Brackets. The Brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.
- e) The rolling Shutter shall be of self rolling type up to 8 Sq.m. clear areas without ball bearing. If the rolling Shutter are larger, then gear operated type shutter shall be used.
- f) The locking arrangement shall be provided at the bottom of shutter at both ends. The Shutter shall be opened from outside.
- g) The Shutter shall be completed with door suspension shafts, locking arrangement, pulling hooks, handles and other accessories.

1.29 ROUGH KOTA STONE (M 29):

- a) 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 colour stones shall not be allowed for use. They shall be without any soft veins, cracks or flows.
- b) 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.
- c) Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be +/- 3 mm.

- d) The edges of stones shall be truly chiselled and table rubbed with coarse sand before paving. All angles and edges of the stone shall be true, square and free from chipping and the surface shall be true and plain.
- e) When machine cut edges are specified, the exposed edges and the edges at joints shall be machine cut. The thickness of the exposed machine cut edges shall be uniform.

1.30 POLISHED KOTA STONE (M 30):

Polished kotah stone shall have same specifications as per rough kotah stone except as mentioned below:

The stones shall have machine polished smooth 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 dado, skirting, platforms, sink, veneering, sills, steps, etc. Where machine polishing after the stones are fixed in situ is not possible, shall be double polished.

1.31 BARBED WIRE (M 31):

The barbed wire shall be of galvanized steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of type-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two bars shall be 75 mm. unless otherwise specified in the item. The barbed wire shall be formed by twisting together two line 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 ± 0.08 mm.

The barbs shall carry four points shall be formed by twisting two point wires each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13 mm. and not more than 13 mm. and not more than 18 mm. The points shall be sharp and cut at an angle not greater than 35 degree of the axis of the wire forming the barbs.

The line and point wire shall be circular 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 weld other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

The lengths per 100 Kg. of barbed wire I.S. type I shall be as under

Nominal 1000 meter Minimum 834 Meter Maximum 1066 Meter.

1.32 CEMENT MORTAR:(M32)

Water shall conform to specification M-1, Cement shall conform to specification M-2, Sand shall conform to specification M-3. Proportion of Mix: 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 by the Engineer-In-Charge.

Preparation of Mortar: In hand mixed mortar, cement and sand in the specified proportion 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 may be adopted as directed by the Engineer-In-Charge. 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. The mortar remaining unused after that period or mortar which has partially hardened or damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

CODE OF PRACTICE

GENERAL:

- (1) The method of the execution of the items shall conform to the relevant specifications as per the latest version of the Indian Standard, List of applicable Indian Standards **annexed** below, unless specified otherwise and as far as is applicable.
- (2) Wherever a reference to any Indian Standard appears in the code, it shall be taken to mean as a reference to the latest version of the Standard.
- (3) Work Tests shall invariably be got carried out by the Contractor, when the same are specified in this Code. Tests shall also have to be carried out, even though the same may not have been specifically mentioned in the Code, if in the opinion of the Engineer-In-Charge, they are required to be carried out. All the tests shall be got carried out in Government or approved laboratories and cost there of shall be entirely borne by the Contractor.

All moulds, equipments, etc. required of preparing specimens for tests shall be kept in sufficient numbers and in good state, as directed by the Engineer-In-Charge, on the site of work.

Specimen for tests shall be, sent to the Laboratory along with the representative of municipality/ consultant in time and the results thereof shall be promptly obtained and reported to the Engineer-In-Charge.

- (4) Satisfactory test results shall not absolve the Contractor, from dismantling and re-doing any work revealed to be defective at a later date. The contractor shall have no claim for any payment or compensation whatsoever on account of replacement of such defective work. Contractor shall take all precautions and care during dismantling and re-doing the work to ensure that any other work, so far executed does not get damage or affected.
- (5) The work shall be carried out in true line and level, and in conformity with the detailed drawings and specified patterns.
- (6) All work shall be carried out in a workman-like manner and as per the best techniques for the particular item.
- (7) All tools, templates, equipments etc. for correct execution of the work, as well as for checking lines, levels alignments of the works, during execution shall be kept in sufficient numbers on the site of work.
- (8) All installations pertaining to water supply and drainage lines fixtures as well as and sanitary fittings shall be deemed to be completed only after giving satisfactory test by the Contractors.
- (9) Scaffolding shall be provided by the Contractor at his own cost for such of the items for the execution of which it is essential

CODE OF PRACTICE		
List of I S (Indian Standard) For DRAINAGE WORKS		
Sr.No	IS number	Particulars of Code
1	651-1980	Code of Practice for Stone Ware Pipes and Fittings
2	4127-1983	Code of practice for laying of Stone ware pipe
3	458-2003	Code of practice for Concrete Pipe (with & without reinforcement)
4	783	Code of practice for laying of Concrete pipe
5	784-1978	Pre Stressed Concrete Pipe
6	3597- 2003	Method of test of Concrete Pipe
7	8329-2000	D.I. Pipe centrifugally cast (spun) for water, Gas Sewerage.
8	12288-1987	Laying of D I Pipe.
9	9523- 2000	D I Fittings/Specials
10	1539-&1536-1989	C I pipe Centrifugally casted (spun) iron pressure pipe for water, Gas, and Sewage.

11	3114-1985	Laying of C I pipe
12	5531-1977	C I Fittings/Specials
13	3486-1966	C I Spigot and Sockets drain pipe
14	5455-1969	C I Steps
15	1726	C I Man Hole and Frame Cover
16	1729	Sand C I spigot and sockets soil fittings
17	780-1980	C I Sluice Valve up to 300 mm Dia.
18	2906-1980	C I Sluice Valve above 300 mm Dia.
19	14333-1996	H D P E pipe for sewerage.
20	7634 (Part-2) 1973	Laying and Jointing HDPE Pipe
21	8360 (pat 1 to 3)	HDPE fabricated fittings
22	8008 (part 1 to 7)	HDPE fitting injection molded
23	7328-1992	H D Polyethylene material for molding & extrusion
24	4985-1988	P V C Pipe
25	1239	Code of practice for G I Pipe
26	7634	Code of Practice for Plastic pipe
27	1592-2003	Code of practice for A C pressure pipe
28	12709-& 14402	G R P Pipes used for water & Sewerage
29	1592-2003	code of practice for A C pipes & Fittings.

Sr.No	I S number	Particulars of Code
30	6530	Code of practice for laying of A C pressure pipes
31	3589	Electrically Welded steel pipe
32	5504-1969	Spiral Welded pipe
33	5822-1986	Laying of Steel Welded pipe
34	6392-1971	Steel pipe flanges.
35	8062	Code of practice for Cathodic protection
36	4111-1986 Part 1	Code of practice for Man Hole Chamber construction
37	4111-1986 (Part 1 to 4)	Code of practice for Ancillary Structure in Sewage system Man Hole, Invert Syphon, Flushing Tank, Pumping Station. & pumping Main.
38	12592-1991 Part 1 & 2	Precast Man Hole Frame & Cover specification
39	1538-1976 (part1 to10)	General Requirements.
40	3764-1966	Safety code for Excavation Works
41	5382-1985	Rubber Ceiling Ring for Water, Gas & Sewerage
42	12820-1989	Dimensional requirements for Rubber Ring Gaskets
43	4883-1988	Specification for Sewer Bricks
44	2212-1962	Code of practice for Brick works.
45	6280-2001	Sewerage Screen.
46	11117-1984	Requirements for High pressure Jetting Machine for Sewerage
47	11397-1985	Attachment Tools for Power Driven Roding Machine.
48	5600-1970	Sewage and Drainage Pumps.
49	6279-1971	Equipment for Grit removal device.
50	10037-1981 (part 1 to 3)	Requirements for Sludge dewatering equipment.
51	11972-1967	Code of practice for Safety precaution to be taken when entering in a Sewage system.
52	10261-1982	Requirements for settling Tank.
53	10552-1983	Buckets to be use in power driven bucket type sewage cleaning machine.
54	10595-1983	Requirements for power driven Bucket type of sewage cleaning machine.
55	210	Specification for Grey Iron Casting
56	269	Specification for ordinary and low heat Portland Cement
57	383	Specification for Coarse and fine aggregates from natural sources for concrete
58	432	Specification for Mild Steel and Medium tensile steel bars and Hard drawn steel wire for concrete reinforcement.
59	456	Code of practice for Plain and reinforcement concrete.
60	516	Methods of tests for strength of concrete

Sr.No	I S number	Particulars of Code
61	554	Dimension for pipe threads where pressure tight joints are required on the threads.
62	774	Flushing Cisterns for Water closets and urinals (Valve less symphonic type)
63	775	C I brackets & Supports for wash basin and sink.
64	1786	Specification for high strength deformed steel bars and wires for concrete reinforcement.
65	1742	Code of practice for building drainage works
66	3370 (Prat1 to 5)	Code of practice for concrete structures for storage of liquids
67	269	Specification for 33 Grade ordinary Portland Cement.
68	10262	Recommended guidelines for concrete mix design.
69	12269	Specification for 53 Grade ordinary Portland cement.
70	455	Specification for Portland Slag Cement
71	12330 or 6909	Specification for Sulphate resisting Portland Cement.
72	3696	Safety Code for scaffolds and ladder.(Part1 &2)
73	2720	Method of test for soils (Part 1 to 38)
74	8989	Safety Code for erection of concrete framed structures.
75	6587	Specification for spun hemp yarn.
76	5611-.2002	Code of practice for Waste Stabilization Ponds (Facultative Type)
77	14846	C I Air Valve.
78	226 & 800-1975	Structural Steel
79	1538 P- i to xxii	C I Fitting for pressure pipe.

2. SPECIFICATION FOR CIVIL WORKS

Following are the specifications for certain items mentioned in Schedule B. Bidder shall refer relevant specifications for Civil Works.

2. 1. SPECIFICATION FOR EXCAVATION AND SINKING OF RCC WELL

A. Excavation for foundation up to 1.5 M depth including sorting out and stacking useful materials disposing of the excavated stuff up to 90 meter lead in loose or soft soil.

1.1 General:

Any soil which generally yields to the application of pickaxes and shovels, pickaxes, rakes or any such ordinary excavating implement or organic soil, gravel silt, sand turf loam, clay, peat etc., fall under this category.

1.2 Clearing the site:

1.2.1 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 be conveyed and stacked as directed. Within 90 M. lead. The roots of the trees coming in the sides shall be cut and coated with hot asphalt.

1.2.2 The rate of site clearance is deemed to be included in the rate of earth work for which no extra will be paid.

1.3 Setting Out :

After clearing the site, the center 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 laborers, materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required for setting out reference marks and bench marks and shall maintain them as long as required and directed.

1.4 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 shoring 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 1 evened both longitudinally and transversely. As directed by removing and watering as required. No earth filling will be allowed for bringing it to level, if mistake or any other reason excavation is made. Deeper or wider than 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.

1.5 Dewatering :

Unless specially provided for as a separate item in the contract, the rate of excavation would include bailing or pumping out all water which may accumulate in the excavation during the progress of the work, either, by percolation, seepage, springs, rain or any other cause and diverting surface flow if any, by earthen bunds shall be removed as soon as the work is completed.

Unless specially provided as a separate item of contract, pumping of water from trenches etc. shall be carried out by the Contractor at his cost and he should arrange for required number of dewatering sets for the above. He should take precaution to prevent any damage to the foundation, trench, concrete, or masonry or any adjacent structure. The excavation shall be kept free from water by the contractor (1) during inspection and measurement (2) when concrete and/or masonry are in progress and till the construction work reaches above, the natural water level had (3) till the Engineer considers that the mortar is sufficiently set.

1.6 Disposal of the excavated stud :

1.6.1 The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layer including ramming and watering etc.

1.6.2 The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead upped 90 M. and all lift.

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 90 meter lead in dense or hard soil.

1.1 Dense or Hard Soil :

Any soil which generally require close application of picks or jumpers or scarifiers to loosen it stiff clay, gravel and rubble stone etc. fall under this category.

1.2 Workmanship :

The relevant specification of item No. 2.1-A shall be followed except that the excavation work shall be carried out in dense or hard soil.

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 90 meter In lead-hard murrum.

1.1 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 silicones material and nature mixture of clay of calcareous origin. The size of hard murrum shall not be more than 20 mm.

1.2 Workmanship:

The relevant specification of item No. 2.1-A shall be followed except that the excavation work shall be carried in hard murrum.

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 90 meter lead-soft rock not requires blasting.

1.1 Workmanship :

- 1.1.1 The relevant specification of item 2.1-A shall be followed except that the excavation shall be carried out for foundation upon 1.5. m. lift in soft-rock not requiring blasting.
- 1.1.2 The excavation in soft or disintegrated rock shall be carried out by crow bards pickaxes or pneumatic drills or any other suitable means.
- 1.1.3 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.
- 1.1.4 The materials available from rock excavation shall be properly stacked within 90 m. lead and 1.5. m. lift and shall be property stacked within 90 m. lead and 1.5.m. lift and shall be the property of department.
- 1.1.5 The classification of state of the foundation soil shall be done by the Engineer-in-charge and shall be acceptable to the contractor.
- 1.1.6 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.

E. 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 90 meter lead in hard rocks.

1.1 Workmanship :

The relevant specification of item No.2.1-A shall be followed except that the excavation for foundation work shall be carried out in hard rock.

Excavation shall be done by blasting to the dimensions shown in the drawings or as directed. The blessing shall be carried out only with written permission of the Engineer-in-charge. All the laws, regulations etc. pertaining to the precautions, acquisition, transport, storage, landing and use of explosives 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 unauthorized 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 the Magazine. The Magazine shall have an effective lightning conductor. The rules of

explosive 1940 revised for time to time shall be followed strictly for obtaining, handling, undertaking blasting work.

The contractor shall be responsible for damage to property, workman, public due to any accident due to use of explosives and blasting operations.

1.2 Precautions :

The blasting operation shall remain in charge of competent and experienced supervisor and workman who are thoroughly acquainted with the details of handling explosives 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.

Red danger flags shall be displayed prominently in all directions during the blasting operations.

People except this who actually light the fuse shall be prohibited from entering into this area. The flag shall be stationed as 200 m. from the firing site in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing warning whistle being sounded for this purpose.

During excavation in rock by blasting, the lowest 15 cm. of the strata's shall be blasted with light charges 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 larger width and lengths than those shown on the drawings or as directed, no payment shall be made for such over break. If excavation is done to depth 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.

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 but 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 primer leaving one third of the copper exposed outside. The primer shall be housed into the explosive. Bore holes shall be of such size that the cartridges can be easily passed down. The primer 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 the tamping is firmed with any convenient materials gently packed with a wooden cover.

At a time, not more than 20 such charges shall be prepared and fired. The man in charge shall blow a whistle in a recognized manner for cautioning the people. All the people shall then be required to move to safe distances. The charges shall be lighted by the man in charge only. The man-in-charge shall count the number of explosions.

He shall satisfy himself that the charges have been exploded before allowing the workman to go to the work site.

The contractor shall be fully responsible to strictly follow the prevailing rules and procedures regarding blasting procedures.

1.3 Misfire :

In case of a misfire the following procedure shall be observed :

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.

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. Should it not blast the old charge, the procedure shall be repeated till the old charge is blasted.

1.4 In case of charge of gelatin, dynamite etc. the man in charge shall gently remove the tamping and the primer with detonator. A fresh detonator and primer shall then be used to blast the charge. Alternatively the hole may then be drilled 15 cm. away and parallel to it. This hole shall then be charged fired when the misfired hole should explode at the same time. The man in charge shall report to the office at once all cases of misfire, the cause of the same and what steps were taken in connection therewith.

1.5 If a misfire has been found to be due to defective detonator or dynamite, the whole quantity in the box from which defective article was taken must be sent to the authority as directed for inspection to ascertain whether all the remaining materials in the box are also defective or not.

1.6 Accidents :

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 :

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 at all times. Surprise visit 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 penalized 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 :

No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5m. of distance prescribed by the Engineer from the outer edges 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 specified lead. Materials suitable and useful for back filling 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.

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 90 meters as directed. Useful materials obtained from clearing site and excavation shall be stacked within a lead of 90 M. beyond the building area as directed. Materials suitable for back filling shall be stacked at convenient places within a lead of 90 M. from the structure for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 90 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 schedule of rates of the Division or at a mutually agreed rates if there are no such rates in the Schedule of rates.

If surplus materials are required to be conveyed beyond 90 M. conveyance will be paid for under a separate item

F. Excavation for foundation for depth from 1.50 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff up to 90 M. in lead-loose or soft soil.

1.1 Workmanship:

The relevant specifications of item No.2.1-A Shall be followed except that the excavation work shall be carried out in loose or soft soil with lift 1.5 M. to 3.0.M.

G. 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 90M.lead in Dense or Hard soil.

1.1 Workmanship :

The relevant specification of item No. 2.1-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.

H. 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 upto 90M.lead in hard murrum.

1.1 Workmanship :

The relevant specification of item No. 2.1-C shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0. M. lift in hard murrum.

I. 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 upto 90M.lead in soft rock not requiring blasting.

1.1 Workmanship:

The relevant specification of item No.2.1-B shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0. M. lift in soft rock not requiring blasting.

J. 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 90M.lead in Hard rock.

1.1 Workmanship:

The relevant specification of item No. 2.1-B shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0. M. lift in hard rock.

K. 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 90M.lead in loose of soft soil.

1.1 Workmanship:

The relevant specification of item No. 2.1-B shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0. M. lift in loose of soft soil.

L. Excavation for foundation for depth from 3.0.M. To 5.0. M. including sorting out and stacking of useful materials and disposing of excavated stuff upto 90 M. lead in Dense or Hard soil.

1.1 Workmanship :

The relevant specification of item No. 2.1-B shall be followed except that the excavation work shall be carried out with 3.0. M. to 5.0. M. lift in loose of soft soil.

M. Excavation for foundation for depth from 3.0.M. to 5.0. M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 90M.lead in hard murrum.

1.1 Workmanship:

The relevant specification of item No. 2.1-C shall be followed except that the excavation work shall be carried out with 3.0. M. to 5.0. M. lift in loose of soft soil.

N. Excavation for foundation for depth from 3.0.M. to 5.0. M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 90M.lead in soft rock not requiring blasting.

1.1 Workmanship :

The relevant specification of item No. 2.1-D shall be followed except that the excavation work shall be carried out with 3.0. M to 5.0. M. lead in soft rock not requiring blasting.

O. Excavation for foundation for depth from 3.0 m to 5.0 m including sorting out and stacking of useful materials and disposing of excavated stuff up to 90M.lead in soft rock not requiring blasting.

1.1 Workmanship :

The relevant specification of item No. 2.1-E shall be followed except that the excavation work shall be carried out with 3.0. M. to 5.0. M. lead in soft rock not requiring blasting.

P. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff up to 90 M. lead in loose or soft soil.

1.1 Workmanship:

The relevant specifications of item No. 2.1-A shall be followed except that the excavation work shall be carried out from more than 5.0.M lift in loose or soft soil.

Q. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff up to 90 M. lead in Dense or hard soil.

- 1.1 The relevant specification of item No.2.1-A Shall be followed.
- 1.2 The excavation work of lift 3.0. M. to 5.0.M. shall be measured under this item.
- 1.3 The rate shall be for a unit of one cubic meter.

R. Excavation for foundation for depth from 3.0.M. to 5.0. M. including sorting out and stacking of useful materials and disposing of excavated stuff upto 90M.lead in soft rock not requiring blasting.

- 1.1 **Workmanship:**
The relevant specification of item No. 2.1-D shall be followed except that the excavation work shall be carried out with 3.0. M. to 5.0. M. lead in soft rock not requiring blasting.

S. Excavation for foundation for depth from 3.0.M. to 5.0. M. including sorting out and stacking of useful materials and disposing of excavated stuff up to 90M.lead in soft rock not requiring blasting.

- 1.1 **Workmanship:**
The relevant specification of item No. 2.1-E shall be followed except that the excavation work shall be carried out with 3.0. M. to 5.0. M. lead in soft rock not requiring blasting.

T. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff up to 90 M. lead in loose or soft soil.

- 1.1 **Workmanship :**
The relevant specifications of item No. 2.1-A shall be followed except that the excavation work shall be carried out from more than 5.0.M lift in loose or soft soil.

U. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff up to 90 M. lead in Dense or hard soil.

- 1.1 **Workmanship:**
The relevant specifications of item no. 2.1-A shall be followed except that the excavation work shall be carried out from more than 5.0.M lift in Dense or hard soil.

V. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff up to 90 M. lead in Hard murrum.

1.1 Workmanship:

The relevant specifications of item no. 2.1-C shall be followed except that the excavation work shall be carried out from more than 5.0.M lift in hard murrum.

W. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff 5.0. M. lead in soft rock not requiring blasting.

1.1 Workmanship:

The relevant specifications of item no. 2.1-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.

X. Extra for additional depth more than 5.0.M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff upto 90 M. lead in Hard rock.

1.1 Workmanship:

The relevant specifications of item no. 2.1-E shall be followed except that the excavation work shall be carried out from more than 5.0.M lift in Hard rock.

XI. Sinking the R.C.C. well for foundation through all strata. Item also included removal of obstacles dredging dewatering kentledge, all necessary plants, machineries divers and proper seating of well etc. completed. as directed by Engineer-in-charge.

1.0 GENERAL :

1.1 This specification pertains sinking of well through all stratas like sand, gravel, pebbles, loose boulders, clay, soft and hard murrum and such other similar strata to the required level as may be directed by Engineer preliminary open excavation or dressing required for laying the cutting edge and curbs and providing island shall be included in this item.

2.0 WORKMANSHIP :

2.1 Sinking of Well :

The method to be adopted for sinking of well shall be first got approved by the Engineer-in-charge/for any change in the method required during execution, the Contractor shall first obtain the written permission of the Engineer-in-charge.

The Contractor may at his own cost. bore holes to ascertain the exact depths to which the particular wells may have to be sunk. If bore results are indicated by the Department, they shall be taken only as general guide. Corporation do not bind it self for the accuracy of the same. The Contractor shall not be entitled to any compensation on account of variation in strata during the sinking.

If the bed is dry open excavation shall be carried out to the actual subsoil water level before

the cutting edge is laid. The cutting edge or the curb shall be laid in the exact position on blocking timber. The blocking timber shall be removed individually in such a manner as to maintain equality of pressure without any tilt of the cutting edge. The blocking timber shall be pulled out after loosening the soil underneath. Material within the curb shall be excavated methodically and evenly over the whole internal area excavating first in the centre and then working towards the circumference uniformly till the curb sinks to about 15 cm (about 6") above the bed. Sand or soil excavated shall then be back filled to keep the pitched curb in place and stable. The form work on steining shall then be set up and the first lift poured.

The well may be adjusted and guided regard to its direction of sink by temporary frame work or staging. The staging may be used as platform for handling materials and fixing the dredging equipment thereon. The design and the layout of the staging shall require prior approval of the Engineer although the Contractor will not be thereby relieved of his responsibility for its safety and suitability.

Sinking must not be started till the concrete steining to be sunk had set properly and until the steining has been passed by the Engineer and commencement of sinking approved.

The well shall be sunk by excavating the material from the exterior methodically and evenly and removing the material and building up additional sections of steining as the well sinks. The excavated materials shall be stacked within a lead of 50 m. (about 164') or as directed. It is essential to see that the curb and the first two lengths of the steining are kept perfectly vertical and that they do not go out of place or plump materially. The subsequent sinking to plump is easier. Any neglect in the initial stages will make it more difficult to correct errors.

The contractor shall adopt his own arrangement and method of sinking consistent with the magnitude of the work, its nature, site conditions, speed required etc. and failing the required process, the sinking shall be done as ordered by the Engineer. Normally one of the following methods or combination of two or more of them will be found to work satisfactorily according to the site condition.

- (1) Manual excavation.
- (2) Excavation by Divers.
- (3) Excavation by sinch and grab heavy chisels etc.
- (4) Excavation by dredgers.
- (5) Sinking by applying kentledge.
- (6) Using light blast with the approval of the Engineer.
- (7) Dewatering.
- (8) Jetting.

Manual excavation aided by tools to suit the strata may be conveniently resorted to where there is not much of water or where the water can be easily pumped out.

In deep water, the excavation will have to be done by the aid of winch and grad or a dredger. Harder strata shall have to be loosened by heavy chisels.

In case of manual excavation under water or removal of obstructions such as boulders, logs, etc. divers may have to be employed to successfully excavated or remove the obstacles.

When the well does not sink, even after dredging or excavation, kentledge shall be applied judiciously to effect the sink.

Great care shall be taken from the commencement of sinking operations to ensure that the well is continuously kept in exact position and perfectly vertical, checking frequently with the plump bobs hanging on the inside faces of the steining. Daily records of tills and shifts shall

be kept on site in the requisite profarma. If there are sand blows in the wells they shall be removed after establishing stable conditions and no claim shall be entertained regarding removal of the material of difficulties connected therewith.

The tendency of the well to lean to one side over dipping hard strata or in soft soil shall be countered by providing suitable supports etc. The levels of the excavation in the well shall be constantly checked so as keep the bottom as nearly level as practicable.

Dewatering to the extent necessary shall be done as and when required. Balancing the water level inside and outside the well shall also be arranged whenever necessary. Jetting on outside may be resorted to when advisable with the approval of the Engineer. All these and any other measures required to sink the well are included in the item.

In sinking groups of wells joined together the excavation in all the wells in one cluster should be carried out simultaneously and equally to facilitate even sinking.

2.2 Obstacles :

When obstacles such as large boulders, logs, hard clay, compacted material etc. are met with, they shall have to be removed by grads, dredgers, etc. after breacking, cutting, jetting, etc. or by sending divers inside the well if necessary. If this is not successful, small charges of explosives may have to be used with the permission of the Engineer to breck to boulders by sending divers. In no case blasting of ANY sort shall be done without the permission of the Engineer in writing and before the concrete in steining has hardened. Sufficiently and is more than 7 days old. The Contractor shall include in his tendered rate, the eventuality of the cost of the services of divers and all other of the cost of the services of divers and all other costs ancillary for removing boulders, dislodging obstructions below cutting edge and such other operations as may be required for sinking the well. The method of removal of the obstades shall be got approved by the Engineer.

2.3 Kentledge :

Kentledge may be used with advantage in sinking the well to over come skin friction and bouyancy but shall not be excessive so as to damage to cutting edge or steining or arranged in such a way as to interfere with the interval excavation.

2.4 Explosive :

When other measure are not successful sinking of well held up by skin friction etc. is sometimes aided by tremor and vibration caused by exploding a small charge of 28 grams or 56 grams. (about one or two OZS) of dynamite in the centre of the well. But such explosives shall not be used without the specific approval of the Engineer. Any damage to the well or adjoining structures due to the blasting shall be made by the Contractor at his own cost.

2.5 Righting :

If the well tilts during sinking it may be righted by :

- (1) Putting on eccentric loading on the high side of the wells.
- (2) One side excavation at bottom of wells which is on the higher side.
- (3) Jetting on the higher sider to reduce skin friction.
- (4) Pulling or pushing the well by approved methods.

(5) Any other suitable method.

Methods adopted for righting a well shall require the approval of the Engineer. This shall however, not relieve the contractor of his responsibility for obtaining satisfactory results.

2.6 Last Sink :

When the well is approaching its final depth and before the last length of the steining is poured in, the exact length required should be decided and the steining should be built up preferably just less than this length with a view to build it upto the correct level after the well has been sunk to its final depth.

2.7 Tolerenace :

The complete well shall not have

(i) tilt of more than 1 in 60 in any direction.

(ii) A shift of more than 200 mm at the top from designed vertical axis at the well in any direction.

Any tilt and/or shift beyond the permissible means such referred to above, shall be removed by all available means such as strutting accentric kentledge railing by wire ropes or by any other approved method. The maximum allowable till and shifts shall not exceed the following limits. The completed well shall not have tilt of more than 1 in 60 in any direction and a shift of more than 200 mm at the top from the designed vertical axis of the well in any direction.

If under any circumstances, the tilt and shift exceeds the above limit for well, but do not exceed the extrame limits of 1 in 40 tilt and 300 mm shift in any direction, the well sinking so done shall be regarded as substandard and such well as accepted for one or other reason shall be penalised to the following extent.

Sr. No.	Amount of tilt and/or shift	Lumpsum deduction per Mt. of well measured from the top of pump house floor or cap to the bottom of the outing edge.
1.	Tilt exceeding 1 in 60 but below 1 in 50.	Rs.1650/-
2.	Tilt exceeding 1 in 60 but below 1 in 40.	Rs.2475/-
3.	Tilt exceeding 1 in 40.	Rs.3300/-
4.	Shift exceeding 200 mm but less than 250 mm.	Rs.825/-
5.	Shift exceeding 250 mm but less than 300 mm.	Rs.1650/-

If the tilt and shift exceed the above limit for any well that well shall be liable to rejection at the discretion of the Engineer-in-charge at the entire risk and cost to the Contractor.

2.8 Precautionary measures :

Following precautionary measures shall be taken by the contractor at his own risk and cost.

All exposed reinforcement bars shall be carefully bent down along the steining and temporarily embedded in lean concrete 1:4:8.

All precautionary measures shall also be taken prevent damage of shift or tilt to the well due to mention.

The above measures shall not however, absolve the contractor term any responsibility in the even of any damage occurring to the incomplete well and he shall have to rectify to same at no extra cost to owner, to the entire satisfaction of the Engineer-in-charge.

The foundation levels as shown in the detailed drawings are tentative and are not taken as first but are liable to alternation by Engineer-in-charge depending upon the actual site conditions and as required by the circumstances. The decision of the Engineer-in-charge regarding the foundation and its variations during execution of the work shall be binding to the contractor.

2.9 Cleaning :

After the well is finally and properly seated, the bottom shall be cleaned and all loose materials removed if necessary, by sending divers before laying of concrete for the bottom is permitted. This will be the time to check and verify the levels and record the depth.

2.10 Safety :

The Contractor shall be responsible to take all measures for the safety of the work and workmen and also for any compensation due to injury to persons or damage to work and property well sinking shall be done in such a way as not to cause any damage to adjoining structures. The contractor shall be responsible for any such all the damage.

2.11 Item to Include :

- (i) Sinking of well through all strata by excavation.
- (ii) Providing island if required.
- (iii) Righting.
- (iv) Dewatering, balancing water levels.
- (v) Trial bores for deciding the actual depth if required by the Contractor.
- (vi) Removing boulders, obstacles etc.
- (vii) Clearing the bottom.
- (viii) Redreding if the work is no completed before monsoon.
- (ix) Use of divers if needed.
- (x) Collecting samples of materials of the foundation strata.
- (xi) All labours, materials, staging, use of equipment, tools and plant and other incidental items necessary for the satisfactory completion of sinking the well.
- (xii) Safety measures and compensation for injury to persons and damage to work and property.

2.2 SPECIFICATION FOR BACKFILLING

2.1 GENERAL

All fill material will be subject to Engineer's approval. If any material is rejected by Engineer, contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be deposited / disposed off as directed by Engineer after the fill work is completed up to a distance of 5 Km for which separate payment will be paid under the corresponding item.

No earth fill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineer.

2.2 MATERIAL

To the extent available, selected surplus soils from excavated materials shall be used as backfill. Fill material shall be free from clods, salts, sulphates, organic or other foreign material. All clods of earth shall be broken or removed. Where excavated material is mostly rock, the bounders shall be broken into pieces not larger than 150 mm size, mixed with properly graded fine material consisting of murrum or earth fill up the voids and the mixture used for filling.

If any selected fill material is required to be borrowed, Contractor shall make arrangements for bringing such material from outside borrow pits. The material and source shall be subject to prior approval of Engineer. The approved borrow pit area shall be cleared of all bushes, roots of trees, plants, rubbish etc, top soil containing salts / sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer. Contractor shall make necessary access to borrow areas and maintain the same, if such access road does not exist, at his cost.

2.3 FILLING IN PITS AND TRENCHES AROUND FOUNDATIONS OF STRUCTURES, WALLS ETC.

As soon as the work in foundations has been accepted and measured, the spaces around the foundations, structures, pits, trenches etc. shall be cleaned of all debris, and filled with earth in layers not exceeding 20 cm, each layer being watered, rammed and properly consolidated, before the succeeding one is laid. Each layer shall be consolidated to the satisfaction of Engineer. Earth shall be rammed with approved mechanical compaction machines if instructed. Usually no manual compaction shall be allowed unless Engineer is satisfied that in some cases manual compaction by tampers cannot be avoided. The final backfill surface shall be trimmed and levelled to proper profile as directed by Engineer or indicated on the drawing.

2.4 FILLING IN TRENCHES

Filling in trenches for pipes and drains shall be commenced as soon as the joints of pipes and drains have been tested and passed. The backfilling material shall be properly consolidated by watering and ramming, taking due care that no damage is caused to the pipes.

Where the trenches are excavated in soil, the filling from the bottom of the trench to the level of the centerline of the pipe shall be done by hand compaction with selected approved earth in layers not exceeding 8 cm; backfilling above the level of the centerline of the pipe shall also be done with selected earth by hand compaction or other approved means in layers not exceeding 20 cm.

- 2.5** In case of excavation of trenches in rock, the filling up to a level 30 cm above the top of the pipe shall be done with fine materials, such as earth, moorum etc. The filling up of the level of the centerline of the pipe shall be done by hand compaction in layers not exceeding 20 cm. Also the filling above the centerline of the pipe shall be done by hand compaction or approved means in layers not exceeding 20 cm. The filling from a level 30 cm. above the top of the trench shall be done by hand or other approved mechanical methods with broken rock filling of size not exceeding 20 cm mixed with fine material as available to fill up the voids.

Filling of the trenches shall be carried simultaneously on both sides of the pipe to avoid unequal pressure on the pipe.

2.6 GENERAL SITE GRADING

- 2.6.1 Site grading shall be carried out as indicated in the drawings and as directed by Engineer. Excavation shall be carried out as specified in the specification. Filling and compaction shall be carried out as specified elsewhere unless otherwise indicated below.
- 2.6.2 If no compaction is called for, the fill may be deposited to the full height in one operation and leveled. If the fill has to be compacted, it shall be placed in layers not exceeding 200 mm and leveled uniformly and compacted as indicated in before the next layer is deposited.
- 2.6.3 To ensure that the fill has been compacted as specified, field and laboratory tests shall be carried out by Contractor at his cost.
- 2.6.4 Field compaction test shall be carried out at different stages of filling and also after the entire height has been completed. This shall hold good for embankments as well.
- 2.6.5 Contractor shall protect the earth fill from being washed away by rain or damaged in any other way. Should any slip occur, Contractor shall remove the affected material and make good the slip at his cost.
- 2.6.6 The fill shall be carried out to such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.

- 2.6.7 If specifically permitted by Engineer, compaction can be obtained by allowing loaded trucks conveying fill or other material to ply over the fill area. Even if such a method is permitted, it will be for contractor of demonstrate that the desired / specified compaction has been obtained. In order that the fill may be reasonably uniform throughout, the material should be dumped in place in approximately uniform layers. Traffic over the fill shall then be so routed to compact the area uniformly throughout.
- 2.6.8 If so specified, the rock as obtained from excavation may be used for filling and leveling to indicate grades without further breaking. In such an event, filling layers not exceeding 50 cms approximately. After rock filling the void in the rocks shall be filled with finer materials such as earth, broken stone etc. and the area flooded so that the finer materials fill up the voids. Care shall be taken to ensure that the finer fill material does not get washed out. Over the layer so filled, a 100 mm thick mixed layer of broken materials and earth shall be laid and consolidation carried out by a 12 tonne roller. No less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.

2.6.9 Fill Density

The compaction, only where so called for, in the schedule of quantities / items shall comply with the specified (Standard Proctor / modified Proctor) density at moisture content differing not more than 4 percent from the optimum moisture content. Contractor shall demonstrate adequately at his cost, by field and laboratory tests that the specified density has been obtained.

2.6.10 Lead

Lead for deposition / disposal of excavated material, shall be as specified in the respective item of work. For the purpose of measurement of lead, the area to be excavated or filled or area on which excavated material is to be deposited / disposed off shall be divided into suitable blocks and for each of the blocks, the distance between centerlines shall be taken as the lead which shall be measured by the shortest straight line route taken by Contractor. No extra compensation is admissible on the grounds that the lead including that for borrowed material had to be transported over marshy or 'katcha' land / route.

2.6.11 Measurement and Payment

Backfilling as per specifications on the sides of foundations of columns, footings, structures, walls, tanks, rafts, trenches etc. with excavated material shall be done. As a rule, material to be backfilled shall stacked temporarily within the basic lead of 90 meters unless otherwise directed by the Engineer. If Engineer directs / permits a lead of over 90 meters for such material, the conveyance of the material for the extra distance over the basic lead of 90 meters for backfilling will be paid for.

Actual quantities of consolidated back filing shall be measured and paid in cubic meters.

Penalty for improper watering and compaction will be Rs. 350/Tanker required and rent for roller @ Rs. 20 per sq.m.

In case the watering and compaction of the backfilled material is not as per the specifications, GUDC/ GWSSB/ GUDM will carry out the same through own resources. A rate of Rs.350 per water tanker and Rs. 20 per sq.m. for rolling and compacting will be recovered from the contractor.

2.3 SPECIFICATION FOR SHORING AND STRUTTING

1.1 GENERAL:

- 1.1.1 This item is applicable only when the trench having more than 5.0 mt. depth and if the sides of trenches cannot be sloped or stepped due to any reason and the Engineer-in-charge feel the necessity for safety of trench and adjacent property and traffic. The Contractor should have to take previous approval from Engineer-in-charge before commencing this item.

1.2 MATERIALS:

- 1.2.1 Sheathing, planks, wales, struts etc. required for shoring and strutting shall be of approved quality of wood or structural steel as per requirements of IS-3764-1966.

1.3 WORKMANSHIP:

- 1.3.1 The Contractor before execution shall get approval of design of shoring from Engineer-in-charge. The shoring shall be of sufficient strength to resist side pressure and ensure safety from slips and below and to prevent damage to work and to prevent injury to persons. It shall be removed after getting permission of Engineer-in-charge, after all items for which it is required area completed. Shoring and strutting shall conform to IS - 3764 - 1966 or its latest version.
- 1.3.2 The sheeting shall be placed against the side of trench so that length of each piece of sheeting is vertical. The sheeting shall be held securely in place against the Wales by ensuring that sheeting is kept firmly placed against the wall of the trench. Where the trench is excavated in loose, sandy or soft soil or soil which has been previously excavated or soil which is under hydrostatic pressure, each piece of sheeting shall be driven into the bottom of trench so has to be firmly held in place.
- 1.3.3 Where two or more pieces of sheeting are used one above another, the sheeting shall be so arranged that the lower piece of sheeting overlap the lowest Wales supporting the pieces of sheeting next above next above it. These pieces of sheeting shall be firmly driven in to the soil and securely supported by Wales and struts as the trench is made deeper.
- 1.3.4 The wales shall be supported parallel to the bottom or the proposed bottom of the trench. Each wale shall be supported on cleats spliced to the sheathing or by posts set on the wales next below it and in the case of lowest wale on the bottom of the trench itself. Where necessary, wedges may be provided between a wale and sheathing is supports to that roughly uniform support is given to all individual pieces of sheathing.
- 1.3.5 Struts shall be horizontal and at right angles to the wales of sheathing supported thereby. Struts shall be cut to the proper length required to fit in tightly between wales, where necessary, the struts shall be held securely in place by wedges, driven between struts and the wales. Struts shall be placed on cleats spliced or bolted to posts supporting wales.
- 1.3.6 The sizes and spacing of sheathing, wales struts and wedges used for shoring and timbering for different depth shall conform the requirement of IS-3764-1966 or its latest version.

- 1.3.7 The extra width of excavation that may be deemed necessary for the purpose of shoring and strutting will be understood to be covered in the rate for item of shoring and strutting for drain side.
- 1.3.8 The contractor shall have to make all the necessary arrangements while removing shoring strutting. However, if contractor fails to remove the shoring strutting safely, the corporation shall not be responsible for any type of damages and contractor shall have to bear all the cost for the same and the corporation shall not pay any extra payment for the same.
- 1.3.9 Shoring and strutting shall be close or open depending on the nature of soil and the depth of trench. The type of shoring and strutting shall be determined by the Engineer in charge. It shall be the responsibility of the contractor to take all necessary steps to prevent the sides of trenches from collapse. Engineer in charge should take guidance from IS: 3764-1966 for designing the shoring and strutting arrangements and specifying the profile of excavation.

1.4 Measurement:

- 1.4.1 The item includes all labours, materials, equipments, tools etc. complete for whole the period for satisfactory completion of the item.
- 1.4.2 No extra payment shall be given for extra excavation that required to do shoring or strutting.
- 1.4.3 The rate shall be for a unit of one square meter.
- 1.4.4 No payment shall be made to any wood which has been left out by the contractor while removing the shoring, strutting etc.

2.4 SPECIFICATION FOR SAND / GRANULAR / CEMENT CONCRETE BEDDING

(A) PROVIDING AND LAYING COMPACTED SAND / GRANULAR BEDDING

Specification as mentioned in Itemwise specification.

(B) PROVIDING AND CASTING SITU CEMENT CONCRETE (1:4:8) BEDDING USING GRANITE QUARTZITE TRAP METAL OF SIZE 25 MM TO 40 MM INCLUDING CONSOLIDATION, CURING ETC. COMPLETE.

- 1.7 The concrete bedding of proportion (1:4:8) shall be according to specification of Item of concrete works.

2.5 SPECIFICATIONS FOR EXCAVATION OF ASPHALT PAVEMENT & REINSTATEMENT OF PAYMENT

Specification as mentioned in Itemwise specification.

2.6 DELETED.

2.7 SPECIFICATION FOR CENTERING AND FORMWORK

A. 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 site reinforced concrete and plain concrete work in foundations, footing, bases of columns, and mass concrete.

1.1 Materials:

The shuttering to be provided shall be of ordinary timber planks and shall conform to M-18.

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.

1.2 Workmanship:

The form work shall conform to the shape lines and dimension as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe guard 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.

1.3 Cleaning & Treatment of forms:

All rubbish, particularly chippings shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work 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 or form oil of approved manufacture may be applied in case steel shuttering is used. Soap solution or 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 reinforcement bars.

1.4 Stripping time:

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 beam24 to 48 hours.
- (b) Beams 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 mm.....14 days
- (d) Removal of props to beams and arches
 - (i) Spanning up to 6 m.....14 days

(ii) Spanning over 6 m.....21 days

1.5 Procedure when removing the form work:

All form work shall be removed without such shock or vibration 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.

1.6 Centering:

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 of 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.

The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.

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 the work, injury to life and damage to property.

1.7 Scaffolding:

All scaffolding, hoisting arrangements and ladders etc required for the facilitating of concreting shall be provided and removed on completion 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.

The scaffolding hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.

The rate is applicable to all conditions 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, nailing, 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.

1.8 Re-use:

Before re use all forms shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned, and joints gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

B. Extra for 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 in between 4 m to 5 m and removal of the same for in situ reinforced or plain concrete work in foundation, footings, bases of columns etc. and mass concrete.

1.1 Materials & Workmanship :

The relevant specifications of item No. 2.7-A shall be followed except that the height of propping and centering below supporting floor to ceiling exceeding 4 m but not exceeding 5 m.

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 exceeding 4 m and removal of the same for in site 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.

1.1 Materials and Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the work is to be carried out for flat surface such as soffits of slabs, landings and the like for floors etc. up to 200 mm in thickness.

D. Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height or propping and centering below supporting floor to ceiling No. exceeding 4 m and removal of the same for in situ reinforced and plain concrete work in flat surfaces such as soffits of slabs, landings and the like floors etc. above 200 mm in thickness.

1.1 Materials and Workmanship:

Relevant specifications of item No. 2.7-A shall be followed except that the work is for floors etc. above 200 mm in thickness.

E. Providing form work of ordinary timber planking so 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 concrete and plain concrete work in vertical surface such as wall (any thickness) partitions.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the form work shall be carried out for vertical surface such as walls of any thickness, partitions etc.

F. Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height or 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 columns, pillars posts, and struts, square rectangular, polygonal in plan.

1.1 Materials and Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the work is for columns, pillars, posts and struts square, rectangular, polygonal in plan.

G. 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 beams, beam hunching, cantilevers, girders, bressumers and lintels not exceeding 1 m in depth.

The relevant specifications of item No. 2.7-A shall be followed.

H. 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 insides and soffits of beam, hunching cantilevers, girders, bressumers and lintels exceeding 1 M in depth.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the work is for side and soffits of beams, beams hunching, cantilevers, girders, bressumers, and lintels exceeding 1 M. in depth.

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 edges of slabs and breaks in floor and walls:

1.1 Materials & Workmanship;

The relevant specifications of item No. 2.7-A shall be followed except that the work is for edges of slabs and breaks in floors and walls.

J. 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 edges of slabs and breaks in floor and walls:

1.1 Materials & Workmanship:

The relevant specification of item No. 2.7-A shall be followed except that the work is for edges of slabs and breaks in floors and walls.

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 removal of the same for in situ reinforced and plain concrete in small surfaces such as cantilevers ends, brackets, and ends of the steps, caps and bases to pilasters and columns and the like.

1.1 Materials and Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the work is for small surface such as cantilever ends, brackets and ends of steps, caps, and bases to pilasters and columns and the like.

L. 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 chulla hoods, weather sheds, chhajas corbels etc. including edges.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except that the work is for chullah hoops, weather sheds, chhajas, and corbels etc including edges of the same.

M. Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, 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 stair case with slopping or stepped soffits including risers and stringers excluding landing.

1.1 Materials & Workmanship:

The relevant specification of item No. 2.7-A shall be followed except that the work is for stair cases, with slopping or stepped soffits including risers and stringers excluding landing.

N. 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.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.7-A shall be followed except the work is for vertical fins and vertical sun breakers.

O. Extra for providing form of work with sheathing of steel sheets so as to give a fair finish in –

(A) Foundation, footings, base of columns etc. and the like.

(B) Flat surfaces such as soffits of slab, landing and the like

(i) Floor etc. up to 200 mm in thickness

(ii) Floor etc. above 200 mm in thickness

(C) Vertical surfaces such as walls (Any thickness), partitions.

(D) Columns, pillars, posts and struts.

(1) Square, rectangular, breassumers, and lintels not exceeding 1 mm depth.

(2) Sides and offits of beams, beam hunching, cantilevers, girders, breassumers and lintels exceeding 1 mm in depth.

(E) Edges of slabs and breaks in floors and walls.

(F) Small surface such as cantilever ends, brackets, and ends of steps, caps and bases to pillars and columns including edges.

(G) Collar woods whether sheds, chhajas, corrodes etc. and the like

(H) Stair cases with sloping or stepped soffits, including risers, skirting, excluding landing.

(I) Vertical fins and vertical sun breakers.

1.1 Materials & Workmanship:

The relevant specifications of item No. 1 A to N 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.

2.8 PLAIN CEMENT CONCRETE AND REINFORCE CEMENT CONCRETE.

A. Providing and laying cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregates 40 mm. nominal size) and curing complete excluding the cost of form work in foundations and plinth.

1.1 Materials :

Water shall conform to M-1.

Sand shall conform M-3.

Cement shall conform to M-2.

Stone aggregate 40 mm. nominal size shall conform to M-6.

1.2 Workmanship :

1.2.1 General:

1.2.1.1 Before starting concrete bed of foundation trenches shall be cleared of all loose materials, leveled, watered, and rammed as directed.

1.2.2 Proportion of Mix :

1.2.2.1 The proportion of cement, sand and coarse aggregate shall be one part of cement, 3 parts of sand, 6 parts of stone aggregates and shall so measured by volume.

1.2.3 Mixing :

1.2.3.1 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 breakdown of machinery's 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 cases 10% more cement than otherwise required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose.

1.2.4 Transporting & Placing the concrete :

1.2.4.1 The concrete shall be handled 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.

1.2.4.2 The concrete shall be laid in layers of 15 cms. to 20 cms.

1.2.5 Compacting :

1.2.5.1 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.

1.2.6 Curing :

1.2.6.1 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.

1.2.7 Surface Finish Of Concrete

1.2.7.1 All formwork, centering and shuttering used for unexposed concrete work shall be rigid and straight, so as to produce all concrete members true to line level and plumb within a tolerance of + 3 mm. Only cement mortar rendering of maximum thickness 6 mm may be permitted as finishing to concrete surfaces except where terrazzo, ceramic tile or other finish are specified. All concrete surfaces scheduled to receive either plaster or similar finish shall be chipped as required if so directed by the Architect / Structural Designer. Shuttering, centering and formwork to be used for all exposed concrete work (like exposed columns, beams, ribs, slabs chhajjas, facias, etc.) shall be of such finish and rigidity as to produce all faces fair and smooth true to line, level and plumb. No. rendering or touching up shall be permitted on these faces.

B. 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.

1.1 Materials :

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Stone aggregate 40 mm. nominal size shall conform to M-6.

1.2 Workmanship :

Relevant specifications of item No. 2.8-A. shall be followed except that cement concrete shall be mixed in the proportion of 1:4:8 instead of 1:3:6 by volume.

C. 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.

1.1 Materials & Workmanship:

The relevant specification of item No. 2.8-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 for the concrete work of wall caps/coping.

D. Providing and laying brick bats cement 1:4:8(1 cement :4 coarse sand :8 graded brick bats) and curing complete excluding the cost of from work in foundation and plinth.

1.1 Materials :

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Brick bat shall conform to M-7.

1.2 Workmanship :

- 1.2.1 The specification of this item shall be followed as per item No. 2.8-C except that the proportion of brick bat cement concrete shall be 1:4:8 i.e. 1 part of cement, 4 parts of coarse sand and 8 parts of graded brick bat by volume, using graded brick bat as coarse aggregate instead of stone aggregate.

E. 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.

1.1 Materials :

Water shall conform to M-1; Cement shall conform to M-2. Sand shall conform to M-3. Stone aggregate 40 mm. nominal size shall conform to M-6.

1.2 Workmanship :

The relevant specification of item No 2.8-A shall be followed for the work except that the work is to be carried out in cement concrete 1:5:10.

F. Providing and laying cement concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded bricks bats 10 mm. nominal size) and curing complete excluding, cost of form work in foundation and plinth.

1.1 Materials :

Water shall conform to M-1; sand shall conform to M-3. Cement shall conform to M-2. Brick bats shall conform to M-7.

1.2 Workmanship :

The relevant specification of item No. 2.8-E shall be followed except that brick bats aggregate shall be used instead of stone aggregate.

G. 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.

- 1.1 The specification of item No. 2.8-A shall be followed except brick bats shall be used as coarse aggregate instead of graded stone aggregates.

H. Providing and laying damp proof course 25 mm thick cement concrete 1:2:4(1 cement : 2 coarse sand : 4 stone aggregate 10 mm nominal size) and curing complete.

- 1.1 The specifications of item No. 2.8-I 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.

I. 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.

1.1 Materials:

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3, Grit shall conform to M-4, Graded stone aggregate 20 mm nominal size shall conform to M-6.

1.2 General:

1.2.1 The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 10 mm nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

1.2.2 The designation ordinary M-100, M-150, M-200, M-250 specified as per I.S Correspond approximately to 1:3:6, 1:2:4, 1 1/2:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

1.2.3 The ingredients required for ordinary concrete containing one bag 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.
M-100 (1:3:6)	300 Liters	Generally 1:2 for fine aggregate by volume but subject to and upper limit of 1:1/2 and lower limit 1:3	34 Liters
M-150 (1:2:4)	220 Liters		32 Liters
M-200 (1:1 1/2 :3)	160 Liters		30 Liters
M-250 (1:1:2)	100 Liters		27 Liters
M-30 (Design Mix)	(Design Mix)		23 Liters

1.2.4 The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the Table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the Table is not exceeded.

- 1.2.5** Work ability of the concrete shall be controlled by maintaining a water cement ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.
- 1.2.6** the maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than surround all reinforcement thoroughly and to fill the corners of the form.
- 1.2.7** For reinforced concrete work, coarse aggregates having a nominal size of 20mm are generally considered satisfactory.
- 1.2.8** 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 bars, or 5 mm less than the minimum cover to the reinforcement whichever is smaller.
- 1.2.9** Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as greater than the minimum cover.
- 1.2.10** Admixture may 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.

1.3 Workmanship:

- 1.3.1** Proportioning: Proportioning shall be done by volume, except cement 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 sizes shall be used for measuring sand aggregate. The size of the boxes (internal) shall be 35 cms x 25 cms. and 40 cms deep. While measuring the aggregate and sand, the box 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 sand, allowances for bulkage shall be made.
- 1.3.2** Mixing: For all work, concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about 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 half a minute. Mixing shall be continued till materials are uniformly distributed and uniform color 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 all ingredients have been put into the mixer.
- 1.3.3** 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 placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also 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 color. Specified quantity of 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.

- 1.3.4** 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.
- 1.3.5 Consistency:** 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. 1199-1959. The slump of 10mm to 25mm. shall be adopted when vibrators are used and 80mm when vibrators are not used.
- 1.3.6** Inspection: 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.
- 1.3.7** 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 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.
- 1.3.8** Transporting and lying: 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 form 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.

1.3.9 Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction 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.

1.3.10 Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking 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 laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgment 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.

1.3.11 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 event 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.

1.3.12 Curing: Immediately after compaction, concrete shall be protected from weather including rain, running water, shocks, vibration, traffic, rapid, temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain 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.

1.3.13 Sampling and Testing of concrete: Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with I.S. 516-1959. 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
1-5 Cmt.	
6-15 Cmt.	
16-30 Cmt.	
31-50 Cmt.	

51 and above 4+ one additional for each additional 50 M. 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 the 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.

1.3.14 The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm² 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.

1.3.15 Stripping: The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time for removal of form work, due consideration shall be given to local conditions, character for the structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperatures are above 200 C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in item No 9.1(A) for respective item of form work.

1.3.16 All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, the 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 shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

- 1.3.17** 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 fine caused by form joints, all cavities produced by the removal of form ties 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 the proportions used in the grade of concrete that is being finished 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. Surfaces 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 portion of the structure affected.

J. 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 concrete work in :

- 1.1** Foundation footing, base of columns and mass (B) Slabs, landings, shelves, balconies, internal beams girders and cantilever up to floor two level (C) Columns, pillars, posts and struts up to floor two level (D) Staircase up to floor two level (E) Vertical and horizontal fins up to floor two level.
- 1.2 Materials & Workmanship**
- 1.2.1** The relevant specification of item No. 2.8-I 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 :
- 1.2.2** 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 of slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 meters centers.
 - (ii) In case of columns 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.

- 1.2.3 All bars projecting from pillars, columns beams, slabs etc., to which other bars and of concrete within the following 10 days. This coat of thin neat cement shall be concrete are to be attached or bounced 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 removed before concreting.

K. Providing and laying cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) for reinforced concrete chhajas not exceeding 10 cms. thick ness up to floor 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.

1.1 Materials & Workmanship:

1.1.1 The cement mortar shall conform to M-11

1.1.2 The relevant specifications of item No. 2.8-I and 2.8-J shall be followed except that the work shall be carried out for reinforced concrete chhajas not exceeding 10 cms in thick ness.

1.1.3 The specifications for form work and centering shall be as per item No.2.2

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. 2.8-A-1.2.7 Before the plastering is done, the surface of the concrete shall be raked for proper bond.

L. Providing Mild Steel reinforcement of R.C.C. work including bending binding and placing in position etc. complete up to floor two levels.

1.1 Materials :

1.1.1 Mild steel bars shall conform to M-10. Mild steel binding wires shall conform to M-13.

1.1.1.1 Workmanship:

1.1.1.2 The work shall consist of furnishing and placing reinforcement to the shape and dimensions shows as on the drawings or as directed.

1.1.1.3 Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

1.1.1.4 Reinforcing steel shall conform accurately 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 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.

1.1.2 All the reinforcement bars shall be accurately placed in exact position shown on the drawing and shall be securely held in position during, 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 no extend to the surface of concrete, except where shown on drawings. Placing of broken stone or brick and wooden blocks 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 producing from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

1.1.2.1 Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm in such manner that they do not slip over each other at the time of fixing and concreting.

1.1.2.2 As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them. 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 bears and located at points along the span where neither shear nor bending movement is maximum.

1.1.2.3 Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be joined 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 normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226

1.1.2.4 When permitted or specified on the drawings, joints of reinforcement bars shall be butt-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 are 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, grease, 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.

M. High yield deform bars steel reinforcement for R.C.C. work including bending binding and placing in position complete up to floor two levels.

1.1 Materials :

1.1.1 Cold twisted steel bars (high yield strength steel deformed bars) shall conform to M-19 Mild steel binding wires shall conform to M-13

1.2 Workmanship :

1.2.1 The specifications of item No 2.8-L shall be followed except that the cold twisted steel bars shall be used with or without hooks and the ends. Deformed bars without hooks shall however comply with relevant anchorage requirements.

N. Extra for additional lift and lead of concrete for all R.C.C. work above floor two level excluding cost of reinforcement

1.1 Materials & Workmanship :

The relevant specification of item No 2.8-J 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.

O. Extra for additional lift of reinforcement steel for all R.C.C. work above floor two level.

1.1 Materials & Workmanship:

1.1.1 The relevant specifications of item No. 2.8-L or 2.8-M as may be applicable, shall be followed except that the work shall be carried out above floor two level for each floor.

P. Providing up to floor two level precast cement concrete jali 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 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 (D) 75 mm thick (E) 100 mm thick.

1.1 Materials :

1.1.2 Water shall conform to M-1 (2) Cement shall conform to M-2 (3) Sand shall conform to M-3 (4) Mortar shall conform to M-32 (5) Aggregate shall conform to M-6 (6) Mild steel wire shall conform to M-13 (7) Shuttering shall conform to M-15.

1.2 Workmanship:

In shall be of 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 other wise specified.

The thickness of 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 of 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.

Q. Providing and laying controlled concrete M-150 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 foundations/level up to floor two level. (C) Slabs, landing shelves, Balconies, lintels, beams, girders, and cantilever, up to floor two level (D) Columns, 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.

1.1 Materials :

1.1.1 Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Grit shall conform to M-4. Coarse aggregate shall conform M-6.

1.2 General:

1.2.1 The relevant specifications of item no. 2.8-J of ordinary concrete shall be followed except that the concrete mix shall be designed from 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 numbers specify 28 days works cube compressive strength of 150 mm cubes of the mix expressed in Kg. / Cmt.

1.2.2 The proportion of cement, sand and coarse aggregates shall be determined by 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 of Concrete	Compressive strength of 15 cms 28 days conducted in accordance Preliminary test Work test Min	cubes in Kg./Cmt. at with I.S. 516-1959 Min.
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-150	200	150
-200	260	200
-250	320	250
-300	380	300
-350	440	350
-400	500	400

In all cases, the 28 days compressive strength specified in above table 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 all purposes as concrete belonging to the lower of the two grades between which its strength lies.

1.3 Workmanship:

- 1.3.1 The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that the 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 being in them in the right proportions as required. Aggregate 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 the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.
- 1.3.2 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. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipments shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.
- 1.3.3 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. 2389(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 concrete shall not be less than 220 Kgs./M³ in plain concrete and not less than 250 Kg/M³ in reinforced concrete.

R. 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 (D) Columns pillars posts and struts up to floor two level (E) Stair cases up to floor two level (K) Vertical and horizontal fins up to floor two level.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.8-Q shall be followed except that the grading of concrete shall be controlled concrete M-200 grades for the work as specified in item.

S. Providing and laying controlled cement concrete M-250 and curing complete excluding the cost of reinforcement for 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, landings shelves, balconies, beams, girders and cantilever up to floor two level (D) Columns, pillars, struts up to two level.(E) Stair cases upto floor two level (F) Vertical and horizontal fins up to floor two level.

1.1 Materials & Workmanship :

1.1.1 The relevant specifications of item No. 2.8-Q shall be followed except that the grading of concrete shall be controlled concrete M-250 grades for the works as specified in the item.

S1. Providing and laying controlled cement concrete M-300 and curing complete excluding the cost of reinforcement for 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, landings shelves, balconies, beams, girders and cantilever up to floor two level (D) Columns, pillars, struts up to two level.(E) Stair cases upto floor two level (F) Vertical and horizontal fins up to floor two level.

1.2 Materials & Workmanship :

1.2.1 The relevant specifications of item No. 2.8-Q shall be followed except that the grading of concrete shall be controlled concrete M-300 grades for the works as specified in the item.

T. Providing and laying ordinary cement 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 of R.C.C. work in : (I) Slabs up to 8 cms thickness (II) Slab having more than 8 cms and up to 10 cms thickness (III) Slab having more than 10 cms and up to 13 cms thickness (IV) Slab having more than 13 cms and up to 15 cms thickness.

1.1 Materials & Workmanship :

- 1.1.1 The relevant specifications of item No 2.8-J shall be followed for concrete work and relevant specifications of item No.2.7.-A shall be followed for form work and centering work. The concrete surface shall be smooth finished in cement mortar 1:3 (1 cement: 3 fine sand) as per item No. 2.8-A-1.2.7 the thickness of the slab shall be as specified in the item.

U. Providing and laying controlled cement concrete M-150 and finishing smooth with curring 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 and up to 10 cms (III) Slabs more than 10 cms and up to 13 cms (IV) Slabs more than 13 cms and up to 15 cms.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item No. 2.8-Q shall be followed for concrete work and item no 2.7-A 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. 2.8-A-1.2.7 The thickness shall be as specified in the item
- 1.1.2 The relevant specification for item No. 2.8-Q shall be followed except that the item shall include the cost and form work and centering.
- 1.1.3 The rate shall be for a unit of one cubic meter.

V. 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 form work but excluding the cost of reinforcement for R.C.C. work in (I) Slab 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 13 cms and up to 15 cms thickness.

1.1 Materials & Workmanship :

- 1.1.1 The relevant specifications of item No. 2.8-J shall be followed for concrete work and that of form work and centering work shall be followed as per item No. 2.7-A. The thickness of the slab shall be as specified in the item.

W. Providing and laying controlled cement 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:(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 13 cms thickness.

1.1 Materials & Workmanship :

The relevant specifications of item No 2.8-J shall be followed for controlled concrete and the relevant specifications of item No 2.7-A shall be followed for exposed concrete form work and centering work. The thickness of the slab shall be as specified in the item.

X. Providing and laying ordinary cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) for R.C.C. lintel Including finishing smooth with curring etc. complete including the cost of form work but excluding the cost of reinforcement.

1.1 Materials & Workmanship :

The relevant specifications of item No. 2.8-J shall be followed for concrete work relevant specifications of item No. 2.8-A-1.2.7 for finishing work and relevant specifications of item No. 2.7-A shall be followed for form work and centering work. The concrete work shall be followed for the form work and centering work for exposed concrete work.

Y. Providing and laying ordinary 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 area 0.05 to 0.08 Sq. meter (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. 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.

1.1 Materials & Workmanship:

1.1.1 The relevant specification of item No. 2.8-J shall be followed for concrete work and item no. 2.7-A 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. 2.8-A-1.2.7 The cross sectional area of beam shall be specified in item.

Z. 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 Sq. mt. 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 are amore than 0.12 Sq. mt. and up to 0.18 Sq. mt.

1.1 Materials & Workmanship:

1.1.1 The relevant specifications of item No. 2.8-Q shall be followed for controlled concrete work for work as specified in item for M-200 and relevant specifications of item 2.7-A shall be followed for the form work and centering work for exposed cement work.

AA. 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 sectional area 0.05 Sq. mt. (II) Having cross sectional area 0.08 Sq. mt. up to 0.12 Sq. mt. (III) Having cross sectional are 0.12 Sq. mt. up to 0.18 Sq. mt.

(B) Columns: (I) Having cross sectional area 0.05 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.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item No. 2.8-Q shall be followed for controlled concrete work as specified in item for M-200 and relevant specifications of item 2.7-A shall be followed for the form work and centering work for exposed cement work.

BB. Providing and laying controlled cement concrete M-250 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. 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.

(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.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item No. 2.8-Q 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.

2.9 SPECIFICATION FOR MASONRY WORK.

A. Cément Mortar:

1.1 Cement: Cement shall conform to specification M-2.

1.2 Water: The water shall conform to specification M-1.

1.3 Sand: The sand shall conform to specification M-3.

1.4 Proportion of Mix:

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 by the Engineer-In-Charge.

B. Preparation of Mortar:

1.1 In hand mixed mortar, cement and sand in the specified proportion 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 may be adopted as directed by the Engineer-In-Charge.

1.2 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. The mortar remaining unused after that period or mortar which has partially hardened or damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

C. 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.

1.1 Materials:

Water shall conform to M-1 Cement shall conform to M-2 Sand shall conform to M-3.
Brick shall conform to M-8 Cement mortar shall conform to item no.2.10-A & B.

1.2 Workmanship:

1.2.1 Proportion:

1.2.1.1 The proportion of the cement mortar shall be 1:5 (1 cement: 5 fine sand) by volume.

1.2.2 Wetting of bricks:

1.2.2.1 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 an indication of through wetting of bricks.

1.2.3 Laying:

- 1.2.3.1 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; closer in such case shall be cut to required size and used near the ends of walls.
- 1.2.3.2 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 side 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.
- 1.2.3.3 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.
- 1.2.3.4 The brick shall be laid with frog upwards. A set of tools comprising of wooden straight edges, mason'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.
- 1.2.3.5 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.
- 1.2.3.6 All fixtures, 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.

1.2.4 Joints:

- 1.2.4.1 Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by taking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to done.
- 1.2.4.2 The face of brick shall be cleaned the very day on which the brick work is laid and all mortar dropping removed.

1.2.5 Curing

- 1.2.5.1 Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period seven days. The top of masonry work shall be kept well wetted at the close of the day

1.2.6 Preparation of foundation bed:

- 1.2.6.1 If the foundation is to be laid directly on the excavated bed, the bed shall be leveled, cleared of all loose materials, cleaned and wetted before starting 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.

D. 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,

1.1 Materials:

Cement mortar of proportion 1:5 shall conform to item no.2.10-A & B. Conventional bricks shall conform to M-7

1.2 Workmanship:

The relevant specifications of item No.2.10-C shall be followed except that the masonry work shall be carried out by using conventional bricks.

E. 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 1:6 (1 cement : 6 fine sand) with modular bricks.

1.1 Materials:

Water shall conform to M-1. Cement mortar shall conform to item no. 2.10-A & B. Bricks shall conform to M-7

1.2 Workmanship:

1.2.1 The relevant specifications of item No. 2.10-C 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

F. 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.

1.1 Materials:

Water shall conform to M-1; Cement mortar shall conform to item no. 2.10-A & B. Bricks shall conform to M-7.

1.2 Workmanship:

1.2.1 The relevant specifications of item No. 2.10-C shall be followed except that the proportion of mortar shall be C.M. 1:8

G. 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.

1.1 Materials:

Water shall conform to M-1; Cement mortar shall conform to item no. 2.10-A & B. Bricks shall conform to M-7.

1.2 Workmanship:

1.2.1 The relevant specifications of item No.2.10-C shall be followed except that the proportion of cement mortar shall be 1: 8 and bricks used shall be conventional bricks.

H. Brick work using common burnt clay building bricks 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.

1.1 Materials:

Bricks shall conform to M-8. Cement mortar shall conform item no.2.10-A & B

1.2 Workmanship:

1.2.1 The relevant specifications of item No.2.10-C shall be followed except that the masonry work shall be carried out above plinth level to floor two level i.e. for ground floor.

1.2.2 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 brick work but for ordinary steel doors and windows required opening for frames, hold fasts etc. shall be left in the wall and frames embedded later on in order to avoid damage to the frames.

1.2.3 Necessary scaffolding shall be provided. The supports of the scaffolding shall be sound and strong tied together with horizontal pieces over which the scaffolding planks shall be fixed. Simple scaffolding shall be allowed normally. In this case scaffolding hole shall rest in hold header horizontal coarse only. Minimum number of holes shall be left in brick work for supporting horizontal scaffolding holes.

1.2.4 The contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

1.2.5 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.

I. 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.

1.1 Materials & Workmanship:

The relevant specifications of item No 2.10-E shall be followed except that brick masonry work shall be carried out with conventional bricks.

J. Extra for brick in super structure above floor two level.

1.1 Materials & Workmanship:

The relevant specifications of item masonry work to be carried out shall be followed except that this work is for additional lift of one floor above floor two level.

K. Half brick masonry in common burnt clay building bricks having crushing strength note less than 35 Kg/Sq. Cm. in cement mortar 1:4 (1 cement : 4 coarse sand) in super structure above plinth level up to floor two level with modular bricks.

1.1 Materials:

Brick shall conform to M-8. Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Cement mortar shall conform to 2.10 – A & B.

1.2 Workmanship:

1.2.1 Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc. shall conform to item No 2.10-H except the brick work of half bricks shall be carried out.

1.2.2 Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 part of sand by volume.

1.2.3 All bricks shall be laid strecher wise, breaking joints with those in the upper and lower courses. The wall shall be taken truly plumb. All courses shall be laid 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.

L. Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in cement mortar 1:4 (1 cement : 4 coarse sand) or super structure above plinth level up to floor two level with conventional bricks.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.10-K shall be followed for bricks, wetting of bricks, joints, curing, except that the bricks to be used shall be conventional bricks instead of modular bricks.

M. 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) in foundation and plinth modular bricks.

1.1 Materials & Workmanship:

The relevant specifications of item No 2.10-K 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.

N. Half brick masonry in 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 brick.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.10-K shall be followed except that the half bricks work shall be carried out in cement mortar 1:5 (1 cement : 5 coarse sand) in foundation and plinth using conventional bricks.

O. Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Mt. cement mortar 1:5(1 cement : 5 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.

1.1 Materials:

Bricks shall conform to M-8. Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Cement mortar shall conform to 2.10-A & B. M.S. reinforcement shall conform to M-10.

1.2 Workmanship:

- 1.2.1 Relevant specification of bricks; wetting and laying of bricks, joints, curing, scaffolding etc. shall conform to item no. 2.10-K except the following
- 1.2.2 Cement mortar used in masonry work shall be proportion to 1 part of cement and 5 parts of sand by volume and shall conform to 2.10-A & B and this work is for half brick thickness for partitions walls.
- 1.2.3 The hoop iron 25 mm x 1.6 mm 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 of hoop iron.
- 1.2.4 The joints in the course where inforcement is placed shall admit of mortar cover to the reinforcement.

P. 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 hoop iron 25 mm X 16 mm or equivalent reinforcement at every third course embedded in cement mortar in foundation and plinth with conventional bricks.

1.1 Material & workmanship:

The relevant specification of item No 2.10-K shall be followed except that the work is to be carried out with conventional brick instead of modular bricks.

Q. Extra for half brick masonry in superstructure above floor two level in Modular bricks

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.10-K & 2.10-L shall be followed except that this work is for additional lift of each floor above floor two level using Modular bricks.

R. for half brick masonry work in super structure above floor two level. Conventional bricks.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.10-K & 2.10-L shall be followed except that this work is for additional lift of each floor above floor two level using conventional bricks.

S. Half bricks thick honey comb brick work with burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in C. M. 1:4 (1 cement : 4 coarse sand)

1.1 Material:

Bricks shall conform to M-8 cement of proportion shall conform to M-2.

1.2 Workmanship:

The relevant specifications of item No. 2.10-K 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 where directed with all lifts

.2.10 DELETED

2.11 SPECIFICATION FOR WOOD WORK (DOOR & WINDOWS)

A. Providing wood work in frames of doors, windows clear story windows and other similar work, wrought, framed and fixed in position, India Teak wood.

1.1 Materials:

Wood in frames shall conform to M-18

1.2 Workmanship:

1.2.1 The item covers the requirement of frames for doors, windows, clearstory windows their supply and fixing.

1.2.2 Frames:

1.2.2.1 All members of the frames shall be exactly at right angles. The right angle shall be checked from inside surface of the respective members.

1.2.2.2 All members of frames shall straight without any warp or bow and shall have smooth surface well planed on the three sides exposed at right angles to each other. The surface touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall size within the tolerances specified.

1.2.2.3 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. still are provided the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm in upper floors, their vertical posts shall be fixed in the floor or masonry by forming notches 10 mm deep. Slight adjustment spacing as necessary shall be done to have the hold fasts in the joints of masonry course. The frame shall be created in position and held plumb with strong support from both sides and built in masonry as it is being built. The transom shall be through tenoned in to the mortices 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.

1.2.3 Tolerance:

Unless specially mentioned otherwise tolerance of ± 1.5 mm shall be allowed for each wrought face.

1.2.4 The tenons shall be closely fitting into the mortices and suitably pinned with wood dowels not less than 10mm. dia meter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

1.2.5 The contact surface of tenon and mortice shall be treated before putting together with an adhesive of approved make.

1.2.6 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 cm from the top and the bottom of the frames. In case of windows and ventilators frames whose height is less 1 M two hold fasts on each side shall be fixed at quarter points of the frames. The size of each hold fast shall be 300 x 25 x 6 mm and of mild steel with split end. The hold fast shall be fixed with screws to frames.

- 1.2.7 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.

B. Providing and fixing 35mm thick fully paneled shutters for doors, windows, and clerestory windows including anodized aluminum butt hinges with necessary screws, Indian teak wood.

1.1 Materials:

Wood for shutter shall conform to M-18 (2) Anodized aluminum butt hinges shall conform to M-23.

1.2 Workmanship:

The item covers the requirement of preparation of shutters for doors, windows, clerestory windows, their supply and fixing.

1.3 Shutters:

1.3.1 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.

1.3.2 All members of the shutters shall be straight without any warp or bow and shall have smooth, well planed faces at right angles to angles to each other.

1.3.3 The size of styles and rails shall be as per drawing or as directed. Styles and rails of shutters shall be made of one piece only.

1.3.4 Timber paneling:

1.3.4.1 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 shutter while fixing the panels in it.

1.3.4.2 The faces of the panel as well as various pieces of the panel shall be closely fitted to the size of the grooves.

1.3.4.3 Finishing of the corners of raised panel edges shall be done as shown in drawings or as directed.

1.3.5 Fixtures & Fastenings:

1.3.5.1 The rate shall include anodized aluminum butt hinges including fixing with iron screws. The size and number of hinges shall be as per table given in annexure-1.

C. Providing and fixing 35 mm thick fully glazed shutters for doors, windows and clerestory windows including anodized aluminum butt hinges with necessary stress, Indian Teak Wood.

1.1 Materials:

Teak wood shall conform to M-18. Glass shall conform to M-22. Anodized aluminum butt hinges shall conform to M-23.

1.2 Workmanship:

1.2.1 The relevant specifications of item No. 2.12-B shall be followed except that the 35 mm thick shutters fully glazed for doors, windows and clerestory windows including aluminum butt hinges with necessary screws.

1.3 Glazing:

1.3.1 The glass panels shall be embodied in putty and secured to the rebate by wooden beds or mouldings shape and size as approved with counter sunk screws of suitable size.

1.3.2 The glass panel shall be properly cut to fit the rebates of the frames and sashes fully with a light minus margin of about 1.5 mm on all sides. Before glazing the frame shall be primed and prepared for painting so that wood may not draw oil out of putty.

1.3.3 The rebate shall be putted to an extent to provide bedding all round the glass.

1.3.4 The glass shall then be bedded in putty and fitted to frames with wooden beads or mouldings as directed and secured with counter sunk screw. The screw shall be spaced not more than 10 mm from each corner and not more than 200 mm apart.

1.3.5 The size of the rebate in the frame and size and shape of beads or moulding shall be as per detailed drawings or as directed. The beds or mouldings shall have mitred corners.

D. Providing and fixing 35 mm thick partly paneled and partly glazed shutters, or doors, windows including anodized aluminum butt hinges with necessary screws, Indian teak wood.

1.1 Materials:

Teak wood shall conform to M-18. Glass shall conform to M-20. Anodized aluminum butt hinges shall conform to M-23.

1.2 Workmanship:

The relevant specifications of item No. 2.12-B and 2.12-C shall be followed except that the 35 mm thick shutters shall be partly paneled and partly glazed for door windows, clerestory windows etc., as per drawings.

E. Providing and fixing 35 mm thick fully paneled, shutters for doors, windows and clerestory windows including black enamelled M.S. butt hinges with necessary screws. Indian Teak Wood

1.1 Materials & Workmanship:

Relevant specifications of item No. 2.12-A shall be followed except that the hinges shall be of black enameled M.S. butt type 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.

F. Providing and fixing 35 mm thick fully glazed shutters for doors window and clerestory windows including black enamelled M.S. butt hinges, with necessary screws. Indian teak wood.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-B shall be followed except that the hinges shall be of black enamelled M.S. butt hinges, bolts and other items of iron mongery with moving parts shall be properly oiled by the contractor before handling over the building.

G. Providing and fixing 35 mm thick partly paneled and partly glazed shutters for doors windows and clerestory windows including black enamelled M.S. butt hinges with necessary screws, India teak wood.

1.1 Materials of Workmanship:

The relevant specifications of item No. 2.12-B shall be followed except that the hinges shall be black enameled M.S. butt type 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.

H. Providing and fixing 25 mm thick fully paneled, shutters for cup boards etc. including anodized aluminum butt hinges with necessary screws Indian teak wood.

1.1 Materials:

First class Indian teak wood for shutters shall conform to M-18. Glass shall conform to M-20. Anodized aluminum butt hinges shall conform to M-23.

1.2 Workmanship:

The relevant specifications of item No. 2.12-C shall apply except that the thickness of shutter shall be 25 mm for cup boards..

I. Providing and fixing 25 mm thick fully paneled shutters for cup boards etc. including anodized aluminum butt hinges with necessary screws Indian teak wood.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-C shall apply except that the thickness of shutters shall be 25 mm thick and fully glazed for cup boards.

J. Providing and fixing 25 mm thick party paneled and partly glazed shutters for cup boards etc. including anodized aluminum butt hinges with necessary screws, Indian teak wood.

1.1 Materials and Workmanship:

The relevant specifications of item No. 2.12-B and 2.12-C shall be followed except that the thickness of shutters shall be 25 mm thick and partly paneled and partly glazed shutters as per drawing for cup-boards

K. 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.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-A 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 anodized aluminum butt hinges and thickness of shutter shall be 25 mm.

L. Providing and fixing 25 mm thick fully glazed shutters for a cup boards etc. including black enamelled M.S. butt hinges with necessary screws. Indian Teak wood.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-C shall be followed except that the fully glazed shutters of 25 mm thickness shall be of Indian teak wood and fixed in position with black enamelled butt hinges for cup boards.

M. Providing and fixing 25 mm thick partly paneled and partly glazed shutters for cup boards including black enamelled M.S. butt hinges with necessary screws. Indian teak wood.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-H and 2.12-I shall be followed except that the shutters shall be partly paneled and partly glazed of 25 mm. thickness of Indian teak wood fixed with black enamelled butt hinges for cup boards.

N. Providing and fixing 35 mm thick paneled glazed or paneled and glazed shutters for doors, windows and clerestory windows including anodized aluminum butt hinges with necessary screws. Indian teak wood shutters with (A) Plywood (B) Particle boards (C) Hard board (D) Asbestos sheet panels.

1.1 Materials:

Indian teak wood for shutters shall conform to M-18. Glass shall conform to M-20.

(A) Plywood shall conform to M-19

(B) Hard board shall of best quality and shall be as approved by Engineer-in-charge.

1.2 Workmanship:

1.2.1 The relevant specifications of Item No. 2.12-B 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.

1.2.2 The shutters shall be prepared by fitting styles and rails (top, bottom, lock and frieze) as for paneled leaves with simple chamfer on edges only. The style and rails shall be grooved with just sufficient width for received panels and plain panels of specified type panes shall be fitted into the grooves.

O. Providing and fixing 35 mm thick paneled glazed or paneled and glazed shutters for doors, windows and clerestory windows including black enamelled M.T. butt hinges with necessary screws. Indian teak wood shutters with (A) plywood (B) Particle board (C) Hard board (D) Asbestos sheet panels.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-N shall be followed except that the hinges shall be of black enamelled M. S. butt hinges instead of anodized aluminum butt hinges and shutter with (A) Plywood (B) Particle board (C) Hard board (D) Asbestos sheet panels as specified in item.

P. Providing and fixing first class Indian teak wood 75 x 60 mm moulded hand rails in straight lengths completed.

1.1 Materials:

First class Indian teak wood shall conform to M-18

1.2 Workmanship:

1.3 The teak wood hand rail shall 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.

2.12 SPECIFICATION FOR FLUSH DOOR

A. Providing and fixing flush door shutters, solid core construction with frame of 1st class shard wood with cross band and face veener or plywood face panels including anodized aluminum butt hinges with necessary screws (A) Non-decorative type and block board core (2) 35 mm thick

1.1 Materials:

Flush door shall conform to M-20. Plywood shall conform to M-20. Anodized aluminum butt hinges shall conform to M-23.

1.2 Workmanship:

1.2.1 The relevant specifications of item No. 2.12-N shall be followed except that the shutters be non decorative type and block board core with face venner or plywood, with 35 mm thickness.

1.2.2 Readymade shutters shall be 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.

B. Extra for using bright finished M. S. Piano hinges of anodized aluminum butt hinges in flush door shutters (A) Nickel Plated Piano hinges.

1.1 Materials & Workmanship:

The relevant specifications of item No. 2.12-A shall be followed except that the nickel plated piano hinges shall be provided fixed. It shall conform to the latest Indian standards and shall be got approved by the Engineer-in-charge.

2.13 SPECIFICATIONS FOR STEEL SHUTTER WINDOWS AND VENTILATORS

A. Steel work riveted, in built up sections, framed work including cutting, hoisting fixing in position and applying a priming coat of red lead paint. In beam and joints, channels, angles, tees, flats with connection plates or Angle cleats as in main & cross beams. Hop and jack rafters, purlins connected to common rafters and the like.

1.1 Materials:

The structural steel work shall conform to M-14. Red lead paint primer shall conform to I. S. : 102-1962.

1.2 Workmanship:

1.2.1 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 other wise jointed to make up 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/permittted.

1.2.2 Steel riveted or bolted in built up sections, frame work.

1.2.2.1 The steel structure as shown in the drawings or as per direction of the Engineer-in-charge shall be laid out one level platform to full scale and to full size or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

1.2.2.2 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 template 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.

1.2.2.3 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 member shall be distinctly marked or stenciled with paint with the identification mark as given in the shop drawings.

1.2.2.4 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, strained or forced into position and when built up, shall be true and free from twist, knicks, buckles, or open joints. Before making holes individual members for fabrication, the steel work intended to be riveted or bolted together shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping 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.

Web splice plates and filters under stiffeners shall be cut to fit within 3 mm or flange angles, web plates of girders shall have not cover plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced shall have clearance of more than 6 mm.

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 to be more that 3 mm at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided.

Pins and rollers shall be accurately turned to gauge. These shall be straight and smooth and free from flows. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it. In columns caps and bases, the ends of shafts together with the attached gussets angles, channels etc., after riveting together shall be accurately mechanized so that the parts connected butt against each other over the entire surfaces of contract 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.

The ends of bearing stiffeners shall be machanised or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm or less in diameter and remade 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 up on the diameter of rivets.

Holes shall have their axis perpendicular to the surface bored through. The drilling or reamering shall be free form butts, and the holes should be clean and accurate. Holes for counter shunk bolts shall be made in such a manner 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 connection 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 of stresses.

1.2.3 **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 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.

The shanks of rivets shall project beyond the plate surface sufficiently so as to fill the hole thoroughly and from 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. Riveting 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 recouping shall not be permitted.

For testing rivets, hammer weighing approximately 0.25 kg. Shall be used 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.

- 1.2.4 Bolting 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 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 they 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 bolts shall not be within the thickness of the parts bolted together. The faces of the bolt 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 steelwork shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

B. 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, up to 25 mm span and 15 mm overall height.

1.1.1 Materials Workmanship:

The relevant specifications of item no 2.14-A shall be followed except that the work shall be for trusses and trussed purlins up to 25 mm span and 15 mm overall height.

C. Steel work welded in built up sections frame work including cutting, hoisting, fixing in position and applying priming coat of red lead paint. In beams and joints, channels, angles, tees, flats, with connecting plates or angle cleats as in plain and cross beams. Hip and jack rafters, purlins, connected to common rafters and the like.

1.1 Materials and Workmanship:

1.1.1 The relevant specifications of item no 2.14-A shall be followed except that the steel work shall be done by welding.

1.1.2 Welding shall generally be done by electric process. Gas welding shall be resorted to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

1.1.3 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 welds as well as type of electrodes to be used. Symbol for welding on plans and shop drawing 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 position on scaffoldings etc.
The welding work shall conform to I. S. 816-1969.

1.1.4 Preparation of surfaces:

Surface, which is 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.

1.1.5 Assembly for welding:

Before welding is commenced, the plates shall first be brought together and firmly clamped or spot welded at specified distance. The temporary connection has to be strong enough to hold the plates accurately in place without displacement.

1.1.6 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:

(a) Welds shall be made in flat position wherever practicable.

(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 who offer the greatest resistance to compression are welded first.

1.1.7 The defective welds, which shall be considered harmful to the strength, shall cut out and rewelded.

1.1.8 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 be painted after the same are approved.

1.1.9 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.

D. Steel work welded in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red paint in trusses and trussed purlines up to 25 m span and 15 m overall height.

1.1 Materials and Workmanship:

The relevant specifications of item no 2.14-C shall be followed except that the work shall be for trusses and trussed purlins up to 25 m span and 15 m overall height.

E. Providing and fixing 1 mm thick M. S. sheet sliding shutters both frame and diagonal braces of 40 x 40 x 6 mm. Angel iron 3.15 mm M. S. gusset plates at junctions and corners. 25 mm dia putty 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.

1.1 Materials:

M. S. sliding shutters shall be fabricated of M. S. component as given in the description of item. M. S. sheet 1 mm thick shall be fixed to the frame with rivets or welds as approved. The shutters shall be provided with top and bottom guide rails of angle or T-iron as specified and 25 mm dia steel pulleys at the top. The frame shall be riveted and/or welded and wherever riveting shall be done 3.15 mm gusset plates shall be provided at the junctions.

1.2 Workmanship:

- 1.2.1 The shutters shall be single or double leaf shutters as specified. The guide rails shall be sufficiently long and continued along the wall on both ends so that the sliding shutters can rest against walls, leaving full opening when so required.
- 1.2.2 The guide rails shall be fixed to the floor by means of anchor bolts embedded in the cement concrete floor. The steel section at the top shall be suitably supported from the walls. Two channel sections shall be 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.
- 1.2.3 All the adjoining work damaged while fixing shall be made good to match the existing work.
- 1.2.4 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.

2.14 SPECIFICATION FOR EXPANSION JOINTS

A. Expansion Joints – Premoulded Filler:

- 1.1 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.
- 1.2 Premoulded bituminous joint filler i.e. performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.
- 1.3 Thickness of the pre-molded joint filler shall otherwise specify.
- 1.4 Premoulded bituminous joint filler shall conform to I.S. 1838-1961.

B. Expansion Joints – Premoulded Filler:

- 1.1 The item provide for expansion joints in R.C.C frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts.
- 1.2 28.2 Copper sheet shall be of 1.25 mm. thick and of 1.25 mm. width when the 'U' shape in middle. Copper strips shall have hold fast of 3 mm. 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 provide in the expansion joint, in the copper plate shall be of 25 mm.

2.15 SPECIFICATIONS FOR LABOUR FOR FIXING AND FASTERING

A. Fixing metallic tower bolts of size with necessary screws etc complete(lower bolts and screws to be paid under separate items)

1.1 Workmanship:

- 1.1.1 This item provide for labour fixing metallic tower bolts of any size with screws, nuts etc.
- 1.1.2 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.
- 1.1.3 The screws shall be driven home with screwdriver. In not case the screws shall be hammered in.
- 1.1.4 All recesses and seats shall be cut to the exact size for counter sinking etc. where so required
- 1.1.5 Care/shall be taken to see that no gaps are left between the fitting and the surface meant to receive the fittings.
- 1.1.6 The fitting shall be properly clamed and left in original finish after fixing.

B. Fixing metallic flush bolts of sizes with necessary screws etc. complete (flush bolts and screws shall be paid under separate item)

1.1 Workmanship:

The relevant specifications shall be followed as per item no 2.16-A except for fixing metallic flush bolts instead of tower bolts.

C. Fixing metallic or plastic door handles of sizes with necessary screws etc. complete (door handles and screws to be paid under separate items)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except fixing.

D. Fixing metallic gate and shutters hooks and eyes of sizes (hooks and eyes to be paid under separate item)

1.1 Workmanship:

The relevant specifications shall be followed as per item no 2.16-A except that the fixing of eye and hooks instead of tower bolts.

E. Fixing metallic door latches of sizes with necessary screws (door latches and screws to be paid under separate items)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except that fixing metallic door latches instead of tower bolts.

F. Fixing metallic mortise night latches with necessary screws including making necessary screws holes in wooden door shutters etc. complete (mortise night latches and screws to be paid under separate items)

1.1 Workmanship:

The relevant specifications of item no 2.16-A above shall be followed except that the fixing of mortise night latches instead of tower bolts.

G. Fixing metallic ball catchers 100 mm dia (Ball catchers to be paid under separate item)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed same except fixing of

H. Fixing metallic casement window fasteners with necessary screws etc. complete (Casement window fasteners and screws to be paid under separate item)

1.1 Workmanship:

The relevant specifications of item no. 2.16-A shall be followed except fixing metallic casement windows fasteners.

1.2 Materials & workmanship:

1.2.1 The relevant specifications of item 2.16-A shall be followed.

1.2.2 The rate shall be for a unit of one number.

I. Fixing metallic casement stays of sizes with necessary screws etc. complete.(casement stays and screws to be paid under separate items.)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except fixing of metallic casement stays.

J. Fixing metallic cup-board or ward robe locks of sizes with necessary screws etc. complete(locks and screws to be paid separately)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except that fixing metallic cup-board or ward robe locks of size with necessary screws etc. complete.

K. Fixing metallic or plastic cup-board or ward robe knobs of size with necessary screws/bolts etc. complete (knobs and screws/bolts to be paid separately)

1.1 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except that fixing of metallic or plastic cup-board or ward robe knobs of sizes with necessary screws/bolts etc. complete.

1.2 Workmanship:

The relevant specifications of item no 2.16-A shall be followed except that fixing of metallic floor door stoppers.

1.3 Workmanship:

1.7.1 The relevant specifications of item no 2.16-A shall be followed except that fixing of metallic door handles or knobs for mortise with necessary screws etc. complete.

2.16 SPECIFICATION FOR GLAZING

A. Providing and fixing sheet glass, selected quality (type-C) bedded putty and fixed with wooden beading including cost of wooden beading of rist class teak wood and necessary cutting of glass 5 mm thick.

1.1 Materials:

The glass shall conform to M-22. The wood beading shall conform to M-18. Putty shall conform to I. S. 419-1967.

1.2 Workmanship:

1.2.1 Size of glass for glazing shall allow a clearness of 2.5 mm between the edges of glass and the wood or metal surrounds. The clearness may be increased, provided the depth of the rebate of groove is sufficient to provide not less than 1.5 cm. Cover to the glass. The detailed process or glazing shall be as specified in I. S. 3548-1966

1.2.2 All stains from the surface of glass shall be removed and cleaned with thinner or spirit without any extra payment.

1.3 Wooden beading:

1.2.2 The size of the wood beads for glass panes shall be 1.5 cms x 3 cms unless otherwise specified. Bead shall be secured to wooden frames with either panels pains or screws and to metal frames in the way provided for in the frame.

1.2.3 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 that 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 aqt, an angle not undercut to prevent water accumulating. Beads should be bedded with compound against the glass and wood beads should also be bedded against the rebate.

1.2.4 Care should be taken to see that no voids are left between the glass and the bead.

B. 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 6 mm thick.

1.1 Materials & Workmanship:

The relevant specifications of item no 2.17-A shall be followed except that the sheet glass of selected quality of 6 mm thick.

C. Providing and fixing rough cast wired glass 6 mm thick bedded in putty and thick with wooden beading including the cost of wooden beadings of Indian teak wood and necessary cutting of glass wired figured glass.

1.1 Materials:

Wired figured glass should conform to M-20. Wooden beading shall conform to M-18. Putty shall conform to I. S. 419-1967.

1.2 Workmanship:

The relevant specifications of item no 2.17-A shall be followed except that the wired figured glass of 6 mm thick shall be used.

D. Providing and fixing sheet glass ordinary quality bedded in the putty and fixed with wooden beading including the cost of wooden beading of first class teak wood and necessary cutting of glass 3 mm thick.

1.1 Materials:

Glass shall conform to M-21. Wooden beading shall conform to M-19. Putty shall conform to I. S. 419-1967.

1.2 Workmanship:

The specifications of this item shall be followed as per item no 2.17-A except that the sheet glass of ordinary quality shall be used and thickness of sheet glass shall be 3 mm thick.

E. Providing and fixing sheet glass ordinary quality bedded in the putty and fixed with wooden beading including the cost of wooden beading of first class teak wood and necessary cutting of glass 4 mm thick.

1.1 Materials and Workmanship:

The relevant specifications of item no 2.17-D shall be followed, except that the thickness of ordinary sheet glass shall be 4 mm.

F. Extra for using ground glass (Frosted or obscured on one side) instead of plain glass.

1.1 Materials:

Glass shall conform to M-21. Wooden shall conform to M-18. Putty shall conform to I. S. 419-1967.

1.2 Workmanship:

The specifications of this item shall be followed as per item no 2.17-A except that ground glass (Frosted or obscured on one side) shall be used.

G. Difference in cost of material and labour involved in method of glazing if changed in item no 13.1 to front end back puttied and sprigged or fixed with glazing pins:

1.1 Materials and Workmanship:

The relevant specifications of item no 2.17-A shall be followed except that the glazing is to be done by front and back putting and springged or fixed with glazing pins.

H. Griding, polishing and round of edges glass or glazing sheets:

1.1 Materials:

The glass shall conform to M-22

1.2 Workmanship:

The edges of glass or glazing sheets shall be grind polished and rounded of 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.

2.17 SPECIFICATION FOR CEILING AND LINING

A. Providing and fixing wooden planks ceiling with tongued and grooved jointing and wood screws (frames work and cover fillets to be measured and paid separately) : India Teak Wood (i) 12 mm. thick (ii) 20 mm. thick (iii) 25 mm. thick.

1.1 Materials :

The India Teak wood shall conform to M-18

1.2 Workmanship :

1.2.1 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 planed for full face.

1.2.2 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 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.

1.2.3 Fixing :

Planks of specified timber and thickness shall be used. The width of the plank mm. for planks above 20 mm. thick and length shall not exceed 3 metres. The planks shall be of uniform width except in the first and last lines of planks adjacent to the 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 shorter lengths are unavoidable. The planks shall be planed true on the exposed sides.

1.2.4 The longitudinal edges of the planks shall be jointed with tongued and grooved type joints as described in the item.

1.2.5 The outer lines of planks shall be accurately fixed parallel and close to the wall. Each subsequently plank shall be carefully jointed up. The plank shall be fixed to the frame above with two screws at each and joint of frame and one at every intermediate joint. (The screws shall not be thinner than designation 8 and of a length not less than twice the thickness of the boards.) The screws shall be counter sunk and the screws holes filled with putty or sloping out way. The unexpected face of planks shall be treated with wood preservative before the board is fixed.

B. 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.

1.1 Materials :

The fiber insulation board of specified thickness shall conform to I.S. 3348-1965.

1.2 Workmanship :

1.2.1 Fixing :

The work shall be carried out as per detailed drawings for panel arrangements.

1.2.2 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 a at least 24 hours before use in the same environment as the one in they are to be fixed.

1.2.3 Frame of 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 cur board in the panel arrangements. All edges of the boards shall be supported. Intermediate supports shall be provided at dedo heights for pircurerails and cornices etc.

1.2.4 Planked battens 40 mm. x 20 mm. shall be sued for grounds on solid walls. The batten shall be plugged to wall as described under. The batten shall be fixed on tapering plugs with 50 mm. long wood screws. The tapering plug shall be traperszoidal 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. The plugs shall treated with coat tar and battens shall be treated with wood preservative before use. On uneven wall faces the battens shall be plugged and fitted with packing at the back where necessary. The frame shall be Nailing shall be done by nails have shank diameter of 2.5 mm. and head diameter of about 8 mm. Nails shall have length as per requirement. The nails shall be placed supports at 100 mm. to 150 mm. centre in centre and edges 75 mm. centres. Minimum clearance for nails from edges shall be 10 mm. The nails shall be rustless 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.

C. Providing and fixing plywood lining with butt jointing and nails (frame work and cover filled to be measured and paid for separately) 6 mm. thick ply.

1.1 Materials: 6 mm. thick plywood shall conform to M-20.

1.2 Workmanship :

The relevant specification of item 2.18-B shall be followed except that 6 mm. thick plywood shall be fixed in lining.

D. Providing and fixing plywood lining with butt jointing and nails (frame work and cover filled to be measured and paid for separately) 9 mm. thick ply.

1.1 Materials & Workmanship:

The relevant specification of item 2.18-C shall be followed except that the thickness of plywood to be fixed shall be 6 mm.

2.18 SPECIFICATIONS FOR PLASTERING AND POINTING

A. 12 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.

1.1 Materials :

Water M-1. The Cement mortar of proportion 1:3 shall conform to item no.-2.10-A & B.

1.2 Workmanship :

1.2.1 Scaffolding:

Wooden ballies, bamboos, planks, treatles 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.

1.2.2 Preparation of back-ground :

1.2.2.1 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 roughened by wire brushing if it is not hard and by racking if it is hard. In case of concrete surface, if a chemical retarder 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 retarder is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.

1.2.2.2 Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

1.2.2.3 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.

1.2.2.4 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 supporting ceiling resting on the wall of the floor have been removed, Ceiling plaster shall be completed before starting plaster to walls.

1.2.3 Applications of Plaster :

1.2.3.1 The plaster about 15 x 15 cms. Shall be first applied horizontally and vertically at not more than 2 meter 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 movement at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive toweling or overworking the float shall be avoided. All corners, arises, angles and junctions be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises junctions etc. shall be carried out with proper templates to the size required.

1.2.3.2 Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site :

1.2.3.3 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 recommending the plaster, the edges of

the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent area to enable the two to properly joint 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 arrises. Horizontal joints in plasterwork 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.

1.2.3.4 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 handling mattings or gunny bags on the outside of the plaster and keeping them wet.

B. 20 mm. thick cement plaster in Double 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).

1.1 Materials & Workmanship :

The relevant specifications of item no. 2.19-A shall be followed except that the thickness of item plaster shall be 20 mm. The plastering work shall be in single coat on rough of half brick wall for interior plastering up to floor two levels, finished even and smooth in C.M. 1:3.

C. Extra over item A & B for finishing with a floating coat of neat cement slurry.

1.1 Materials & Workmanship:

The relevant specifications of item 2.19-A and 2.19-B shall be followed for materials and workmanship except that this work is only of providing smooth cement finish with floating coat of neat cement slurry.

The coat of cement and fine sand mortar of proportion 1:1 (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.

In any continuous face of wall the finishing treatment should be carried out continuously and day to day braked made to coincide with architectural breaks in order to avoid unsightly junctions.

1.2 1.4 Curing:

All the plaster work shall be kept damp continuously for a period of 7 days.

D. Extra over items 2.19-A to 2.19-C for providing and mixing water proofing materials in cement mortar in proportion recommended by the manufacturers.

1.0 Materials & Workmanship:

1.1 The relevant specifications of item no 2.19-A to 2.19-C 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 of water proofing

materials to be mixed with 50 kg. Bags shall be as recommended by the manufactures of the water proofing material.

E. 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:

Water shall conform to M-1. Cement mortar shall conform to item no. 2.12-A & B.

2.0 Workmanship:

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. 2.19-A shall be followed except that the thickness of back coat shall be 12 mm. average. Before the first coat hardens its shall be beaten up by edges of wooden tappers 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 up to 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 for a period of 7 days. During this period, it shall be protected from all damages.

F. 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-2.12-A & B.

2.0 Workmanship:

2.1 The flush pointing work shall be carried out with cement mortar proportion 1:3 (1 part of cement and 3 parts 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 of finished pointing or from the edge of the brick shall be average 10 mm.

2.3 Application of Mortar & Finishing:

2.3.1 The mortar shall be pressed into the raked out joints with a pointing trowel according tot he type of pointing specified in item. The mortar shall not spread over the corner edges or surface of the masonry. The pointing shall then the 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.

G. Pointing on brick work with cement mortar 1:3 (1 cement :3 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 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 on a similar way. The pointing line shall be uniform in width and truly horizontal and parallel in case of floor and ceiling.

H. 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. 2.19-F shall be followed except that the pointing work shall be carried out C.M. 1:4.

I. 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. 2.19-G shall be followed except that the proportion of C.M. 1:4 shall used for ruled pointing.

J. Pointing on coursed stone masonry with cement mortar 1:3 (1 cement :3 sand) flush pointing.

1.0 Materials & Workmanship:

- 1.1 The relevant specifications of item no. 2.19-F 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.

K. Pointing on course masonry with cement mortar 1:3 (1 cement : 3 sand) Ruled pointing.

1.0 Materials & Workmanship :

- 1.1 The relevant specifications of item no. 2.19-J and 2.19-G shall be followed.

L. Pointing on uncoursed stone masonry with cement mortar 1:3 (1 cement :3 sand) Flush pointing.

1.0 Materials & Workmanship:

- 1.1 The relevant specifications of item no. 2.19-F shall be followed except that the flush pointing shall be done on uncoursed rubble masonry work in 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.

**M. Pointing on uncoursed stone masonry with cement mortar 1:3 (1 cement : 3 sand)
Ruled pointing.**

1.0 Materials & Workmanship:

- 1.1** The relevant specifications of item no. 2.19-L and 2.19-F shall be followed except that the ruled pointing work shall be carried out on uncoursed rubble masonry work in C.M. 1:3.

2.19 SPECIFICATION FOR WHITE WASHING AND DISTEMPERING

A. White washing with lime on undecorated wall surfaces (two coats) to give an even shade including thoroughly brooming the surface to remove all dirt, dust mortar drops and other foreign matter.

1.1 Materials :

- 1.1.1 The calcarcole shall be made from glue and boiling water by mixing 1 kg. Mixture shall be suitably tinted where required for use under coloured distemper if required. Glue shall conform to I.S. 852-1969 (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 the preparation 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 wash. Pigments: mineral colours, not affected by lime shall be used in preparing colour wash.

1.2 Workmanship :

1.2.1 Preparation of white wash solution :

Surface already white or colour. The fat lime shall be slaked at site and shall be mixed and stirred with about five liters of water for 1 kg. of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth, 4 kg. of gum dissolved in hot water shall be added to each cubic meter of lime cream. Small quantity of ultramarine blue (Upto 3 gms. 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.

1.2.2 Preparation of surface :

- 1.2.2.1 The surface shall be thoroughly cleaned of all dust, dirt, mortar cropping and other foreign matters before white wash is to be applied.
- 1.2.2.2 The surface spoiled by smoke soot shall be scraped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brick bats. The surface shall be then boomed to remove all dust, dirt and shall be washed with clean water.
- 1.2.2.3 Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubbed wire brushes.
- 1.2.2.4 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 be wetted and allowed to dry. They shall then be given one coat of white wash.
- 1.2.2.5 All unnecessary nails shall be removed, the holes cracks patches etc. shall be made good with materials similar in composition to the surface to be prepared.

1.2.3 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 coloured 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

tyed 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.

1.2.4 Application of white wash :

1.2.4.1 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 stroke from the right another from the left, over the first stroke brush before the it dries. This will from one coat. Each coat shall be allowed to dry before next coat is applied. Number coats as specified in item shall be applied. It shall present smooth and uniform finish free from brush marks and it should not come off easily when rubbed finger.

1.2.4.2 Splashing and dropping if any on the doors and windows, ventilators etc. shall be removed and the surface cleaned.

1.2.4.3 Priming and Alkali resistant treatments, scrapping of surface washing etc. surface spoiled by smoke soot removed of oil and grease spots treatment for infection with effloresces moulds moss, funji and kitchen and patch repairs to plaster wherever done shall not be paid extra.

B. 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 of item No. 2.20 - A shall be followed except that it shall be for colour wash.

1.1 Materials:

1.1.1 Clear-Colle:

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 suitable tinted to match with colour of washing as directed. Glue shall conform to I.S. 852-1969.

1.1.2 Lime

Lime used shall be freshly burnt class 'C' lime (Fat lime) and white in colour conforming to I.S. 712-1973.

1.1.3 Water

Water shall conform to M-1.

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.

1.2 Workmanship:

1.2.1 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 2.20-A Mineral colour 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 appeals lighter in shade then when the same shades are applied precisely to large surface. 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 Ochre** : 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 the required shade is obtained.
- (b) **With Blue Vitriol** : Fresh crystals of hydrous copper sulphate (i.e. blue vitriol) shall be ground to fine powder 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.

1.3 Preparation of Surface:

The surface shall be prepared by removing mortar droppings and foreign matter and thoroughly cleaned with wire or fibre brush or any other suitable means as directed by the Engineer-in-charge. All loose pieces and scales shall be scrapped off boles filled with mortar.

- 1.3.1. For scaffolding and application of colour wash, relevant specification of item No. 2.20-A 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. 2.20-A "Application of white wash for colour washing on undecorated surface" after the surface has been prepared. The first primary coat shall be of white wash and subsequent coat (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 in full numbers of coats as described in the item and the shade so obtained shall be examined before the entire work of colour washing is taken up in hand. It shall be noted that small areas of colour wash will appear lighter in shade then when the same shade is applied to the large surface.

- 1.3.2 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 requiring 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.

1.4 Protective measure:

- 1.4.1 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.

C. Cement washing with Portland 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.

1.1 Materials :

1.1.1 Water shall conform to M-1. Portland cement shall conform to M-2.

1.2 Workmanship :

1.2.1 The relevant specifications of item No. 2.20-A 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 shall be mixed to water to form slurry to the consistency of good ready mix oil paint. The slurry shall be applied with brushed to form a smooth bodies opaque surface.

D. 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 matter.

1.1 Materials :

1.1.1 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. Whiting shall conform to I. S. 63-1964.

1.2 Workmanship:

1.2.1 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 (Joules) 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.

1.3 Preparation of Surface:

1.3.1 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.

1.3.2 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, fungi, algae lichen, 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 & then papering the same after it is dry.

1.4 Priming coat:

- 1.4.1 A priming coat of whitening shall be applied as per item No. 2.20-A 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.
- 1.4.2 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 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.
- 1.4.3 Distemper is not recommended to be applied within six months of the completion of wall plaster.
- 1.5 **Proportion of Distemper:**
The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufactures only. Sufficient of distemper required for one day's work shall be prepared.
- 1.6 **Application of Distemper coat:**
- 1.6.1 For undercoated 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 cut 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 time interval of at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surfaces shall be even and uniform without patches, brush marks; distemper drops etc.
- 1.6.2 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.
- 1.6.3 15 cm. double bristled distemper brush shall be used. After the days work, brushes shall be thoroughly washed in hot water with a soap solution and hang down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.
- 1.7 **Protective Measure:**
- 1.7.1 The surfaces of door, windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be protected from being splashes upon. Such surfaces shall be cleaned of distemper splashes if any.

E. Distemping (two coats) with oil bound distemper of approved brand and manufacture and or required shade on undecorated wall surfaces to give an even shade, over and including a priming coat with distemper primer of approved brand and manufacturer after thoroughly brushing the surface free from mortar dropping and other foreign matter also including preparing the surface even and sand papered smooth.

1.1 Materials :

- 1.1.1 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.

1.2 Workmanship:

- 1.2.1 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 (Joules) 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.
- 1.3 **Preparation of surface:**
- 1.3.1 The undecorated surface to be distempered shall be thoroughly brushed off 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.
- 1.3.2 All unnecessary nails shall be removed. pitting in plaster shall be made good with plaster of Paris mixed with dry distemper of colour to be used. The surface shall then be rubbed down 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-I) 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.
- 1.4 **Priming coat:**
- 1.4.1 A priming coat or distemper prime 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.
- 1.4.2 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.
- 1.4.3 Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.
- 1.5 **Preparation of oil bound distemper:**
- 1.5.1 The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manner recommended by the manufacture only. Sufficient quantity of distemper required for a day's work shall be prepared.
- 1.6 **Application of Distemper coat:**
- 1.6.1 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 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 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.
- 1.6.2 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.
- 1.6.3 15 cm. double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.
- 1.7 **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.
- 1.8 **Finishing wall with water proofing cement paint on 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 all dirt and remains of loose powered materials.**
- 1.1 **Materials :**
- 1.1.1 The water shall conform to M-1. Cement water proofing shall conform to I.S. 5410-1969.
- 1.2 **Workmanship:**
- 1.2.1 Scaffolding: The relevant specifications of item No. 2.20-A shall be followed.
- 1.2.2 Preparation of surface: The relevant specifications of item No. 2.20-A 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.
- 1.2.3 Preparation of paint: Portland cement 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 manufacturer's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use.
- 1.3 **Application of Paint:**
- 1.3.1 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.
- 1.3.2 When weather conditions are such as to cause damage the work shall 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.
- 1.3.3 To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.
- 1.3.4 For undercoated surfaces, the surfaces 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 preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be slightly moistened before applying the subsequent coat.

- 1.3.5 The finished surface shall be even and uniform in shade, without patches, brush marks, paint drops etc.
- 1.3.6 The cement paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessive heavy brush marks. The lamps shall be well brushed out.
- 1.3.7 Water proof cement paint shall not be applied on surfaces 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.
- 1.4 **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 paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after the application.
- 1.5 Protection measures shall be taken as per item No. 2.20-A

2.20 SPECIFICATION FOR PAVING AND FLOOR FINISHES

A. 40 mm thick marble chips flooring rubbed and polished (i.e. Terrazzo) to (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 and black marble chips of required sizes from 1 mm to 4 mm nominal size laid in cement marble power mix 3:1 (3 cement : 1 marble powder by weight in proportion 4:7 cement marble powder mix:7 marble chips by volume) Dark shade pigment with ordinary cement (in top layer only)

1.1 Materials:

1.1.1 Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Stone grit shall conform to M-4

1.1.2 The pigment incorporated in terrazzo shall be of permanent color and shall conform to requirement mentioned in Appendix A in I. S.: 2114:1962. Marble chips shall conform to M-46. The marble powder shall pass through I. S. Sieve terrazzo-30.

1.2 Workmanship:

1.2.1 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 crushing 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.

1.2.2 Under layer:

1.2.2.1 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 2.8-J

1.2.3 Terrazzo topping:

1.2.3.1 The topping shall have mix of ordinary cement and marble powder in proportion(3:1) (3 cement : 1 marble powder :7 marble powder by weight) and marble aggregate shall be mixed in proportion 4:7(4 cement:7 marble by chips by volume). The thickness of concrete and crushing 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.

1.2.4 Panels:

1.2.4.1 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 are so located that the layer dimensions of any panel do not exceed 2 M. the panels shall preferably be

separated by means of dividing strips. However where the butt joints are provided, the bays shall be laid alternatively allowing for an interval of atleast 24 hours between the laying of adjacent bays.

1.2.5 Mixing Materials;

1.2.5.1 With a view to avoid variation in color, 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. Color 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 head as this would result in coarser aggregates moving on the sides and cement to the center. 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 to flow. The mix shall be used within half an hour of mix of addition of water during preparation laying.

1.2.6 Laying

1.2.6.1 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. Screed strips shall be used where the dividing strips are not used. The base shall be cleaned of all dust, dirt, laintance 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 spread and leveled with a screeding board. The top surface shall be left rough to provide a good bound to the terrazzo.

1.2.6.2 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 color 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 complete thoroughly by tapping or rolling and traveled smooth. Excessive trowling or rolling in carly stages shall be avoided as it results in working up cement to the surface which will reduce a surface liable to cracking and will require more grinding to expose marble chip. The terrazzo surface shall be lamped trowelled and brought one 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.

1.2.7 Curing:

1.2.7.1 The surface shall be left dry for air curing for a period of 12 to 24 hours. Thereafter, water shall be allowed to sand overnight in pools for a period of a minimum of four days. The floor shall be prevented from being subjected to extreme temperature.

1.2.8 Grinding and finishing:

1.2.8.1 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.

1.2.8.2 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 1.2.7 above.

1.2.8.3 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 be washed again and allowed to dry for 12 hours and wet cured 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 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 hession 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.

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 to 4 mm nominal size laid in cement marble powder mix 3:1(3 cement : 1 marble powder mix by weight in proportion 4:7(4 cement : marble powder : 7 marble chips by volume): light shade pigment with white cement (in top layer only)

1.1 Materials and Workmanship:

The relevant specifications of item no 2.21-A shall be followed, except light shade pigment with white cement shall be used in top layer.

C. Marble chips skirting (terrazzo) of dedor rubbed and polished to granolithic finish top layer 6 mm thick with white and black or white and black or white and black marble chips of sizes from smallest to 4mm. Nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder 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).

1.1 Materials :

The relevant specifications of item No. 2.21-A shall be followed.

1.2 Workmanship :

1.2.1 Under layer :

The under layer for terrazzo on vertical surfaces like skirting and dedo 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.

1.2.2 Terrazzo topping shall not be less than 6 mm. Thick and the combined thickness of under layer and topping shall be not 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.

D. Marble chips skirting (terrazzo) of 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 powder 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% 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).

1.1 Materials & Workmanship :

The relevant specifications of item No. 2.21-C 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. .

E. Kota stone slab (Polished, Green colour) flooring over 20 mm. (average) thick base of cement mortar 1:6 (1 cement : 6 coarse sand) laid over and joined with gray cement slurry including rubbing and polishing complete 25 mm. thick.

1.1 Materials :

Water shall conform M-1. Cement mortar shall conform to item no. 2.10-A & B polished kota stone shall conform to M-30.

1.2 Workmanship :

- 1.2.1 Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact 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 plain 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.
- 1.2.2 Bedding for the kota stone slabs shall be cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of average thickness 20 mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be 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 be lifted and laid a side. 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 place in position and tapped with wooden mallet till it is properly pedded 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 wall shall enter not less then 10 mm. under the plaster skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.
- 1.2.3 The floor shall be kept wet for a minimum period of 7 days. So that bedding and joints set properly.
- 1.2.4 Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with ear corundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 of 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 polish machine fitted with bobs shall be run over it.

- 1.2.5 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

F. 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) lain in layer finished with a floating coat of net cement 40 mm. thick.

1.1 Materials

Water shall conform to M-1. Cement shall conform to M-2. Sand shall conform to M-3. Stone aggregate 20 mm. nominal size shall conform to M-9. Cement concrete 1:2:4 proportion measured by volume shall conform to relevant specification or ordinary grade 1:2:4 concrete.

1.2 Workmanship :

- 1.2.1 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 mixer may however be allowed for smaller quantities of work and in case of failure of machines 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 cost. The mechanical mixing shall be done for a period of $\frac{1}{2}$ to 2 minutes. The quantity of water shall be thus sufficient to produce a dense concrete required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over a period of one to six hours depending 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 paste twice by means of iron flats, once, when the slurry is applied and the second time when cement starts setting and finished 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 where so required upto 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.
- 1.2.2 Any damage, done to water supply sanitary fittings during the execution of work shall be made good.

- 1.2.3 After the final set, the concrete shall be kept continuously wet, if required ponding for a period of not less than 7 days from the date of placement.
- 1.2.4 The form work shall be provided if necessary as directed by the engineer in charge. Concreting shall be done as per alternate bay method with necessary centering wither by mastic or cement mortar as directed.

2.21 SPECIFICATION FOR DEMOLITION & DISMANTLING

A. Demolition and disposal of unserviceable materials with all leads and lifts : Cement Concrete.

1.1 Workmanship :

- 1.1.1** 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 item as specified or shown in the drawings.
- 1.1.2** The demolition shall always be planned before hand and shall be done in reverse order of 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.
- 1.1.3** Necessary dropping, 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 damages is caused to the adjoining property.
- 1.1.4** Wherever required, temporary enclosures or partitions shall also be providing 1. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.
- 1.1.5** 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.
- 1.1.6** 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.
- 1.1.7** 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 b stacked as directed by the Engineer-in-charge.
- 1.1.8** On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

B. Demolition and disposal of unserviceable materials with all leads and lifts. Unreinforced cement concrete.

1.1 Workmanship :

The relevant specifications of item 2.22-A shall be followed except that the unreinforced cement concrete work is to be demolished instead of lime concrete.

C. Dismantling tiled or stone floors laid in mortar including stacking of serviceable material and disposal of unserviceable material with all lead and lifts

1.1 Workmanship:

The relevant specifications of item no 2.22-A shall be followed except the dismantling of tiled or stone floors laid on mortars shall be done Dismantling implies carefully

taking up or down or these are fixed by nail screws bolts etc. the shall be taken out with proper tools

D. Dismantling doors windows ventilation etc(woods or steel shutters including chokhats architaves hold faster and other attachment etc. complete and staking that within all leads and lift exceeding 3 sq meter in area

1.1 Workmanship :

The relevant specifications of item No 2.22-A shall be followed except that the doors, windows, ventilators, exceeding 3 sq. meters are to be dismantled under this item.

2.22 SPECIFICATION FOR MISCELLANEOUS BUILDING WORKS

A. Providing and fixing 1.20metre high tenting with 2 meter long M S angle posts 40mm X 6 mm and oil painting 3 coats fixed at 2.5 M C/C with five horizontal lines and two diagonals of galvanized steel barbed wire weighting 938 kg per 100 meter (Min) strained and fixed to posts with GI staples including fixed to post in ground with 0.5 M X 0.5 M x 0.5 < block in CC 1:5:10 (1 cement , 5 Sand 10 graded brick aggregate 40 mm nominal size) etc complete.

1.1 Materials :

- (1) Water shall conform to M-1
- (2) Cement shall conform to M-2
- (3) Sand shall conform to M-3
- (4) Bricks bats aggregate shall conform to M -7
- (5) Oil Paint shall conform to M-26
- (6) Barbed wire shall conform to M-31.

1.2 Workmanship :

- 1.2.1** The pits of the size 0.5 M X 0.5 M X 0.5 shall first be excavated true to line and level to receive the post at 2.5 M C/C the relevant specifications of item 4.00. It shall be followed for excavations work.
- 1.2.2** The pits shall be filled with a layer of 0.15 M thick with lean concrete 1:5:10 (1 cement :5 sand :10 graded brick bat aggregates 40 mm nominal size) The MS angle 40 mm X 40 MM x 6 mm Shall be the pierced over the confute in true to line and plumb. The remaining portion of block shall be filled in with filled in with lean concert 1:5:10 and rammed properly so as to form total 0.5 M x 0.5M x 0.5M concrete block .The concert shall be cured for 7 days to allow it to set.
- 1.2.3** The barbed wire shall be stretched and fixed in 5 horizontal rows and two diagonals. The bottom row shall be 140mm above ground and the rest at 125 mm center to center the concrete shall be stretched between adjacent posts from top of one post of 2nd post the wire shall be fixed to posts by means of staple. The MS Angle posts shall be painted with 3 coats of oil paint of approved tinted shade.

B. Constructing cooking platform of 60cms width and 70cms height resting on BB masonry Wall 23 cms thick in CM 1:6 with fixing of precast 1:2:4 RCC 0.08 M thick slab with marble mosaic chips set in CM (Tarazo) with Plastering on exposed faces to wall in CM 1:4 etc., complete.

1.1 Materials :

Water shall conform to M-1 .Cement shall conform to M-2 Sand shall conform to M-3. Burnt brick shall conform to M-8 Marble Mosaic chips shall conform to M-28 Stone aggregate 20 mm nominal size shall conform to m9 and MS Bars shall conform to M-10

1.2 Workmanship :

- 1.2.1** The cooking platform of size as directed shall be constructed in 60 cms width and 70 cms height .The brick masonry wall in CM 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
- 1.2.2** The RCC slab of 8 cms thickness and of adequate design and size shall be put on the BB masonry work.
- 1.2.3** The top and exposed size of the RCC slab shall be finished with marble mosaic terrazzo shall be carried out as per relevant specification of item 14.4(E)
- 1.2.4** The whole masonry work shall be finished with cement mortar in CM 1:4.The relevant specifications of item17.59(II) shall be followed.

C. Constructing cooking platform of 60 cm width and 70cms height resting on BB masonry wall 23 cm thick in CM 1:1 with fixing black kada pastone surface laid on precast RCC slab 1:2:4 with plastering on exposed faces to wall in CM 1:4 etc. complete.

1.1 Materials & Workmanship :

The relevant specifications of item NO 2.23-B shall be followed except that the cooking platform shall be constructed by providing black kads pastone of 25 mm to 20mm thickness on percent RCC 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 eoges of stone shall be matching cut.

2.23 SPECIFICATION FOR WATER SUPPLY, PLUMBING & SANITARY FITTINGS

A. Providing and fixing to wall ceiling and floor galvanized 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 dia. (D) 342 mm. (E) 40 mm (F) 50 mm.

1.1 Materials:

Galvanized mild steel tubes of specified dia. nominal bore shall conform to I. S. 1239-1968. The galvanized fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and make as approved by the Engineer-in-charge.

1.2 Workmanship :

1.2.1 Cutting, Laying and Jointing :

1.2.1.1 When the tubes are to be cut or rethreaded, the end 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 as will not result in slackness of joints when the two pieces are screwed together.

1.2.1.2 The taps and dies shall be used only for straightening screw threads which have become bent or damaged and dies shall not be used for turning of the threads so as to make them slacks as the latter procedure may not result in watertight joints. The screw threads for tube and fittings shall be protected from edge until they are fitted.

1.2.1.3 In jointing the tubes, the inside of the socket and the screwed end of the tubes shall be oilled and smeared with white or red lead and wrapped 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 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 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.

1.2.1.4 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.

1.3 Fixing of the tube fitting to wall ceiling and floors :

1.3.1 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 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 floor, 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. When required M. S. tube sleeve 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.

- 1.3.2 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 (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 length at 2 M C/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 of the smallest required size. After fixing the pipe the holes shall be made good with cement mortar 1:3(1 cement : 3 coarse sand) and properly finished to match the adjacent surface.

1.4 Testing of joints :

- 1.4.1 After laying and jointing the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone, and all leaking pipes removed and replaced without extra cost.
- 1.4.2 The pipes and fittings as 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 shock 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 of laying proceeds keeping the joints exposed for inspection during the testing.

B. Providing and laying in trenches galvanized mild steel (medium gauge) of the following nominal bore and tube fittings (earth work in trenches to be measured and paid for separately (A) 15 mm. di, (B) 20 mm. (C) 25 mm. (D) 40 mm. (E) 60 mm. (F) 80 mm.

1.1 Materials:

- 1.1.1 Galvanized mild steel tube of specified dia. nominal bore and fitting shall conform to I.S. 1239-1968.

1.2 Workmanship:

- 1.2.1 The relevant specifications of item 2.24-A shall be followed for cutting, laying and joining testing of joints except that the fixing of tube shall be done in trenches.
- 1.2.2 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.
- 1.2.3 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.

- 1.2.4** 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 so specified. The remaining portion of trench shall be then filled with excavated earth. the surplus earth shall be disposed of as directed.
- 1.2.5** 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 vary high, thrust block of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm normal size) shall be constructed on all bends to transmit the hydraulic thrust without imparting the ground and spreading it over a sufficient area if so specified.

C. Making connection of galvanized M.S. distribution branch with galvanized mild steel main 50 mm. to 80 mm. normal bore by providing and fixing tee including cutting and threading the pipes etc. complete.

1.1 Materials :

The fitting required of specified dia of pipe shall conform to I.S. 1237 –1968.

1.2 Workmanship:

- 1.2.1** 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 water in water main shall also be disconnected by closing the sluice or wheel valves on the mains. The main shall first be cut. Water if any, concerned in the pit shall be bailed.
- 1.2.2** The Connections of distribution pipe shall be made by fixing malleable galvanized mild steel tee of the required size and fittings such as jam nut, socket , connecting piece etc.
- 1.2.3** The testing of the joints shall be done as per relevant specifications of item No 23.2 (A).

D. 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 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.

1.1 Materials :

- 1.1.1** 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 fitting required shall be of best quality.

1.2 Workmanship:

- 1.2.1** The P.V.C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P.V.C. Pipes, due 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 is in service.

- 1.2.2 Above ground installation of rigid P.V.C. pipe should be undertaken after preparations are observed for their protection against direct sun rays and mechanical damage.
- 1.2.3 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.
- 1.2.4 P.V.C. pipes shall be supported at the following intervals:
20 mm dia. 500 mm. 32 mm. dia. 900 mm.
25 mm. dia. 750 mm.
- 1.2.5 Closer support spacing shall be provided if recommended by the manufacturer.
- 1.2.6 The guide lines indicated by the manufacturer regarding, handling, transportation, storing laying and jointing of pipes shall be kept in view during execution.
- 1.2.7 P.V.C. pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.

1.3 Jointing the pipes:

- 1.3.1 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.
- 1.3.2 If manufacturer recommends its own methods of jointing, the same shall be adopted after necessary approval from the Engineer-in-charge.

1.4 Laying pipes in Trenches:

- 1.4.1 The pipe shall be laid over uniform relatively soft fine grained soil found to be free of presence of hard objects such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.
- 1.4.2 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 stresses due to deflection. Any deviation required shall be obtained by using proper type of rubber ring joints.

E. 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.

1.1 Materials:

- 1.1.1 Water closet squatting pan (Indian type W.C. Pan) shall conform to M-22. Cement mortar shall conform to item no.2.10-A & B

1.2 Workmanship:

- 1.2.1 The pan shall be sunk into the floor and embedded in a cushion of average 15 cm. cement 1 : 5 : 10 (1 cement : 5 fine sand : 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or as specified. This concrete shall 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 sloped so that the waste water is drained into the pan. The pan shall be provided with 100 mm. 'P' or 'S' trap as specified in the item No. 24.113 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).

F. 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.

1.1 Materials:

1.1.1 Water closet squatting pan (Indian type W.C. Pan) shall conform to M-22. Cement mortar shall conform to 2.10-A & B

1.2 Workmanship :

1.2.1 The pan shall be sunk into the floor and embedded in a cushion of average 15 cm. cement 1 : 5 : 10 (1 cement : 5 fine sand : 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or as specified. This concrete shall 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 sloped so that the waste water is drained into the pan. The pan shall be provided with 100 mm. 'P' or 'S' trap as specified in the item No. 24.113 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).

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G. Providing and fixing G.I. inlet connection for flush pipe with W.C. Pan.

1.1 Materials:

1.1.1 The G.I. inlet connection for flush pipe shall conform to I.S.

1.2 Workmanship:

1.2.1 The flush pipe from the cistern shall be connected to the closet by means of cement or read-lead.

H. 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.

1.1 Materials:

1.1.1 The white glazed earthenware wash basin shall be 550 cm. x 400 mm of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall conform to M-I.S.

1.2 Workmanship :

1.2.1 The wash basin 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 wash basin. After fixing the basin, plaster shall be made good and surface finished matching with the existing one.

- 1.2.2 The bracket shall be painted white with ready-mixed paint.
- 1.2.3 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 into the 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 into vertically.
- 1.2.4 The height of the front edge of the wash basin from the floor level shall be 80 cms.
- 1.2.5 The necessary inlet, outlet connections and fittings such as pillar cocks. C. P. dress waste trap waste pipe, stop cock, chain wish rubber plug etc. shall be fixed.
- 1.2.6 The payment of fittings shall be made separately under separate item.

I. Providing and fixing kitchen sink with C.I. or M.S. Brackets painted white including cutting holes in walls and making good the same but excluding fittings, Vitreous china Sink 600 mm. x 450 mm. x 150 mm. size.

1.1 Materials:

- 1.1.1 White glazed vitreous china sink 600 mm. x 450 mm. x 150 mm. size shall conform to I.S.

1.2 Workmanship:

- 1.2.1 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. 775-1972. 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 the surface finished to match with the existing one.
- 1.2.2 The C.P. brass trap and union shall be connected to 40 mm. dia. nominal bore galvanized milled steel 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 into the 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 surface drain or a floor trap is placed directly under the sink and the waste is discharged to it vertically.
- 1.2.3 The height to front edge of the wash basin from the floor level shall be 80 cms.

J. Providing and fixing brass screw down bib taps of following size : Polished bright 14 mm. dia.

1.1 Materials:

- 1.1.1 15 mm. dia. brass screw down with bright polished finish shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

1.2 Workmanship:

- 1.2.1 The screw down bib cock 15 mm. dia. 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 than screwed and fixed to water tight position.

K. Providing and fixing brass screw down bib taps of following size : Polished bright : 20 mm dia.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item 2.24-J shall be followed except that the bib taps of 20 mm. dia. shall be fixed.

L. Providing and fixing chromium plated brass screw down bib taps of the following size: 15 mm dia.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item No.2.24-J shall be followed except that the brass chromium placed screw down bib tap shall be fixed.

M. Providing and fixing gun metal screw down bib taps of the following size: 15 mm. dia.

1.1 Materials & Workmanship:

- 1.1.1 The relevant specifications of item No. 2.24-J shall be followed except that the 20 mm. dia. gun screws down bib tap shall be fixed.

N. Providing and fixing gun metal 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.

1.1 Materials:

- 1.1.1 The gun metal check or non return full way wheel valve of specified dia. shall conform to I.S. 778-1964. The non return valve shall be of tested quality.

1.2 Workmanship:

- 1.2.1 The gun metal check or non return valve shall be fully cleared of all foreign matter before fixing. The fixing of valve shall be done by means of bolts nuts and 3 mm. rubber insertions with flanges of spigot and socketed tail pieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes. The jointing shall be done leak proof.

O. Providing and fixing chromium plated brass half turn flush cock of approved quality incl. fixing in pipe line etc. complete (I) 20 mm. dia. (II) 25 mm. dia. (III) 32 mm. dia.

1.1 Materials :

- 1.1.1 Chromium plated brass half turn flush cock shall conform to I.S.

1.2 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. 2.24-B

P. Providing and fixing ball cock of approved quality as directed (Copper metal) (1) 25 mm. dia. (II) 50 mm. dia.

1.1 Materials :

The ball cock of specified diameter shall conform to I.S.

1.2 Workmanship :

The ball cock of specified diameter shall be fixed as directed. The fixing of ball cock shall be carried out as per relevant specifications of item No. 2.24-A for joints etc.

Q. Providing and fixing to wall ceiling and floor polythene pipe of specified diameter will 6 Kg. F/Sq.cm. working pressure outside diameter, low density completion with special flange compression type fittings wall clips, etc., incl. making good the wall, ceiling and floor. (A) 20 mm. dia. (B) 25 mm dia. (C) 32 mm. dia. (D) 40 mm. dia. (F) 50 mm. dia.

1.1 Materials:

1.1.1 The low density polythene pipe of specified diameter with 6 Kg.F/Sq.Cm. working pressure shall conform to I.S. 3076-1968. The specials and fittings required shall be of best quality.

1.2 Workmanship:

1.2.1 The P.V.C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P.V.C. Pipes, due 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 is in service.

1.2.2 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.

1.2.3 The rigid P.V.C. pipe lines should not be kept exposed above ground when it passes through public place, railway lines, roads, road side and footpaths.

1.2.4 P.V.C. pipes shall be supported at the followings intervals :

20 mm. dia. 500 mm.

25 mm. dia. 750 mm.

32 mm. dia. 900 mm.

1.2.5 Closet support spacing shall be provided, if recommended by the manufacturer.

1.2.6 The guide line indicated by the manufacturer regarding handling, transportation, storing, laying and jointing of pipes shall be kept in view during execution.

1.2.7 P.V.C.V. pipes shall be fixed on wall with wooden plugs and suitable clamps.

1.3 Jointing the pipes:

1.3.1 The pipes and sockets shall be accurately cut. The ends of the pipes and fitting 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 ch

- 1.3.2** If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge.
- 1.3.2** Laying pipes in trenches:
- 1.3.3** The pipes shall be laid over uniform relatively soft fine grained soil found to be free of presence of hard objects such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.
- 1.3.4** 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 stresses due to reflection. Any deviation required shall be obtained by using proper type of rubber ring joints.

R. Providing and 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.

1.1 Materials:

- (1) Water shall conform to M-1,
- (2) Cement mortar of proportion 1: 1 shall conform to Item no. 2.10 – A & B
- (3) 100 mm. dia. glazed stoneware pipe shall conform to I.S.

1.2 Workmanship:

- 1.2.1** The trenches for stoneware pipe drains shall be carried out as per relevant specifications of item No. 2.24-B except that the work is for stoneware pipes of 100 mm. dia.

1.3 Laying:

- 1.3.1** 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 an even level bed grips being made or left on the bed to receive the sockets of the pipes.

1.4 Jointing:

- 1.4.1** Tarred gaskin or yarn socket in neat cement slurry first be placed around the spigot of 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 dept or (13 mm. in depth) of the socket.
- 1.4.2** The remainder of the socket 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 filled, a fillet, shall be formed round the joints trowel, forming an angle of 45° with the barrel of the pipe.
- 1.4.3** The mortar shall be mixed as necessary for immediate use.

1.4.4 After the joint is made, any extraneous materials shall be removed from the inside of the joints with a suitable scraper of 'badger'. The newly made joint 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.

1.4.5 The mortar shall be cured to 10 days.

1.4.6 Testing of Joints :

The pipe line shall be tested as directed.

1.5.1 If any leakage is visible, the defective part of the work shall be made good at no extra cost.

1.5.2 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.

1.

S. Providing and laying and jointing salt glazed stoneware pipes with the 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.

1.1 Materials & Workmanship :

The relevant specifications of item 2.24-R shall be followed except that the diameter of pipe shall be 150 mm. dia.

T. 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 formwork and curing complete : 100 mm. dia. 300 mm. width (112 mm. average bed thickness)

1.1 Materials:

(1) Water shall conform to M-1.

(2) Cement shall conform to M-2.

(3) Sand shall conform to M-3.

(4) Stone aggregate 40 mm. nominal size shall conform to M-9.

1.2 Workmanship:

1.3 The relevant specifications of item 2.3-E shall be followed except that the concrete work shall be carried out in trenches as bedding for stoneware pipes. The width of concrete work 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.

U. 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 diameters with necessary form work and curing complete : 150 mm. dia. 450 mm. width (166 mm. average bed thickness)

1.1 Materials & Workmanship :

- 1.1.1 The relevant specification of item 2.24-T shall be followed except that the cement concrete work shall be carried out for bedding for stoneware pipe of 150 mm. dia. The average thickness of bedding shall be 166 mm. and width shall be 450 mm.

V. 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 diametres with collars and butt-ends prepared for collar joints incl. testing of joints etc. complete (B) 150 mm. (C) 250 mm. (D) 300 mm. (E) 450 mm. (F) 500 mm. (G) 600 mm. (H) 900 mm. (K) 1000 mm. (M) 1200 mm.

1.1 Materials:

- 1.1.1 The reinforced concrete light duty non-pressure pipes of specified diameter shall conform to I.S. 458-1971.

1.2 Workmanship:

- 1.2.1 The relevant specifications of item No.2.24-T shall be followed for work of trenches except that the excavation in trenches shall be for reinforced concrete pipes of specified diameter.

1.3 Laying:

- 1.3.1 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 with loose collars, the collars shall be slipped on before the next pipe is laid.

- 1.3.2 In case where the foundation conditions are unusual such as the proximity of trees or holes, under existing or proposed around 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.

- 1.3.3 In case where the natural foundation is inadequate the pipe shall be laid either in concrete cradle, supported on proper foundation or on any other suitably designed structure. If concrete bedding is used, the depth of concrete below bottom of the pipe shall be atleast 14 th of the internal diameter of the pipe subject to a minimum of 100 mm. and maximum 300 mm. The concrete shall be extended upto the sides of the pipe atleast a distance of 14 th of the outside diameter for pipes 300 mm. and over in diameter.

- 1.3.4 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 upto 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 round curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

1.4 Jointing:

- 1.4.1 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 threading dipped 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. This process shall be

repeated for two or three pipes which shall then be 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 : 112 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.

1.5 Curing:

1.5.1 Every joint 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.

1.5.2 The joints shall be left exposed for observation.

1.6 Testing of joints:

1.6.1 The testing of joints shall be done as per relevant specifications of item No. 2.24-T except that the testing of reinforced concrete pipes shall be done.

W. Constructing 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 brick 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 (1 cement : 2 coarse sand : 4 stone aggregate 20 mm. nominal size) finished smooth complete incl. curing and testing (1) inside size 900 mm. x 120 mm. and 1.5 mm. deep including C.I. cover with frame size 560 mm. diameter, total weight of cover and frame to be not less than '18 Kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) with 230 mm. thick walls of masonry using brick shaving 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 150 meter for 150 sewer
- iii. C type depth 2.25 meter for 150 mm. sewer
- iv. D type depth 315 meter for 150 sewers

1.1 Materials :

Water shall conform to M-1. Cement shall conform to M-3 Burnt bricks shall conform to M-8. Brick bats of 40 to 50 mm. size shall conform to M-7. Stone coarse aggregate of 20 mm. nominal size shall conform to M-7. Grit shall conform to M-4. Cement mortar of specified proportion shall conform to item no. 2.10- A & B. The cast iron manhole cover of 560 mm. dia. with frame shall conform to I.S. 1726-1966.

1.2 Workmanship:

1.2.1 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 or as directed.

1.3 Bed concrete:

1.3.1 The manhole shall be built on a bed of cement concrete 1 : 3 : 6 (1 cement : 3 coarse sand : 6 brick bats) (40 to 20 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 2 meters. depth and 30 cms. for manholes of greater depth.

1.3.2 Projection of bed concrete beyond the masonry wall shall be 15 cms.

1.4 Walls:

1.4.1 The walls or manhole shall be carried out with burnt bricks using bricks, having crushing strength not less than 35 Kg./Cm² 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 full joints.

1.5 Plaster:

1.5.1. The inside of walls 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.

1.6 Channels & Benching:

1.6.1 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 outgoing 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 and appropriate fall suitably rounded off in the direction of flow in the main channel shall be given.

1.6.2 The channel and benching shall be done 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 trowelled smooth.

1.7 Cover slab:

1.7.1 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. brass 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.

1.8 Testing:

1.8.1 Manhole shall be tested by filling with water to a depth not exceeding 1.2 M. as directed.

1.8.2 After completion of work, manhole covers shall be sealed by means of thick grease.

X. Extra rate for costing B. B. masonry or every additional depth of 0.1 M. or part thereof of over item 24.27 (I) for depth from 0.90 M to 1.5 M.

1.1 Materials & Workmanship :

The relevant specifications of item No. 2.24-W shall be followed for excavation 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.

Y. 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 incl. 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.

1.1 Materials:

1.1.1 The steel ventilating column internal dia. 150 mm. 12.20 m. high shall be of standard make and best quality as approved. Stone aggregate of 20 mm. nominal size shall conform to M-9. Brick-bats 40 to 50 mm. nominal size shall conform to M-7. Cement shall conform to M-2. Water shall conform to M-1. Silver (Aluminum) paint shall conform to I.S. 2339-1963.

1.2 Workmanship:

1.2.1 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, syphons etc. As far as possible, the location shall be such a place where it receives sun rays for the maximum period of the day.

1.2.2 A pit of 120 x 120 x 165 cms. 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 center of the pit truly in plumb by means of such as shear legs, pullies, tackles and rope etc.

1.2.3 The connections with sewer manhole 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 upto 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.

1.2.4 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.

Z. Providing and laying lime concrete 1 : 2 : 4 (1 Lime putty : 2 fine sand : 4 graded brick aggregates 40 mm. nominal size) bedding for stoneware pipes of following internal diameter with necessary form work and curing complete 150 mm. dia. (166 mm. average bed thickness)

1.1 Materials & Workmanship :

The relevant specifications of item No. 2.24-Y 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.

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(A) LIST OF APPROVED VENDORS FOR CIVIL WORKS

Sr. No.	ITEMS	Approved Brands / Quality
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, Paresh, 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 પાર્કિંગ 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

Sr. No.	ITEMS	Approved Brands / Quality
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.
		LHP
3	Electrical Panel	Crompton Greaves Ltd
		Bhagyashree Power Control
		Dynamic Control System
		Elembica Services
		JSL Industries Ltd.
		Nutral Power Tech
4	Kinetic Air Valve	Kirloskar Brothers Limited (KBL)
		FOURESS Engineering (India) Limited.
		Durga Valves Pvt.Ltd
		Orbinox
		श्री. डिवा. एन्ड.सु.टी.स
5	Expansion Bellows	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
		Essar Steel
10	C.I. Pipe	Electro Steel, Kejrival, 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 कृष्णा इंटरवैल्व 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	Swelore, 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

SR NO	DESCRIPTION	Name Of Manufacturer
1	Electromagnetic Flow Meter	E+H, Siemens, Abb, Fuji, Yokogawa, Krohne-Marshall, AAROHI 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"> 1. PLC (Programmable Logic Controller) 2. SCADA (Supervisory Control and Data acquisition) 3. VFD (Variable Frequency Drive Up to 500 KW) 4. ACB (Air Circuit Breaker up to 	MITSUBISHI ELECTRIC INDIA PRIVATE LIMITED, Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune 411026

	<p>6000A)</p> <ol style="list-style-type: none">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 A9. Multi Functional Meters10. 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**

SR. NO.	ITEMS	NAME OF AGENCIES
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 ક્રિષ્ના 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

MUNICIPAL CORPORATION

BHAVNAGAR

VENDOR LIST

(A) LIST OF APPROVED VENDORS FOR CIVIL WORKS

Sr. No.	ITEMS	Approved Brands / Quality
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, Paresh, 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

Sr. No.	ITEMS	Approved Brands / Quality
20	ALUMINIUM SHEETS AND ACCESSORIES	Nalco, Jindal, Hindalco, Banko
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 પાઈપિંગ 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

Sr. No.	ITEMS	Approved Brands / Quality
38	RCC bench	Sardar Pre cast
39	Rubber mould garden curbin	Sardar Pre cast
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.
		LHP
3	Electrical Panel	Crompton Greaves Ltd
		Bhagyashree Power Control
		Dynamic Control System
		Elembica Services
		JSL Industries Ltd.
		Nutral Power Tech
4	Kinetic Air Valve	Kirloskar Brothers Limited (KBL)
		FOURESS Engineering (India) Limited.
		Durga Valves Pvt.Ltd
		Orbinox
		શ્રી કિલના ઇન્ડસ્ટ્રીઝ
5	Expansion Bellows	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
		Parixit Industries Ltd., A'bad
9	HDPE Pipe	Jain Irrigation Systems Ltd., Jalgaon
		Dutron Polymers Ltd
		Jindal
		Essar Steel

Sr. No.	Description	Name of Manufacturer
10	C.I. Pipe	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
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

Sr. No.	Description	Name of Manufacturer
		Pennwalt
28	Gear Box	Greaves
		Radicon
		Elecon
		Shanti
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 कृष्णा इंटरवैल्व 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

Sr. No.	Description	Name of Manufacturer
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
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 ligh (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 octogonal poles,swage poles,street loght poles, high mast poles,decorative poles, conical poles, JETCOTECH Engineering LLP
60	Resilient Seated Slice Valve	Cair
61	Air Vale	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

SR NO	DESCRIPTION	Name Of Manufacturer
1	Electromagnetic Flow Meter	E+H, Siemens, Abb, Fuji, Yokogawa, Krohne-Marshall, AAROHI 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	1. PLC (Programmable Logic Controller)	MITSUBISHI ELECTRIC INDIA PRIVATE LIMITED, Emerald House, EL-3, J Block, M.I.D.C.,

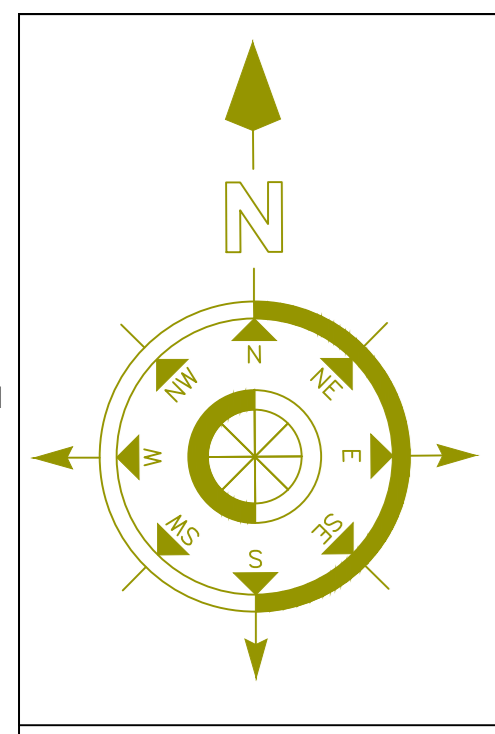
	<ol style="list-style-type: none"> 2. SCADA (Supervisory Control and Data acquisition) 3. VFD (Variable Frequency Drive Up to 500 KW) 4. ACB (Air Circuit Breaker up to 6000A) 5. MCCB (Moulded Case Circuit Breaker up to – 1600 A) 6. MCB (Miniature Circuit Breaker up to – 63 A) 7. ELCB (Earth Leakage Moulded 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) 	<p>Bhosari, Pune 411026</p>
--	--	-----------------------------

**(D) LIST OF APPROVED VENDORS FOR MATERIALS RELATED TO WATER
SUPPLY AND SEWERAGE NETWORK**

SR. NO.	ITEMS	NAME OF AGENCIES
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 ઇન્જિનીયર્સ, 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

DRAWINGS



ANAND NAGAR AREA

TRILOKNAGAR CHOWK TO
TRIKONIYA BAG AREA

DR NIRVANI AND VAGHELA
MANDAP SERVICE KHACHO
TO KANSARA LINE AREA

AMBAWADI CHOWK TO
MANGLAMATA MANDIR
CHOWK

SHIVAJI CIRCLE TO SUBHASH NAGAR SHMASAN
EXISTING LINE CONNECTION AREA

DIVERSION LINE FROM
SHIVAJI CIRCLE TO EX.
MANHOKE OF KANSARA

0	09-01-2024	FOR REVIEW
REV	DATE	SUBMISSION
SCALE	1:1000	TITLE : OVERALL KEY MAP SHOWING SEWER NETWORK DESIGN OF A1.1 PROJECT UPGRADES
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	05-01-2024	
DRAWING NO.	SHEET NO.	
046-CE-HYD-DWG-01	01 OF 01	
SHEET A0	JOB NO. 046	

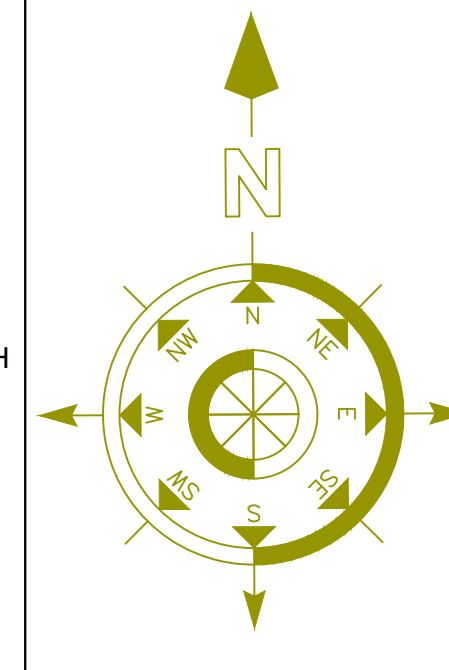
PROJECT :
 PREPARATION OF DETAILED PROJECT REPORT ON
 SEWER NETWORK DESIGN OF VARIOUS AREA OF
 BHAVNAGAR MUNICIPAL CORPORATION



BHAVNAGAR MUNICIPAL
 CORPORATION (BMC)

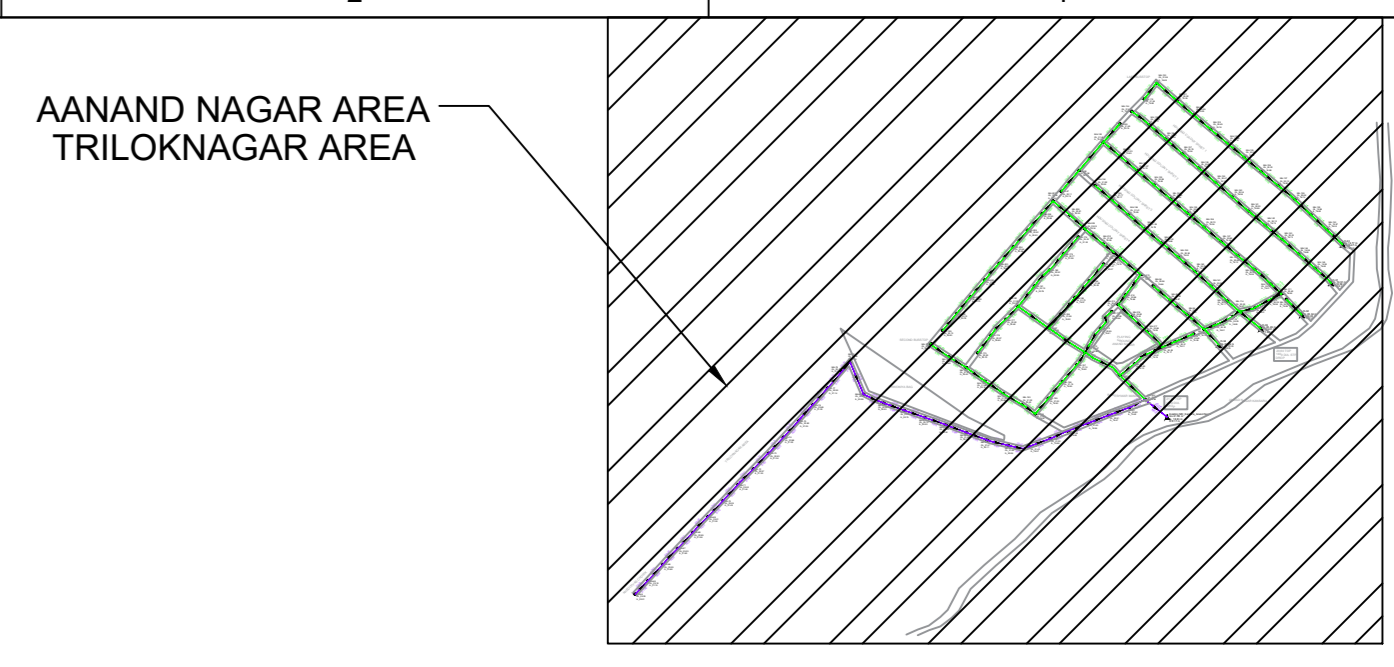
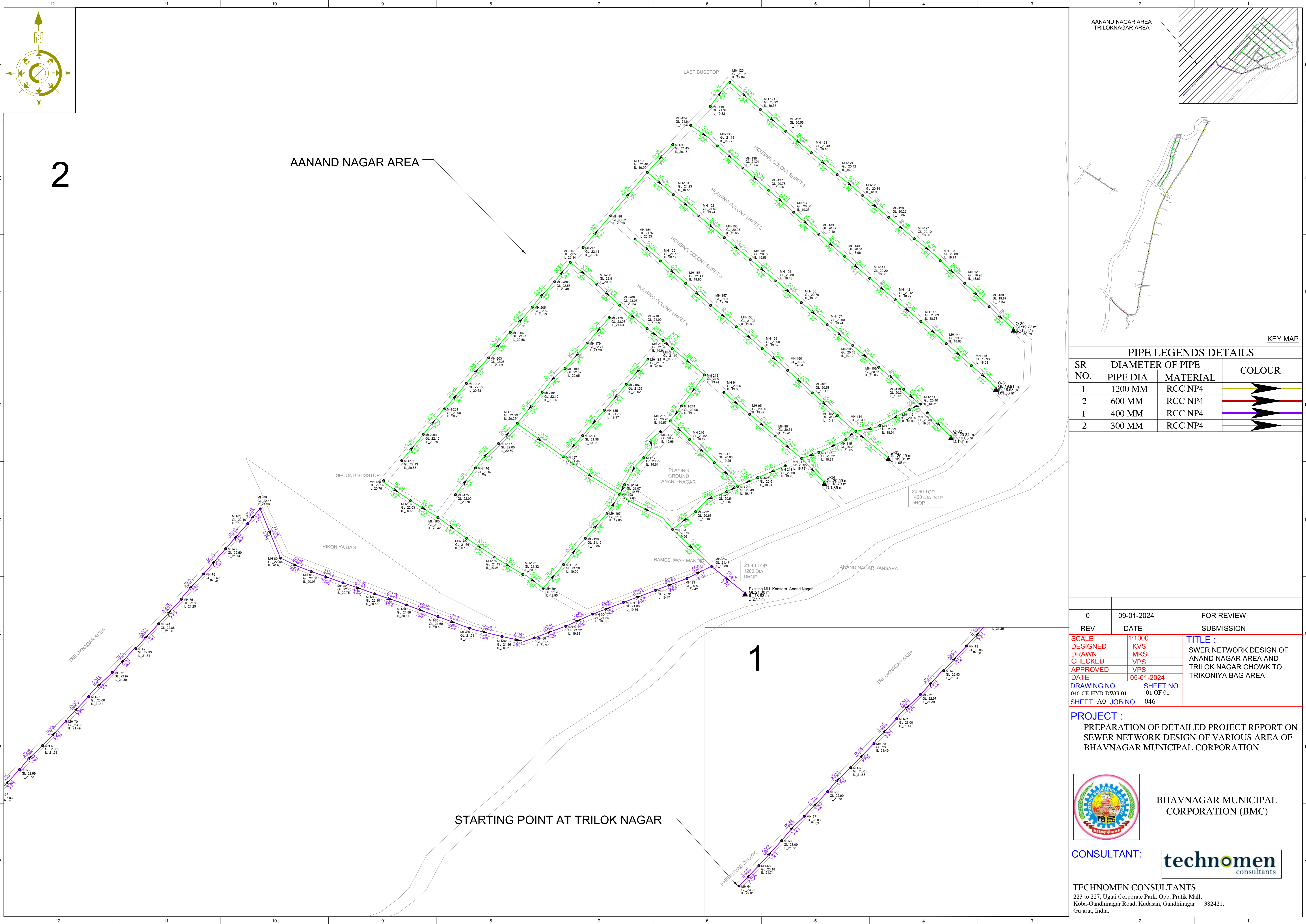
CONSULTANT:


TECHNOMEN CONSULTANTS
 223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
 Koba-Gandhinagar Road, Kudasan, Gandhinagar – 382421,
 Gujarat, India.



2

AANAND NAGAR AREA



KEY MAP

PIPE LEGENDS DETAILS

SR NO.	DIAMETER OF PIPE		COLOUR
	PIPE DIA	MATERIAL	
1	1200 MM	RCC NP4	
2	600 MM	RCC NP4	
1	400 MM	RCC NP4	
2	300 MM	RCC NP4	

REV	DATE	SUBMISSION
0	09-01-2024	FOR REVIEW

SCALE	TITLE :
1:1000	SWER NETWORK DESIGN OF ANAND NAGAR AREA AND TRILOK NAGAR CHOWK TO TRIKONIYA BAG AREA
DESIGNED KVS	
DRAWN MKS	
CHECKED VPS	
APPROVED VPS	
DATE 05-01-2024	

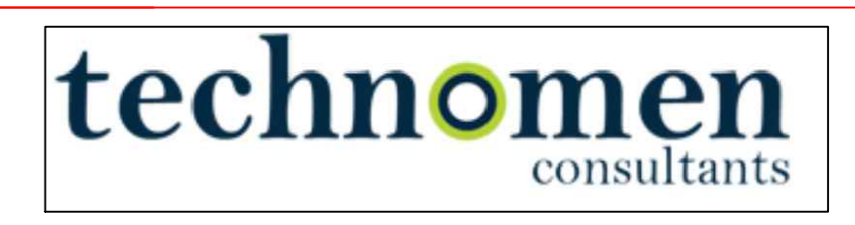
DRAWING NO.	SHEET NO.
046-CE-HYD-DWG-01	01 OF 01
SHEET A0	JOB NO.
046	

PROJECT :
 PREPARATION OF DETAILED PROJECT REPORT ON SEWER NETWORK DESIGN OF VARIOUS AREA OF BHAVNAGAR MUNICIPAL CORPORATION



BHAVNAGAR MUNICIPAL CORPORATION (BMC)

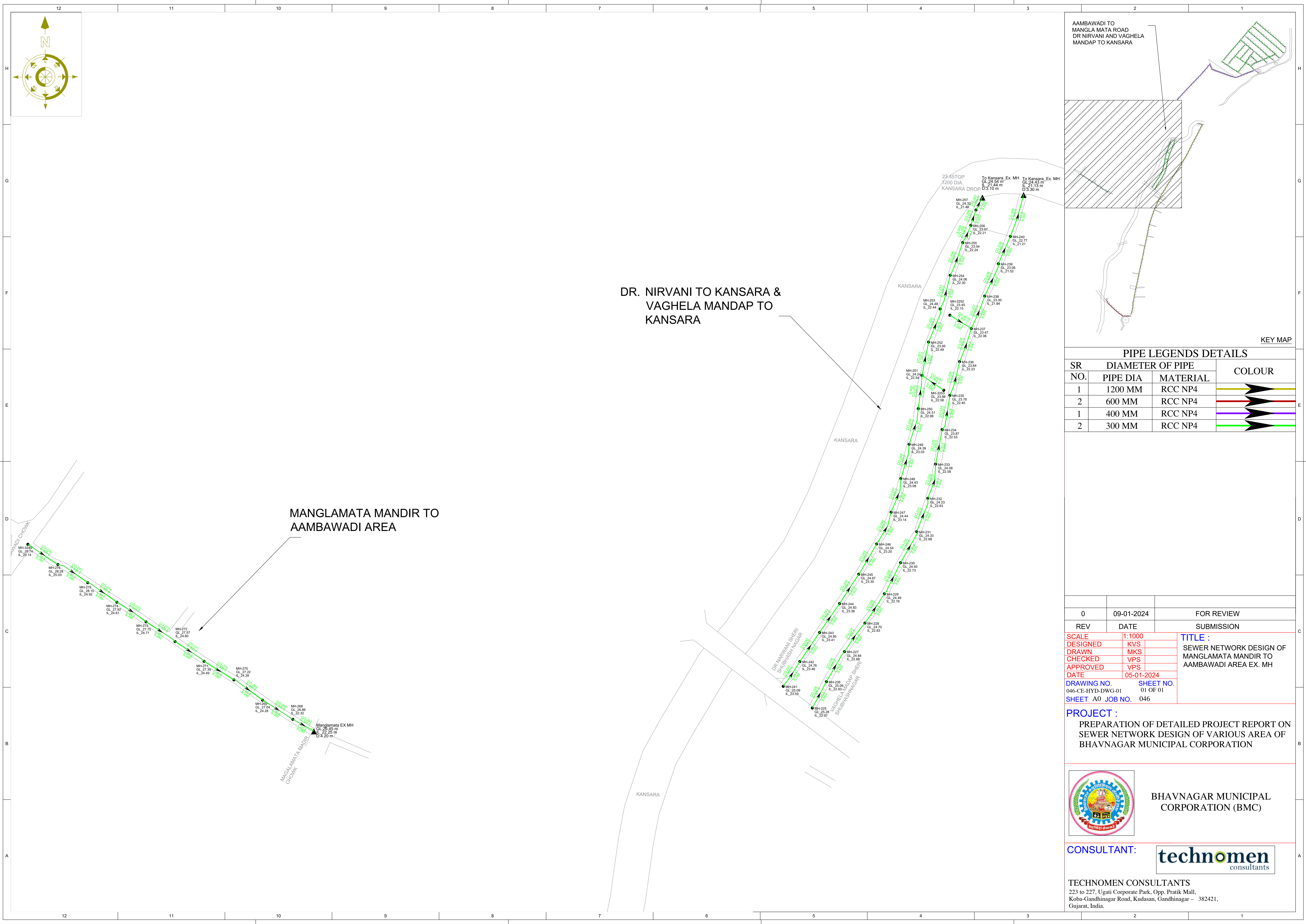
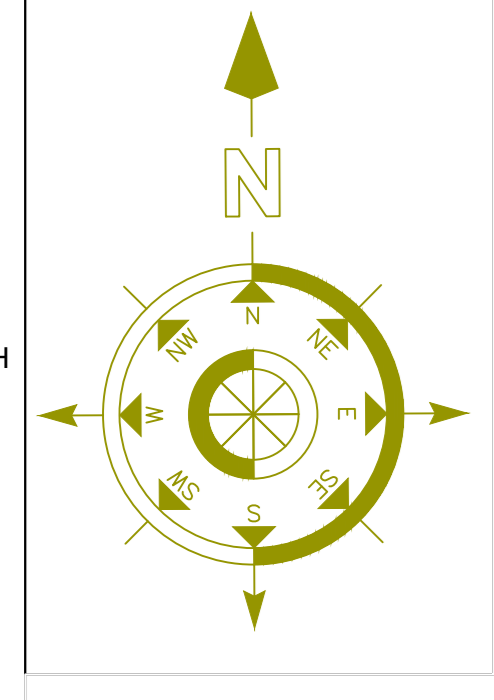
CONSULTANT:



TECHNOMEN CONSULTANTS
 223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
 Koba-Gandhinagar Road, Kudasana, Gandhinagar - 382421,
 Gujarat, India.

1

STARTING POINT AT TRILOK NAGAR



KEY MAP

PIPE LEGENDS DETAILS

SR NO.	DIAMETER OF PIPE		COLOUR
	PIPE DIA	MATERIAL	
1	1200 MM	RCC NP4	
2	600 MM	RCC NP4	
1	400 MM	RCC NP4	
2	300 MM	RCC NP4	

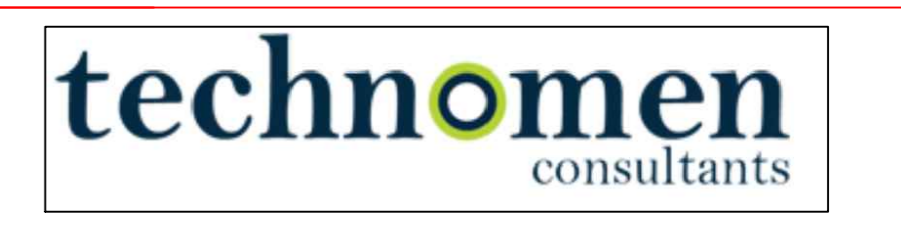
0	09-01-2024	FOR REVIEW
REV	DATE	SUBMISSION
DESIGNED	1:1000	TITLE : SEWER NETWORK DESIGN OF MANGLAMATA MANDIR TO AAMBAWADI AREA EX. MH
DRAWN	KVS	
CHECKED	MKS	
APPROVED	VPS	
DATE	05-01-2024	
DRAWING NO.	SHEET NO.	
046-CE-HYD-DWG-01	01 OF 01	
SHEET A0	JOB NO.	046

PROJECT :
 PREPARATION OF DETAILED PROJECT REPORT ON
 SEWER NETWORK DESIGN OF VARIOUS AREA OF
 BHAVNAGAR MUNICIPAL CORPORATION

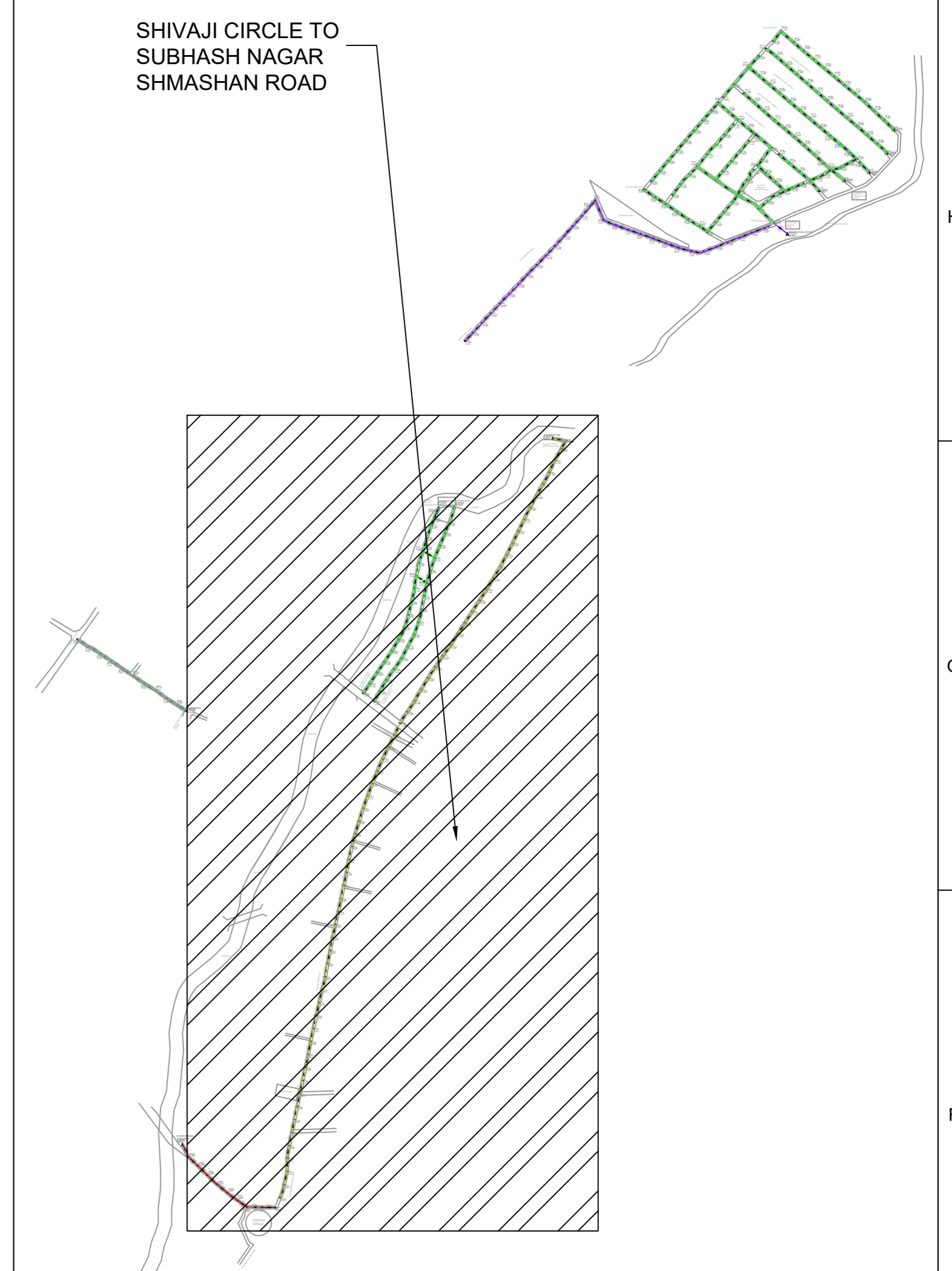
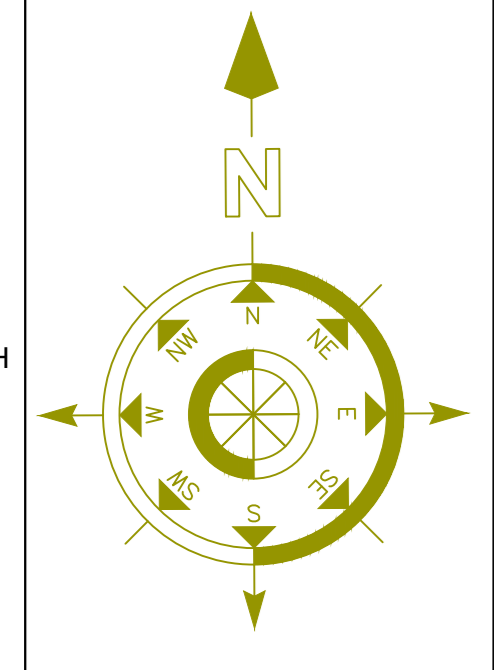
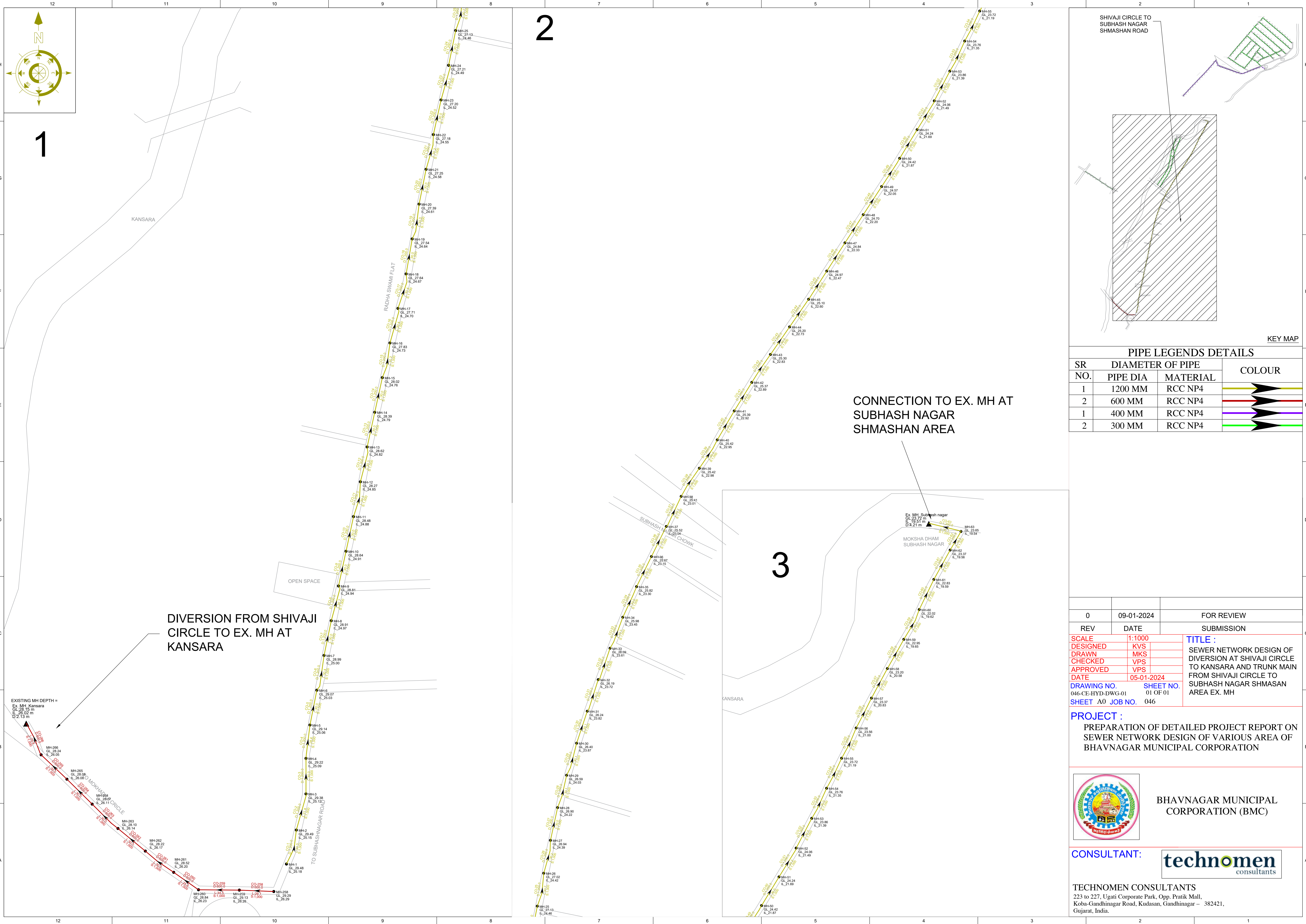


BHAVNAGAR MUNICIPAL CORPORATION (BMC)

CONSULTANT:



TECHNOMEN CONSULTANTS
 223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
 Koba-Gandhinagar Road, Kudasana, Gandhinagar - 382421,
 Gujarat, India.



KEY MAP

PIPE LEGENDS DETAILS

SR NO.	DIAMETER OF PIPE		COLOUR
	PIPE DIA	MATERIAL	
1	1200 MM	RCC NP4	
2	600 MM	RCC NP4	
1	400 MM	RCC NP4	
2	300 MM	RCC NP4	

REV	DATE	SUBMISSION
0	09-01-2024	FOR REVIEW

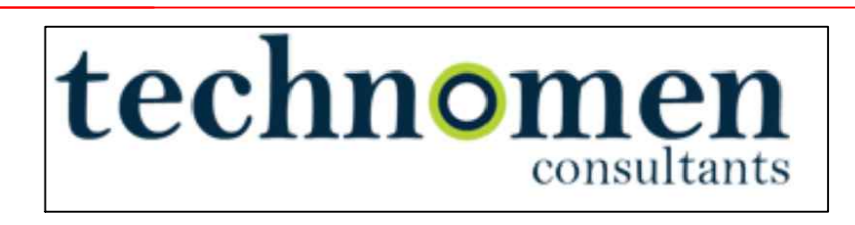
SCALE	1:1000	TITLE : SEWER NETWORK DESIGN OF DIVERSION AT SHIVAJI CIRCLE TO KANSARA AND TRUNK MAIN FROM SHIVAJI CIRCLE TO SUBHASH NAGAR SHMASAN AREA EX. MH
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	05-01-2024	
DRAWING NO.	046-CE-HYD-DWG-01	SHEET NO. 01 OF 01
SHEET	A0	JOB NO. 046

PROJECT :
PREPARATION OF DETAILED PROJECT REPORT ON
SEWER NETWORK DESIGN OF VARIOUS AREA OF
BHAVNAGAR MUNICIPAL CORPORATION

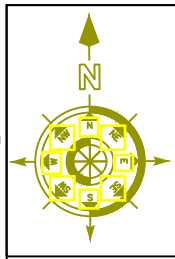


BHAVNAGAR MUNICIPAL CORPORATION (BMC)

CONSULTANT:



TECHNOMEN CONSULTANTS
223 to 227, Ugat Corporate Park, Opp. Pratik Mall,
Koba-Gandhinagar Road, Kudasana, Gandhinagar - 382421,
Gujarat, India.



NATURAL GROUND LEVEL

EXISTING MANHOLE

INVERT LEVEL OF
INCOMING PIPE
CONNECTING TO
EXISTING MANHOLE

INCOMING SEWER

INVERT LEVEL OF
OUTGOING PIPE
FROM MANHOLE

OUTGOING SEWER

TYPICAL SKETCH FOR EXISTING MANHOLE CONNECTION

0	09-01-2024	FOR REVIEW
REV	DATE	SUBMISSION
SCALE	1:1000	TITLE : TYPICAL SKETCH SHOWING PROPOSED PIPE WITH EXISTING MANHOLE
DESIGNED	KVS	
DRAWN	MKS	
CHECKED	VPS	
APPROVED	VPS	
DATE	05-01-2024	
DRAWING NO.	SHEET NO.	
046-CE-HYD-DWG-01	01 OF 01	
SHEET A0	JOB NO. 046	

PROJECT :
PREPARATION OF DETAILED PROJECT REPORT ON
SEWER NETWORK DESIGN OF VARIOUS AREA OF
BHAVNAGAR MUNICIPAL CORPORATION



BHAVNAGAR MUNICIPAL CORPORATION (BMC)

CONSULTANT: **technomen**
consultants

TECHNOMEN CONSULTANTS
223 to 227, Ugati Corporate Park, Opp. Pratik Mall,
Koba-Gandhinagar Road, Kudasana, Gandhinagar - 382421,
Gujarat, India.

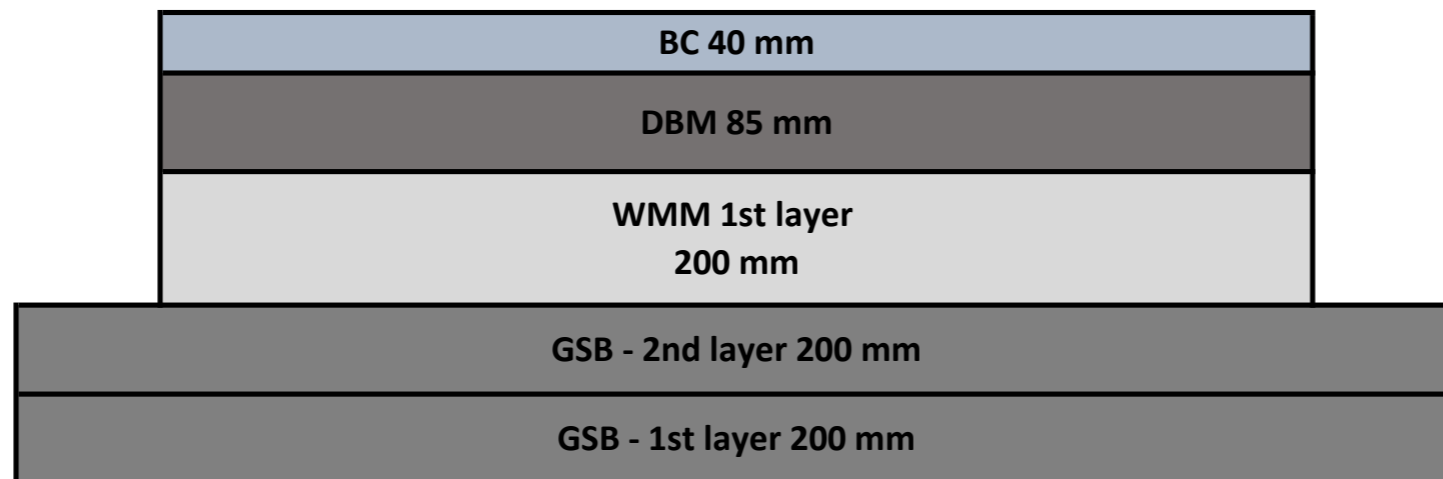
Typical Road Cross Section Detail

Abbreviation for Section

- 1 BC = Bituminious Concrete
- 2 DBM = Dense Bituminious Macadam
- 3 WMM = Wet Mix macadam
- 4 GSB = Granular Sub Base

Note :-

All Dimension are In MM
Drawing are Not to Scale



Section at A A

	CLIENT :-		
	Bhavnagar Municipal Corporation, Bhavnagar		
	CONSULTANT :-		
	Technomen Consultants, Gandhinagar		
Typical Road Cross section Details			
Dwg. Title :-	Typical Road Cross Section Details		
Drawing No. :-			A3
Date :-		Drawn By :-	MMS
Revision No. :-	R0	Date :-	

Consolidated Tender Details

Home > Consolidated Tender Details

Tender Id: 119307

[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	BMC/DRAINAGE/AMRUT 2.0/DR/13/2024
Tender Creation Date	17-10-2024 17:58
Tender Type	Open
Tender Title/Name of Project	Atal Mission for Rejuvenation and Urban Transformation 2.0
Description of Material/Name of Work	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.
Sector Category	Urban Development
Form of Contract	Works
Product Category	Civil Works - Others
Tender Category	WORKS
Estimated Cost Value	87034501.17 INR (Eight crore Seventy Lacs Thirty Four Thousand Five hundred One Point One S even Only)
Is ECV Visible to Supplier?	Yes
Tender Currency Type	Single
Tender Currency Setting	Indian Rupee
Period of Completion/Delivery Period	16 Months
Procurement Type	Works
Consortium / Joint Venture	N/A
Rebate	N/A
Alternate decrypter	N/A

Calender Details

Bid Document Download Start Date	17-10-2024 18:45
Bid Document Download End Date	06-11-2024 18:00
Bid Submission Start Date	17-10-2024 18:45
Bid Submission Closing Date	06-11-2024 18:00
Tender NIT View Date	N/A
Remarks	CLASS OF REGISTRATION REQUIRED FOR BIDDER MUST BE "AA" .Cheque/Demand Draft/fdr for tender fee & Emd shall be submitted in Electronic Formate through online scanning alongwith all the supporting documents such as Registration, Bank Solvency Certificate etc. while uploading thebid. Offer of those will be opened whose EMD & Tender fee is received electronically alongwith the bids. however for the purpose of realization of Cheque/Demand Draft/FDR, 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. Engg. - Drainage,Bhavnagar Municipal Corporation during office hours between 06.11.2024 to 11.11.2024 16:00 pm. Penaltative action shall identinitiated for not submitting the supporting documents in original to E.E. by bidder. Hard copy will not be accepted and considered.Successfull Bids (Preliminary & Technical Bid), if possible will be opened on the 11.11.2024, 17:00 pm at the City Engineer's office - BMC
Pre-Bid Meeting Mode	Offline
Pre-Bid Meeting Opening Date	28-10-2024 12:00
Bid validity	180

Amount Details

Bidding Processing Fee (OFFLINE)	12000.00 INR(Twelve Thousand)
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)	870345.00 INR (Eight lacs Seventy Thousand Three hundred Forty Five)
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	Yes

Other Details

Officer Inviting Bids	Executive Engineer (Drainage Dept.), Municipal Corporation, Bhavnagar.
Bid Opening Authority	Tender Committee.
Address	1st Floor, Office of the Executive Engineer (Drainage Dept.) , Municipal Corporation Bhavnagar, Si r Mangalsinhji road, Bhavnagar- 364001.
Contact Details	Phone no. (Office) 0278 2430256 , Mobile No. 9825836369 E-mail ID:- bmcdrainage@gmail.com

General Terms & Conditions

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	Volume I Technical Bid.pdf	Volume I Technical Bid.pdf	2,696.57 K B
2	N.I.T.pdf	N.I.T.pdf	286.28 KB
3	1. Volume III Part 1 Extent of Work.pdf	1. Volume III Part 1 Extent of Work.pdf	400.93 KB

Sr No	Document Name	Document Definition	Document Size
4	2.Volume III Part 2 Itemwise Spec Bhavnagar R1.pdf	2.Volume III Part 2 Itemwise Spec Bhavnagar R1.pdf	1,445.58 KB
5	03. 1.5 dia Precast MH 1 1.pdf	03. 1.5 dia Precast MH 1 1.pdf	132.76 KB
6	3. Manhole Drawing R0 V1.pdf	3. Manhole Drawing R0 V1.pdf	609.97 KB
7	3.Volume III Part 3 General and Material Specifications R1 200 3.pdf	3.Volume III Part 3 General and Material Specifications R1 200 3.pdf	1,135.99 KB
8	Road Cross Section Details.pdf	Road Cross Section Details.pdf	417.03 KB
9	6.Volume III Part 6 Vendor list.pdf	6.Volume III Part 6 Vendor list.pdf	358.21 KB
10	Network Drawings.pdf	Network Drawings.pdf	1,215.67 KB
11	Vol IV Preamble and Payment Schedules Bhavnagar.pdf	Vol IV Preamble and Payment Schedules Bhavnagar.pdf	667.14 KB
12	Volume II General O and M and Special Conditions of Contract R1.pdf	Volume II General O and M and Special Conditions of Contract R1.pdf	2,205.19 KB
13	02. 1.2 dia Precast MH 3.pdf	02. 1.2 dia Precast MH 3.pdf	153.49 KB

Tender Stages

Stage Name	Evaluation Date	Minimum Forms for Submission	Evaluation Dependency
Preliminary Stage	11-11-2024 17:30	0	
Commercial Stage	11-11-2024 17:35	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. or F.D.R. 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	

Documents required for Stage - Commercial Stage


Sr No	Document Name	Mandatory
1	Prise Bid	No

Evaluation Committee

Stage Types	Opening Committee	Decryptor		Stage Evaluator
		Primary Decryptor	Alternate Decryptor	
Preliminary Stage	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)	N/A	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)
Commercial Stage	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)	N/A	Nitesh Bachubhai Vadhvaniya .(bmc tpnbv)

BACK

EXPORT TO PDF

Legends	
Icon	Description
	View

BHAVNAGAR MUNICIPAL CORPORATION
Tender Notice (online) No. - **BMC/DRAINAGE/AMRUT 2.0 /DR/01/2024**



Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

PROJECT FUNDED UNDER AMRUT 2.0 GRANT

**VOLUME – IV
PRICE BID**

Milestone Dates	
Online Downloading of Technical Bid & Price Bid	As Per Volume I
Pre – Bid Conference	As Per Volume I
Last Date of Online Submission of Technical Bid & Price Bid	As Per Volume I
Last Date for Physical Submission of Tender Fee, EMD and other Documents	As Per Volume I
Online Opening of the Technical Bid	As Per Volume I

CONSULTANT:

Technomen consultants
223-227 Ugati corporate park, Opp.
Pratik mall, Koba-Gandhinagar
highway, Kudasán
Gandhinagar - 382421

CLIENT:

Executive Engineer,
Bhavnagar Municipal Corporation.,
Sir Mangalsinhji Road,
Bhavnagar- 364 001
Mobile No.:9879792732
Fax: -0278-2428628
E-mail: bmcdrainage@gmail.com

Bid Documents for

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

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A. PREAMBLE TO PRICE SCHEDULES

1. Name of work: "Title as mentioned in Notice Inviting Tender"
2. The bidder shall quote his firm and fixed price for the entire work under this Contract, defined in more details in various sections of this bid document.
3. The rates and prices shall be submitted in the electronic formats given by n-procure which is called Schedule-B, rates and prices received in any other formats will be rejected and the bids will be disqualified.
4. It will be entirely at the discretion of the employer to accept or reject the bidder's proposal, without giving any reasons whatsoever and the bidder shall not be permitted to withdraw his bid on this account.
5. In Price Schedule-B the Bidder shall quote prices for the items on lump sum / unit rate as called for against the each item.
6. In Price Schedule-B, bidder shall quote his price for entire work. Prices quoted in Schedule-B only will be considered for comparison and evaluation.
7. In the Price Schedule B-1 to Schedule B-6 bidder shall furnish breakup of his prices quoted in Price Schedule-B.
8. Wherever for a particular item the quantities have been specified payment shall be on unit rate basis and unit variation in quantity will be paid with pro rata basis.
9. Each item is to be individually priced online and the amounts shall be added up to arrive at the "Total of each Price Schedule". No column in the Schedules of prices shall be left blank except where the item description requires the item to be priced on "as applicable" basis. The item shall not be priced if it is "not applicable" to the bidder's design, in which case the bidder shall add the words "Not Applicable". The wording in the item description is for subject matter guidance only; clause references are indicative only and all other relevant clauses shall also be referred to. The prices shall allow for all the works covered under the bid and all liabilities and contractual obligations whether separately specified or not. Items against which no prices are quoted shall not be separately paid for and the bidder shall be deemed to have covered the cost of execution of such items (according to the requirements of the bid document) in the prices quoted for other items.
10. Items not specifically listed in his Price Schedules, but required to be executed for satisfactory working/safety of the system as specified, will not be separately paid for by the Employer when executed and shall be deemed to be already covered by other items and rates listed in the price sheets. No extra payment shall be given for any item which is required to complete and perform the project.
11. The total of the item prices in Price Schedule B-1 to Schedule B-6 shall be equal to the price quoted by the bidder in Price Schedule-B and shall be firm and fixed, during the pendency of the Contract. In case of any discrepancy noted in the various price schedules, those in Schedule B will be considered and binding on the Contractor. The prices in Price Schedule B-1 to Schedule B-6 of the successful bidder shall be corrected accordingly. Only Price Schedule-B after carried over and arithmetic corrections if any will be considered for financial evaluation of the bid.
12. DELETED
13. Schedule-D gives the basis of interim payment for construction of civil works.

14. The bidder shall be deemed to have allowed in his price for provision, maintenance and final removal of all temporary works of whatsoever nature required for construction including temporary bunds, diverting water, pumping, de-watering etc. for the proper execution of works. The rates shall also be deemed to include any works and setting out that may be required to be carried out for laying out of all the works involved.
15. Prices shall be filled online only.
16. The Price Schedules are to be read in conjunction with the conditions of Contract, the Specifications and other sections of these bid documents and these documents are to be taken as mutually explanatory of one another.
17. The bidder shall interpret the data furnished and carry out any additional survey work, or investigation work required at his own cost.
18. The prices quoted shall also include the cost of materials utilized for testing.
19. The bidder should acquaint himself with the site conditions including the access to Work site. The successful bidder shall have to make suitable access to work sites at his own cost. These accesses will be used by the other contractors working for BHAVNAGAR MUNICIPAL CORPORATION.
20. The item descriptions in price schedule are for subject matter guidance only and the prices shall include all the equipments / materials / accessories and services required as per the specifications. The bidder shall fill in the price schedule furnished.
21. ~~The amount to be quoted for O&M shall be as per Volume-II, General Conditions of Contract, Clause No. 1 "Security Deposit".~~
22. 1% of the value of work will be deducted from the Running bill against labour cess, which shall be non-refundable.
23. Third Party Inspection / CSC agency will be deployed by Bhavnagar Municipal Corporation and charges of the same will be borne by Bhavnagar Municipal Corporation.
24. Any expenditure incurred by inspection/ CSC agency for the work misinformed by the contractor and charges of inspection/ CSC agency without any work due to misinformation shall be recovered from the contractor.
25. The prices shall be quoted inclusive of all taxes, royalties and duties prevailing at the time of submission of the bids. Statutory variation if any during the currency of contract shall have to borne by the agency which shall be not reimbursed by the BHAVNAGAR MUNICIPAL CORPORATION.
26. The rates should be quoted inclusive of all taxes but **Excluding GST** as per Volume-II, **General Conditions of Contract, Clause No. 47.**

B. BID FORM (WITH PRICE)

Bidders are required to fill up all the blank spaces in this Bid Form.

To,
The Municipal Commissioner
Bhavnagar Municipal Corporation
Bhavnagar

Dear Sir,

SUB: Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

1. Having visited the site and examined the Bid Documents, Drawings, Conditions of Contract, Specifications, Schedules, Annexure, Preamble to Price Schedules, Price Schedules etc. including Addenda / Amendments to the above, for the execution of the above Contract, we the undersigned offer to Design, Engineer, Procure, Construct, Complete, Commission, operate, maintain and Run the whole of the said works for 60(Sixty) Months from the date of commissioning including defects liability period as given in Conditions of Contract and in conformity with the drawings, conditions of Contract, specifications, Preamble to Price Schedules, Price Schedules, Annexure, Bidding Documents, including Addenda Nos. _____ (insert numbers) for Lump sum _____ fixed _____ price _____ of Rs. _____.(Rupees _____) for Construction or such other sum as may be ascertained in accordance with the conditions.
2. I / We agree that;
 - (a) If we fail to provide required facilities to the Employer's representative or any other person / Agency by the Employer to perform on his behalf for carrying out the inspection and testing of materials and workmanship.
Or
 - (b) If we incorporate into the Works, materials before they are tested and approved by the Engineer's representative
Or
 - (c) If we fail to deliver pure water of required quantity according to the conditions / stipulations of the Contract, the Engineer will be at liberty to take any action including termination of Contract and impose at his absolute discretion any penalties, and / or reject the work.
3. We undertake, if our Bid is accepted, to complete and deliver the works in accordance with the Contract within **16 Months**, Exclusive of monsoons, from the date or receipt of Letter of Acceptance issued to us by you.
4. We agree to abide by this Bid for a period of **180 days** from the last date of submission of bid and it shall remain binding upon us and may be accepted at any time before the expiry of that period.

- 5. In the event of our Bid being accepted, we agree to enter into a formal Contract Agreement with you incorporating the conditions of Contract thereto annexed but until such agreement is prepared this Bid together with your written acceptance thereof shall constitute a binding Contract between us.
 - 6. We agree, if our Bid is accepted, to furnish performance Security in the forms and of value specified in the General Conditions of Contract.
 - 7. We have independently considered the amounts of liquidated damages shown in Appendix to Bid and agree that they represent a fair estimate of the damages likely to be suffered by you in the event of the work not being completed by us in time.
 - 8. We understand that you are not bound to accept the lowest or any bid you may receive.
- Dated this _____ day of _____ 20__

(Signature)

(Name of the person)

(In the capacity of)

Company Seal

(Name of firm)

Duly authorized to sign Bid for and on behalf of
(Fill in block capitals)

Witness :

Signature

Name

C. PREAMBLE

1. As mentioned in the Conditions of contract, the Contract being a Item Rate/lump sum type turnkey Contract on EPC basis, the provision of measurement will be applicable only for the assessment of value of work done for inclusion in any interim certificate for part payment to the Contractor.
2. The Schedule specifies the procedure for all such assessment of the items specified in Schedule B.
3. Each item of Schedule-B has been divided into broad components. The Employer's Representative shall assess the value of each component as indicated in paragraph 6 herein below.
4. Percentages are indicated against each component of each items specified in Schedule B, based on the Employer's best appreciation of the value of the component as related to the total costs of the concerned item as whole. A head titled (any other item(s)) is included in each breakdown of schedule and the tenderer shall at the time of tendering indicate any additional items which he considers necessary but cannot be covered by any of the heads indicated in the breakup.
5. The percentage breakup as indicated in the Schedule may differ from that corresponding to the tenderer's scheme and design and he should take this into account while quoting his lump sum prices for the items specified in Schedule-B.
6. The contractor shall, after approval of his detailed designs and drawings furnish to the Employer's Representative an initial bill of quantities to all major items, to be reviewed and updated periodically with the Employer's Representative. This bill of quantities will be used for assessment of percentage progress of the component at any stage. By measurement jointly taken by the Employer's Representative and the Contractor, mutually agreed and entered in the measurement books in the form and by the method approved by the Employer's Representative, and signed jointly by both the parties.

D. SCHEDULE-D PAYMENT-SCHEDULE**BREAK UP FOR INTERIM PAYMENTS
(CIVIL, MECHANICAL, INSTRUMENTATION & ELECTRICALWORKS)**

Item	Description of Items	Percentage Payment to be released
1	PUMPING STATION – Civil Works	Percentage Payment to be released for respective Pumping Stations
a	On completion of topographical survey, Geotechnical Investigations and approval of structural designs	2 % of Quoted rate
b	On completion of Excavation & base slab	18% of Quoted rate
c	On completion of vertical wall up to plinth (incl. screen chamber)	15% of Quoted rate
d	Full supporting structure incl. ring beam and top slab.	15% of Quoted rate
e	On completion of pump house including inlet chamber, screen chamber, Compound Wall, Toilet Blocks, fixing doors windows	25 % of Quoted rate
f	Plastering inside & outside with epoxy paint etc comp.	5 % of Quoted rate
g	Painting of letters, MS ladder pipe, railing, lighting arrester and all miscellaneous items such as snowcem paints in three coats etc. (Completed with all respect)	5% of Quoted rate
h	On hydraulic testing	5 % of Quoted rate
i	After completion	10% of Quoted rate
2	MECHANICAL, ELECTRICAL AND INSTRUMENTAL WORKS	
a	On supply of material at work site in good condition	65% of Quoted rate
b	On erection of Equipment	20% of Quoted rate
c	On completion of Testing & Commissioning of Equipment	5% of Quoted rate
d	Satisfactory running of system.	10% of Quoted rate
3	RISING MAIN	
A	Pipeline	
	On receipt of materials at project site	65 % of Quoted rate
	On Excavation, Lowering, laying and Jointing	20 % of Quoted rate

Item	Description of Items	Percentage Payment to be released
	On Hydraulic testing	5 % of Quoted rate
	On refilling and disposal of surplus stuff	5 % of Quoted rate
	After commissioning	5 % of Quoted rate
B	Other Materials	
1	On running bill as per actual work done	85% of Quoted rate
2	On completion & commissioning of the section in all aspects, and handing over to department / ULB.	15% of Quoted rate
4	GRAVITY MAINS	
A	Pipeline	
1	On receipt of materials at project site (Maximum 5.0 Km. un laid length is payable for this item per each dia. per Each Bill)	65 % of Quoted rate
	On Excavation, Lowering, laying and Jointing including Construction of Manholes and Completed with all respect	25 % of Quoted rate
2	On Flow Test	5 % of Quoted rate
3	On completion & commissioning of the section in all aspects, and handing over to department / ULB.	5 % of Quoted rate
B	Manhole and other Materials	
1	On running bill as per actual work done	85% of Quoted rate
2	On completion & commissioning of the section in all aspects, and handing over to department / ULB.	15% of Quoted rate
5	OPERATION AND MAINTENANCE	
4	Every month in equal installment based on quoted prices of O & M will be paid	

Notes:___

1. For All other Items except above items in Price Bid if any, Payment shall be done as follows,
 - i. 85% payment shall be made on pro-rata basis against executed quantity and certification from Employer
 - ii. Balance 15 % payment against satisfactory commissioning of scheme and on receipt of commissioning certificate from Employer.
2. **Separate Agreement for comprehensive Operation and maintenance shall have to be made after handing over of complete project to the department.**

Schedule B

Schedule B No.	Item Description	Amount (In Rs)
1	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Kansara Main (East) to trunk main of a road around the city, Bhavnagar	29,78,207.84
2	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line at LIG, MIG Colony of Housing board in Anandnagar Area, Bhavnagar	2,11,52,769.80
3	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Tilaknagar Chowk to trikoniya bag, Bhavnagar	78,12,804.66
4	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Ambawadi chowk to Shree Mangala mata chowk., Bhavnagar	40,91,483.71
5	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line at Dr Naravani & Vaghela mandap street, Bhavnagar	73,31,805.97
6	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Shubhashnagar smashan to Shivaji Circle, Bhavnagar	4,36,67,429.19
7	Total (1+2+3+4+5+6)	8,70,34,501.17
	Say	
8	Rebate on above tendered amount (if any) %	0.00
9	Net amount considering rebate (7-8)	8,70,34,501.17
Total Amount in Figures Rs. <u>8,70,34,501.17</u>		
Total Amount in Words Rs. Eight Crore seventy lacs thirty-four thousand five hundred and One rupees only		

Schedule B1

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Kansara Main (East) to trunk main of a road around the city, Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chieilling only for finishing i) Excavation upto 0 to 1.5m depth.	847.62	Cum	127.88	108393.98
ii	Excavation upto 1.5 to 3 m depth.	463.22	Cum	170.20	78840.04
iii	Excavation upto 3 to 4.5 m depth.	6.51	Cum	456.55	2972.14
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges For Bedding	38.467	Cum	202.40	7785.72
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	20.00	L.S	1150.00	23000.00
4	Providing and supplying ISI marked standerd R.C.C pipe (of sulphate retesting cement) in standerd length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, convayance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 600 NP4 mm dia. Pipe	295.90	Rmt	2994.00	885925.00
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following	295.90	Rmt	262.20	77585.00

	diameters in proper position, grade and alignment, as directed by engineer in charge incl. conveyance from store to site of work, labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 600 NP4 mm dia. Pipe				
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "B" circular type having inside diameter of minimum 1500 mm and for depth from 1.5 M to 4.0 M (for 150 mm to 600 mm dia sewers) i) Manhole type "B" as above but up to 1.5 M depth.	9.00	Nos.	24283.40	218551.00
ii)	Extra depth beyond 1.5 M but up to 4.0 M depth for type B manhole above.	7.0250	Rmt.	14159.95	99474.00
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH	9.00	Nos.	1319.05	11871.00
ii)	Cover suitable for 50 cm opening of MH	9.00	Nos.	1319.05	11871.00
8	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3 km.	1192.08	Cum	25.30	30160.00
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead	1.00	Nos.	38911.40	38911.00

	oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height				
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	13.57	sqm	81.65	1108.00
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	790.406	cum	19.55	15452.00
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Removal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	269.00	Rmt	50.60	13611.00
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works	13.56	Cum	9288.55	125930.00
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all diameters.	1220.18	kg	89.13	108755.00
15	Supplying and installation of IS Standard quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation up to site or store etc.	5.00	Nos.	2580.00	12900.00

	complete as per instruction of site in charge.				
16	Supply, testing & commissioning portable diesel driven self-priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	347.76	cum	1050.21	365221.00
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	190.89	cum	979.45	186967.00
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.	30.24	cum	4764.00	144063.00
20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG	64.26	cum	5402.00	347133.00

	30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete				
	Total of Above	29,78,207.84			

Schedule B2

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line at LIG, MIG Colony of Housing board in Anandnagar Area, Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chiselling only for finishing i) Excavation upto 0 to 1.5m depth.	6386.40	Cum	127.88	816692.83
ii	Excavation upto 1.5 to 3 m depth.	345.41	Cum	170.20	58788.78
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges	359.99	Cum	202.40	72861.98
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	150.00	L.S	1150.00	172500.00
4	Providing and supplying ISI marked standard R.C.C pipe (of sulphate resesting cement) in standard length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, conveyance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 300 NP4 mm dia. Pipe	3599.86	Rmt	1087.00	3913047.82
	ii) 350 NP4 mm dia. Pipe	500.00	Rmt	1379.00	689500.00
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following diameters in proper position, grade and alignment, as directed by engineer in charge	3599.86	Rmt	136.85	492640.84

	incl. conveyance from store to site of work, labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 300 NP4 mm dia. Pipe				
	ii) 350 NP4 mm dia. Pipe	500.00	Rmt	152.95	76475.00
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer) up to 1.0 meter depth	112.00	Nos.	14005.85	1568655.20
ii)	Extra depth beyond 1.0 M but upto 1.5 M depth for "A" type manhole above	32.63	Rmt.	7622.20	248712.39
B	Manhole type "B" circular type having inside diameter of minimum 1500 mm and for depth from 1.5 M to 4.0 M (for 150 mm to 600 mm dia sewers) i) Manhole type "B" as above but up to 1.5 M depth.	18.00	Nos.	24283.40	437101.20
ii)	Extra depth beyond 1.5 M but up to 4.0 M depth for type B manhole above.	5.99	Rmt.	14159.95	84818.10
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of	130.00	Nos.	1319.05	171476.50

	work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH				
ii)	Cover suitable for 50 cm opening of MH	130.00	Nos.	1319.05	171476.50
8	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3 km.	6360.65	Cum	25.30	160924.45
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height (6mtr M.S pipe)	2.00	Nos.	38911.40	77822.80
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	45.21	sqm	81.65	3691.40
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	4039.08	cum	19.55	78964.01
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Remocal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	3272.60	Rmt	50.60	165593.56
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all	48.60	Cum	9288.55	451423.53

	structures with water proofing compound. for encasements works				
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all diameters.	4373.83	kg	89.13	389839.47
15	Supplying and installation of IS Standard quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation upto site or store etc. complete as per instruction of site incharge.	35.00	Nos.	2580.00	90300.00
16	Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	3161.72	cum	1050.21	3320469.96
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	1735.51	cum	979.45	1699845.27
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using	274.93	cum	4764.00	1309766.52

	emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.				
20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete	584.23	cum	5402.00	3156010 .46
21	Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with requiried length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8 mm	2.00	Nos.	600515.05	1201030 .10
	Total of Above	2,11,52,769.80			

Schedule B3

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Tilaknagar Chowk to trikoniya bag, Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chielling only for finishing i) Excavation upto 0 to 1.5m depth.	2327.67	Cum	127.88	297662.00
ii	Excavation upto 1.5 to 3 m depth.	233.64	Cum	170.20	39766.00
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges	138.83	Cum	202.40	28099.00
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	30.00	L.S	1150.00	34500.00
4	Providing and supplying ISI marked standard R.C.C pipe (of sulphate resesting cement) in standard length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, conveyance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 350 NP4 mm dia. Pipe	250.00	Rmt	1379.00	344750.00
	ii) 400 NP4 mm dia. Pipe	1023.44	Rmt	1873.00	1916903.00
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following diameters in proper position, grade and alignment, as directed by engineer in charge incl. conveyance from store to site of work,	250.00	Rmt	152.95	38238.00

	labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 350 NP4 mm dia. Pipe				
	ii) 400 NP4 mm dia. Pipe	1023.44	Rmt	174.80	178897.00
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer) up to 1.0 meter depth	32.00	Nos.	14005.85	448187.00
ii)	Extra depth beyond 1.0 M but upto 1.5 M depth for "A" type manhole above	9.42	Rmt.	7622.20	71801.00
B	Manhole type "B" circular type having inside diameter of minimum 1500 mm and for depth from 1.5 M to 4.0 M (for 150 mm to 600 mm dia sewers) i) Manhole type "B" as above but up to 1.5 M depth.	9.00	Nos.	24283.40	218551.00
ii)	Extra depth beyond 1.5 M but up to 4.0 M depth for type B manhole above.	1.21	Rmt.	14159.95	17134.00
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH	41.00	Nos.	1319.05	54081.00
ii)	Cover suitable for 50 cm opening of MH	41.00	Nos.	1319.05	54081.00
8	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff	2340.26	Cum	25.30	59209.00

	as directed within a radius of 3 km.				
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height (6mtr M.S pipe)	4.00	Nos.	38911.40	155646.00
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	9.09	sqm	81.65	742.00
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	1536.78	cum	19.55	30044.00
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Removal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	930.40	Rmt	50.60	47078.00
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table 9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works	15.35	Cum	9288.55	142594.00
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars	1381.64	kg	89.13	123146.00

	confirming to relevant IS Fe – 500 grade for all diameters.				
15	Supplying and installation of IS Standard quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation upto site or store etc. complete as per instruction of site incharge.	10.00	Nos.	2580.00	25800.00
16	Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	941.16	cum	1050.21	988416.00
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	516.62	cum	979.45	506003.00
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.	81.84	cum	4764.00	389886.00

20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete	173.91	cum	5402.00	939462.00
21	Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with requiried length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8	1.00	Nos.	600515.05	600515.00
Total of Above		78,12,804.66			

Schedule B4

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Ambawadi chowk to Shree Mangala mata chowk., Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chiselling only for finishing i) Excavation upto 0 to 1.5m depth.	871.20	Cum	127.88	111409.06
ii	Excavation upto 1.5 to 3 m depth.	675.13	Cum	170.20	114907.13
iii	Excavation upto 3 to 4.5 m depth.	78.84	Cum	441.0198	34770.00
iv	Excavation upto 4.5 to 6 m depth.	0.20	Cum	465.75	93.15
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges	34.28	Cum	202.40	6938.27
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	15.00	L.S	1150.00	17250.00
4	Providing and supplying ISI marked standard R.C.C pipe (of sulphate resisting cement) in standard length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, conveyance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 300 NP4 mm dia. Pipe	322.19	Rmt	1087.00	350220.53
	ii) 350 NP4 mm dia. Pipe	100.00	Rmt	1379.00	137900

					.00
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following diameters in proper position, grade and alignment, as directed by engineer in charge incl. conveyance from store to site of work, labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 300 NP4 mm dia. Pipe	322.19	Rmt	136.85	44091.70
	ii) 350 NP4 mm dia. Pipe	100.00	Rmt	152.95	15295.00
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer) up to 1.0 meter depth	4.00	Nos.	14005.85	56023.40
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH	16.00	Nos.	1319.05	21104.80
	ii) Cover suitable for 50 cm opening of MH	16.00	Nos.	1319.05	21104.80
8	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3 km.	1592.15	Cum	25.30	40281.40
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with	1.00	Nos.	38911.40	38911.40

	necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height (6mtr M.S pipe)				
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	162.16	sqm	81.65	13240.36
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	975.22	cum	19.55	19065.55
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Remocal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	292.90	Rmt	50.60	14820.74
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works	3.95	Cum	9288.55	36689.77
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all diameters.	355.87	kg	89.13	31718.69
15	Supplying and installation of IS Standerd quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading,	10.00	Nos.	2580.00	25800.00

	unloading, transportation upto site or store etc. complete as per instruction of site incharge.				
16	Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	539.12	cum	1050.21	566189.22
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	295.93	cum	979.45	289848.64
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.	46.88	cum	4764.00	223336.32
20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid	99.62	cum	5402.00	538147.24

	process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete				
21	Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with requiried length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8	1.00	Nos.	600515.0 5	600515 .05
22	Providing Supplying Lowering Laying and Jointing Precast Sewer manholes as per tender Design, as per the type design in Reinforced Cement Concrete with neat finish without any damage and honey combs with fixed HDPE steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete (excl. excavation). rates are inclusive of groting the joints between two members basic chambers constitues of Base Slab, 1st cylindrical piece with pipe opening on both sides top piece (Conical or slab piece as per design type drawing) and additional rings as per depth adjustment according to design type Manhole type "C" circular type having inside diameter of minimum 1500 mm and for depth from 4.0 M to 6.0 M (for 150 mm to 1800 mm dia sewers) i) Manhole type "C" as above but up to 1.5 M depth.	10.00	Nos.	65236.00	652360 .00
ii)	Extra depth up to 4.0 M depth for type C manhole above.	0.37	Rmt.	20637.41	7635.8 4
	Total of Above			40,91,483.71	

Schedule B5

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line at Dr Naravani & Vaghela mandap street, Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chiselling only for finishing i) Excavation upto 0 to 1.5m depth.	2136.23	Cum	127.88	273181.09
ii	Excavation upto 1.5 to 3 m depth.	272.05	Cum	170.20	46302.91
iii	Excavation upto 3 to 4.5 m depth.	1.01	Cum	441.0198	445.43
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges	128.13	Cum	202.40	25933.51
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	35.00	L.S	1150.00	40250.00
4	Providing and supplying ISI marked stander R.C.C pipe (of sulphate retesting cement) in stander length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, convayance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 300 NP4 mm dia. Pipe	1281.30	Rmt	1087.00	1392773.10
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following diameters in proper position, grade and alignment, as directed by engineer in charge	1281.30	Rmt	136.85	175345.91

	incl. conveyance from store to site of work, labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 300 NP4 mm dia. Pipe				
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer) up to 1.0 meter depth	20.00	Nos.	14005.85	280117.00
ii)	Extra depth beyond 1.0 M but upto 1.5 M depth for "A" type manhole above	7.56	Rmt.	7622.20	57623.83
B	Manhole type "B" circular type having inside diameter of minimum 1500 mm and for depth from 1.5 M to 4.0 M (for 150 mm to 600 mm dia sewers) i) Manhole type "B" as above but up to 1.5 M depth.	15.00	Nos.	24283.40	364251.00
ii)	Extra depth beyond 1.5 M but up to 4.0 M depth for type B manhole above.	6.04	Rmt.	14159.95	85526.10
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH	35.00	Nos.	1319.05	46166.75
ii)	Cover suitable for 50 cm opening of MH	35.00	Nos.	1319.05	46166.75
8	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff	2297.82	Cum	25.30	58134.85

	as directed within a radius of 3 km.				
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with 0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height (6mtr M.S pipe)	1.00	Nos.	38911.40	38911.40
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	2.95	sqm	81.65	240.87
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	1445.58	cum	19.55	28261.09
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Remocal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	983.00	Rmt	50.60	49739.80
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works	13.27	Cum	9288.55	123259.06
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all	1194.35	kg	89.13	106452.42

	diameters.				
15	Supplying and installation of IS Standard quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation upto site or store etc. complete as per instruction of site incharge.	15.00	Nos.	2580.00	38700.00
16	Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	1130.46	cum	1050.21	118722.040
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	620.52	cum	979.45	607768.31
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.	98.30	cum	4764.00	468301.20
20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using	208.89	cum	5402.00	112842.378

	specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete				
21	Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with requiried length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8 mm	1.00	Nos.	600515.0 5	600515 .05
	Total of Above	73,31,805.97			

Schedule B6

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Upgradation of Drainage line from Shubhashnagar smashan to Shivaji Circle, Bhavnagar

Sr.No.	Description	Quantity	Unit	Rate	Amount
1	Excavation for Sewer Collecting System including all safety provision using site rails and removing the excavated stuffs directed with lead upto 90 M. (Including of Manhole excavation) For Sewer pipes in all sort of soils and soft murrum, hard murrum, boulders including macadam roads, soft rock, masonry in CM or LM or Lime concrete, Hard rock with blasting and chiseling or by chiselling only for finishing i) Excavation upto 0 to 1.5m depth.	7032.90	Cum	127.88	899367.00
ii	Excavation upto 1.5 to 3 m depth.	4296.95	Cum	170.20	731341.00
iii	Excavation upto 3 to 4.5 m depth.	48.5120	Cum	441.0198	21395.00
2	Providing bedding incl. ramming, watering, levelling, consolidating etc. Complete. as per standard and instruction of engineer incharge Considering Murrum bedding and murrum to be brought from outside including all lead charges	394.74	Cum	202.40	79895.00
3	Add for Restoration of Infrastructures Like Kharkuwa, Electrical line, Water Supply Line, Telephone cables all type , Gas Line, Septic Tank, OFC cables, Internet cables, Any private or Government sewer connection line and water supply line etc	75.00	L.S	1150.00	86250.00
4	Providing and supplying ISI marked standard R.C.C pipe (of sulphate resting cement) in standard length of following class and diameter suitable for either collar joint or rubber ring joint incl. all taxes, insurance, transportation, freight charges, octroi, inspection, charges, loading, unloading, conveyance to departmental store, stacking etc. complete.(IS 458/1959) Note : One rubber ring should be supplied with each full length socketed pipe, cost included in rates below Class NP3/NP4 Test Pressure 0.7 Kg/sq.cm i) 350 NP4 mm dia. Pipe	400.00	Rmt	1379.00	551600.00
	ii) 1200 NP4 mm dia. Pipe	2074.93	Rmt	9704.00	201351.21.00
5	Lowering, laying and jointing R.C.C. pipes with collar joints in C.M.1:1:1/2 of following	400.00	Rmt	152.95	61180.00

	diameters in proper position, grade and alignment, as directed by engineer in charge incl. conveyance from store to site of work, labour, giving hydraulic testing as per IS code and tender specification. (IS 458/1959) For 0 to 1.5 depth i) 350 NP4 mm dia. Pipe				
	ii) 1200 NP4 mm dia. Pipe	2074.93	Rmt	506.00	104991 5.00
6	Providing and constructing Sewer manholes, scraper manholes as per the type design in brick masonry in C. M. 1:5 and inside and outside 20 mm thick plastering in C. M. 1:3 necessary 100mm coping with reinforcement in R.C.C. M200 fixing C.I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete as per latest CPHEEO manual (Excl. excavation). Manhole type "A" Circular type having inside diameter of 1200 mm for depth upto 1.5 m depth (for 150 mm to 500 mm dia sewer) up to 1.0 meter depth	16.00	Nos.	14005.85	224094 .00
7	RCC precast M.H. Frame and Cover:- RCC precast M.H. Frame & Cover of type EHD - 35 , supply & Delivery at store or at site of work including cost of reinforcement M.S. Angles or Flat, curing mold work, fitting of the same etc. complete as per EIC.. Extra Heavy Duty 35 i) frame suitable for 50 cm opening of MH	79.00	Nos.	1319.05	104205 .00
	ii) Cover suitable for 50 cm opening of MH	79.00	Nos.	1319.05	104205 .00
8	Refilling the pipeline trenches incl. ramming, watering, consolidating desposal of surplus stuff as directed within a radius of 3 km.	9245.01	Cum	25.30	233899 .00
9	Providing and erecting C. I. and MS ventilating columns 15 cms. dia. with C.I. ornamental cap and Min 6.00 Mtr. Height (Height may be varying as per site) base fixed firmly with necessary foundation with one coat of red lead oxide paint and one coat of any approved colour with 15 cms, dia.10 Mt.in length with	4.00	Nos.	38911.40	155646 .00

	0.35mt*0.35mt* M100 Encasing, stoneware or R.C.C. pipe connection with M.H. including excavation and jointing as required etc. complete. as per drawing. For 6 mtr Height (6mtr M.S pipe)				
10	Shoring or timbering INCLUDING COST OF LOCAL WOOD MATERIAL Shoring or timbering for trench with 50 mm thick planks and suitable size struts etc. complete.	73.47	sqm	81.65	5999.00
11	In all sorts of soil and soft murrum, hard Murrum and boulders, Soft Rock, Hard Rock, upto 1.5 mt. depth from G.L. Extra for dewatering in all sorts of strata's, for each 1.5 mt. or part thereof beyond 1.5 mt. depth.	6827.02	cum	19.55	133468.00
12	Removing of existing pipeline incl. removal of specials, valves jointing material including carting and stacking of removed material from site of work to the department store as directed excl. excavation and refilling. *Existing Pipe Remocal of Any Material (CI, DI, RCC, PVC, MS,DWC, HDPE from 100 mm dia to 1200 mm Dia pipe)	1886.30	Rmt	50.60	95447.00
13	Providing and cast in situ C.C. in grade M-20 (approx. corresp. to prop. 1:1.5:3) (proportions as per mix design or as per table9 of IS456 2000 in masses by weigh batching) using quartzite trap metal of size 12 mm to 20 mm and or 6 mm to 12 mm including scaffolding centering form work, needle vibrated consolidation, curing and hydraulic testing etc. complete (excluding cost of reinforcement) with centering and shuttering/deshuttering etc. complete up to 6 meter height/depth from Av. G.L. for all structures with water proofing compound. for encasements works	101.86	Cum	9288.55	946132.00
14	Supplying cutting, bending, binding and placing in position steel as per plan and design and as per ISS 2502 including cost of steel and binding wire for reservoirs/structures only including lift up to 6 meter height or depth below G.L. for all diameters Do – deformed (TMT) bars confirming to relevant IS Fe – 500 grade for all diameters.	9167.42	kg	89.13	817092.00
15	Supplying and installation of IS Standard quality perforated manhole cover and suitable frame upto 20 tonne capacity for replacing on storm water line manhole including all loading, unloading, transportation upto site or store etc. complete as per instruction of site incharge.	20.00	Nos.	2580.00	51600.00

16	Supply, testing & commissioning portable diesel driven self priming horizontal mono dewatering pump set with four wheel trolley, GI medium duty delivery pipes, specials, suction strainer etc. complete set Material of Constructions: Impeller: Bronze, Casing: CI, Shaft: Carbon Steel. 12-30 LPS with 6-12 m of Head Note: Given quantity of pumps with DG Set to be supplied on site prior to commencement of work.	2.00	Nos.	30864.00	61728.00
17	Construction of 200 mm thick granular sub-base (Grade – I) by providing coarse graded material, spreading by providing 75 B.T.Crushed Kapchi in uniform two layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.	3477.60	cum	1050.21	3652210.00
18	Providing, laying, spreading and compacting graded stone aggregate to 200 mm thick WMM wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with motor grader in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density.	1908.90	cum	979.45	1869672.00
19	Providing and laying 40 mm thick bituminous concrete using stone chips at 0.66 cum/M.T. with asphalt for mixing 50 Kg./M.T. of total mix by continuous batching of hot mix plant and laying the same by paver finishing using emulsion tack coat 2.50 Kg./10 smt. including consolidation with roller including cost of fuel, kerosene, labour charges etc. using contractor's own Drum mix plant necessary equipment tools including flushing of sand / dust etc. complete using asphalt VG-30 (60/70) grade.	302.40	cum	4764.00	1440634.00
20	Providing and laying Dense bituminous macadam 85 mm compacted thickness using specified graded black trap crushed stone aggregates as per MORTH gradation using emulsion for tack coat (Rapid setting) @ 2.5 Kg./10 Sq.m. with mechanical sprayer and VG 30 bulk bitumen for mixing at the rate of 4.5 % (45 Kg./M.T.) by Drum mix and hot laid process using sensor paver finisher to the required camber and grade, and rolling with vibratory roller to achieve desire density	642.60	cum	5402.00	3471325.00

	including cost of fire wood, oil, Kerosene, flushing of stone dust as required, labour charges and hire charges of machineries etc. complete				
21	Drilling of 600mm dia Horizontal borehole for watermain pipeline crossing under the road incl in all strata with required length incl fixing of 500mm dia M.S/RCC casing pipe with pushing etc complete various size of pipe for 273.1 to 355.6mm dia watermain (For 45 mt Length) Without Water main & with MS Casing Pipe of thick:8	1.00	Nos.	600515.05	600515.00
22	Providing Supplying Lowering Laying and Jointing Precast Sewer manholes as per tender Design, as per the type design in Reinforced Cement Concrete with neat finish without any damage and honey combs with fixed HDPE steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete (excl. excavation). rates are inclusive of groting the joints between two members basic chambers constitutes of Base Slab, 1st cylindrical piece with pipe opening on both sides top piece (Conical or slab piece as per design type drawing) and additional rings as per depth adjustment according to design type Manhole type "C" circular type having inside diameter of minimum 1500 mm and for depth from 4.0 M to 6.0 M (for 150 mm to 1800 mm dia sewers) i) Manhole type "C" as above but up to 1.5 M depth.	63.00	Nos.	75021.40	4726348.00
ii)	Extra depth up to 4.0 M depth for type C manhole above.	53.49	Rmt.	23733.02	1269479.00
				4,36,67,429.19	
	Total Estimated cost (B1 To B6) Rs.				8,70,34,501.17

Special Note:

1. Charges for the testing of material or TPI will be borne by Work Agency.
2. Joint venture will not allowed.
3. Bidder has to must submit all the filled up annexure and adequate detailed documents with technical bid/physical submissions for fulfilling qualifying criteria, failing witch BMC will disqualify the bidder without giving chance for submission of missing documents etc for further clarifications
4. The quoted rates should be inclusive of all taxes, insurance, labour overhead charges, constrictor's profit, royalties etc but **Excluding GST**

SUBMISSION OF PRICE PROPOSAL: I HAVE VISITED THE SITE OF WORK AND THOURGHLY GO THROUGH STATED SPECIFICATIONS AND CONDITIONS OF CONTRACT, HENCE, I AM SUBMITTING/QUOTTING RATE % **ABOVE OR BELOW** THEN ESTIMATED WORK AMOUNT Rs. **8,70,34,501.17** (Indian Rupees)

Signature of Contractor: Executive Engineer
Name: Bhavnagar Municipal Corporation,

Company's Seal: Bhavnagar
Date

BHAVNAGAR MUNICIPAL CORPORATION

Tender Notice (online) No BMC/Drainage/AMRUT 2.0/DR/01/2024



Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different Eastern areas of Bhavnagar under AMRUT 2.0 Grant.

PROJECT FUNDED UNDER AMRUT 2.0 GRANT

**VOLUME – I
TECHNICAL BID**

Milestone Dates	
Online Downloading of Technical Bid & Price Bid	17/10/2024 to 06/11/2024 up to 18.00 hrs.
Pre – Bid Conference	28.10.2024 at 12.00 hr @ City Engineer Office
Last Date of Online Submission of Technical Bid & Price Bid	06/11/2024 up to 18.00 hrs.
Last Date for Physical Submission of Tender Fee, EMD and other Documents	11/11/2024 up to 16.00 hrs.
Online Opening of the Technical Bid	11/11/2024 at 17.00 hrs.

CONSULTANT:

Technomen consultants
223-227 Ugati corporate park,
Opp. Pratik mall, Koba-
Gandhinagar highway
Kudasan
Gandhinagar - 382421

CLIENT:

Executive Engineer (Drainage Department),
Mangalsinhi road,
Bhavnagar Municipal corporation
E-mail: bmcdrainage@gmail.com

BHAVNAGAR MUNICIPAL CORPORATION**BHAVNAGAR**

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

VOLUME – I**TECHNICAL BID****INDEX**

SR. NO.	PARTICULARS	PAGE NO.
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BHAVNAGAR MUNICIPAL CORPORATION

Bhavnagar

Tender Notice No. **BMC/DRAINAGE/AMRUT 2.0 /DR/01/2024**

ONLINE E-TENDERING

Deputy Municipal Commissioner/City Engineer, Bhavnagar Municipal Corporation (BMC), invites EPC and **Percentage rate** Tender on line in single stage two bid system for the work shown in the schedule given below respectively :-

1.0	Tender Notice No.	BMC/DRAINAGE/AMRUT 2.0 /DR/01/2024
2.0	Work Description	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.
3.0	Estimated Cost (Capital + 2-year DLP)	Rs. 8,70,34,501.17+ GST
4.0	EMD @1%	Rs 8,70,345.00/-
5.0	Tender Fee	Rs. 12,000 /- (Non-refundable)
6.0	Qualification of Bidder	Duly registered with State/Central Govt./Municipal Corporation/PSU/Agencies in Class 'AA' or above.

The detail tender notice & Bid Documents will be available on the website: <https://bmc.tender.nprocure.com> and notice can be seen on and <https://www.bmcgujarat.com> from date: **17/10/2024 to 06/11/2024**. The Municipal Commissioner reserves the right to reject any or all offers received without assigning any reasons thereof. Further details, if any, may be obtained from Executive Engineer (Drainage Department), BMC. Mob: **9879792732**, Fax No.– 0278-2428628. Email: bmcdrainage@gmail.com

Executive Engineer

Bhavnagar Municipal Corporation

Date: / /2024

Place: Bhavnagar

DETAILED TENDER NOTICE

Tender NoticeNo.	BMC/DRAINAGE/AMRUT 2.0 /DR/01/2024	
Organization Name	BHAVNAGAR MUNICIPAL CORPORATION	
Department Name	DRAINAGE DEPARTMENT Executive Engineer (DRAINAGE), Bhavnagar Municipal Corporation., Sir Mangalsinhji Road, Bhavnagar- 364 001	
Name	Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.	
Tender Notice	BMC/DRAINAGE/AMRUT 2.0 /DR/01/2024	
Tender Type	Open Online	
Bidder Nationality	LCB (Local Competitive Bidding)	
Qualification of Bidder	Duly registered with State/Central Govt./Municipal Corporation/PSU/Agencies in Class 'AA' or above.	
Type of Contract	Percentage Rate	
Bidding Type	Single stage	
Bidding Currency	Single (Rupees)	
Rebate	Applicable	
Joint Venture	Not Applicable	
Schedule of E-Tender	Document downloading date & time	17/10/2024 to 06/11/2024 up to 18.00 hrs.
	Pre-Bid Meeting date & time	02/04/2024 at 12.00 hr @ City Engineer Office
	Last date & time of online Bid submission	06/11/2024 up to 18.00 hrs.
	Physical submission of EMD, Document Fee, PQ bid and Supporting documents	11/11/2024 up to 16.00 hrs.to Executive Engineer (Drainage), Bhavnagar Municipal Corporation by RAPD or Speed Post only
	Opening of PQ Bid (Online) & Technical Bid	If possible, On 11/11/2024 at 17:00 hrs.
	Opening of Price Bid (Online)	Intimated Later to successful bidders Only
	Bid validity period	180 days from opening of bid on line
	Project Duration	16 Months (Including Monsoon period & three months trial run)
Payment Details	Document Fee	Rs.12,000/- (Rupees Twelve Thousand Only) in favour of "Commissioner, Bhavnagar Municipal

		Corporation " in form of Demand Draft shall be issued by any nationalized bank or as per list mentioned in GR of. Finance Department, GR. No: EMD/10/2018/18/DMO, Date: 16.04.2018 (Enclosed)
	EMD	Rs 8,70,345.00/- (Rupees Eight-lakh Seventy thousand Three hundred and fourth five rupees only) EMD in form of DD in the name of Commissioner, Bhavnagar Municipal Corporation valid up to 28 days from the date of closure of the bid validity period of 180 days i.e.(Total of 180+28=208 days), shall be issued by any nationalized bank or as per list mentioned in GR of. Finance Department, GR. No: EMD/10/2018/18/DMO, Date: 16.04.2018 (Enclosed)
	Estimated Value	Estimated Cost Rs. 8,70,34,501.17+ GST (Rupees Eight Crore seventy lacs thirty-four thousand five hundred and One rupees only)
General Terms & Conditions	<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 Government approved certifying agency i.e. (n) Code Solution.</p> <p>DOWNLOAD OF TENDER DOCUMENT: -</p> <p>The tender document for these works is available only in Electronic format which can be download free of cost by the bidder from the internet site www.bmc.nprocure.com</p> <p>SUBMISSION OF TENDER: -</p> <p>Tenderer shall submit their offer in Electronic format on above mentioned website on 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/FDR/Bank Guarantee details online. The Demand Draft toward Tender Document fees can be submitted along with Earnest Money Deposit before the due date as specified above. This should be as per details given online and This submission shall mean that Tender Fee and EMD are received for Purpose of Opening the Bid. Accordingly offer of only those shall be opened whose tender fee and EMD is received electronically. However, for the purpose of realization of instrument of tender fee & EMD, bidder shall send the same in original through RPAD/SPEED POST only so as reach To Executive Engineer (Drainage Department), Mangalsinhi road, Bhavnagar Municipal corporation of last date of bidding during office on or 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> <p>(a) Documents required for evaluation as sought in different annexure duly</p>	

	<p>digitally signed.</p> <p>(b) Scanned copy of DD as EMD.</p> <p>(c) Scanned copy of Demand Draft as tender fee.</p> <p>(d) The Contractor shall enter in to an Agreement with the BMC on Rs. 300 Stamp Paper in the case of submission of BG, DD or Cash as SD and not to pay separate stamp duty. Require value of stamp paper for agreement is 4.25% of Security Deposit in the case of FD, NSC or સરકારી બચતી.</p> <p>(e) Scanned copy of contractor's registration certificate 'AA' Class in Govt. of Gujarat (R&B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state government).</p> <p>(f) Scanned copy of Bidder's solvency certificate. (Minimum of Rs 300 Lakhs)</p> <p>(g) Scanned copy of PAN Card</p> <p>(h) Scanned copies of Experience certificates showing successful completion of work (with certificate)</p> <p>(i) Scan copies of financial documents.</p> <p>The Bidder should submit price Bid electronically only. Price bid in physical form shall Not be accepted and any such offer if received by Bhavnagar Municipal Corporation same will be out rightly rejected.</p> <p>Technical bid in physical form is required to be submitted by all bidders. However, for lacking Documents BMC will ask to submit the contractor if found necessary.</p> <p>Bidders are need not to submit tender volumes in hard copy but L1 bidder will download all the tender volumes, his price bids, all addendums etc and will submit in three sets with his sign and seal at time when he receives LOI.</p>
	<p>OPENING OF TENDER: -</p> <p>The Technical Bid will be opened on the specified date online on website https://bmc.nprocure.com Bidders or their representative who wish to participate in online tender opening can log on to https://bmc.nprocure.com on the due date and time, mark their presence and participate in online tender opening. Bidders who wish to remain present at Bhavnagar Municipal Corporation premises at the time of tender opening can do so. Only one representative of each firm will be allowed to remain present. Date of opening of Price bid will be informed only to the qualifying bidders.</p>
<p>Information for online participation</p>	<ol style="list-style-type: none"> Internet site address for e-Tendering activities will be https://bmc.nprocure.com Interested bidders can view detailed tender notice and download tender documents from the above mentioned website. Bidders who wish to participate in online tender shall have to register with the website through the "New User Registration" link provided on the home page. Bidder will create login id & password on their own in registration process. Bidders who wish to participate in this tender need to procure Digital Certificate as per In formation Technology Act-2000 using that they can digitally sign their electronic bids. Bidders can procure the same from any of the CCA approved certifying agencies, or they may contact (n) code Solution at below mentioned

	<p>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</p> <p>M/S (n)code Solution 301, G.N.F.C. Info Tower, Near The Grand Bhagwati Hotel, Ahmedabad 380015, India. Tel: +91 79 26857316 Tel: +91 79 26857317 Tel: +91 79 26857318 E-Mail: URL: https://bmc.nprocure.com</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 experience details and Price bid only.</p> <p>6. Bidder should upload scan copies of reference 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 & Reference Documents in hard copy if such instructions are given by tendering authority.</p>
General Instruction	<ol style="list-style-type: none"> 1. The Bid Document Fee will not be refunded under any circumstances. 2. EMD in the form of specified in tender document only shall be accepted. 3. The offer shall be valid for 180 days from the last date of submission of bid. 4. Tenders without Bid Document Fee, Earnest Money Deposit (EMD), Valid Registration Certificate and which do not fulfill all or any of the conditions or those submitted incomplete, in any respect shall not be considered for evaluation. 5. Not more than one tender shall be submitted by a Bidder. 6. Conditional tender shall not be accepted. 7. Bhavnagar Municipal Corporation reserves the right to accept the lowest responsive offer, based on evaluation of package and reject any or all tenders without assigning any reason. 8. The notice shall form a part of contract document 9. The bidders are advised to read carefully the "Instruction" and "Eligibility Criteria" contained in the tender documents.
Qualifying Criteria	As per tender Documents
Contact person	<p>For further details of any query regarding the tender Contact to: Executive Engineer (Drainage), Bhavnagar Municipal Corporation., Sir Mangalsinhji Road, Bhavnagar- 364 001</p>

Mob. No: 9879792732, Fax-0278-2428628

Pre-Bid queries if any, contractor will deliver it in hard copy to Executive engineer (Project) in two days prior to Pre-Bid meeting and also e-mail to following both the e-mail addresses.

(1) E-mail address: bmcdrainage@gmail.com (2) info@technomen.in

Date: / /2024

Place: Bhavnagar

Executive Engineer
Bhavnagar Municipal Corporation,
Bhavnagar

MEMORANDUM OF WORK IN BRIEF

Name of work: Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

Name of Employer: Bhavnagar Municipal Corporation

- a. **Name of concerned City Engineer:** Mr. C.C Devmurari
 - b. **Address:** Bhavnagar Municipal Corporation ,Bhavnagar -364001
 - c. **Estimated Cost:** As Mentioned in Tender Notice
1. **Time allowed for completion of the work:** As Mentioned in Tender Notice
 2. **Amount of Earnest Money deposit (E.M.D.) as specified in the bid:** As Mentioned in Tender Notice.

Mode of submission of tender documents:

- a. Technical bid & Price bid duly filled in with Scanned copy of EMD and tender fee and other supporting documents. : Online submission only on <https://bmc.nprocure.com>
- b. Other documents in Hard copy- Registration Certificate, IT certificate, Tender fee, EMD, solvency certificate, required supporting documents& tender volumes. : "Address of the Executive Engineer (Drainage) Department, Bhavnagar Municipal Corporation By RPAD/ SPEEDPOST only.

Note: Tenders sent by any other mode than specified in 2a & 2b above will be outright rejected.

3. **Validity period of the offer :** 180 days from the last date of submission of bid.
4. **Opening of the Tender :** On the date specified, the electronic tender box will be opened:
5. **Place of opening :** As specified in the Tender Notice
6. **Date & Time of Opening :** As specified in the Tender Notice
7. **Amount of security Deposit:** As specified in the Tender Notice

BHAVNAGARMUNICIPAL CORPORATION

BHAVNAGAR

VOLUME - I

SECTION-II

INSTRUCTIONS TO BIDDERS

SECTION - II**INSTRUCTIONS TO BIDDERS****A. GENERAL****1.0 GENERAL:**

Online tenders are invited and published by Commissioner, Bhavnagar Municipal Corporation for the work of **“Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.**

.”from the contractors who are registered as 'AA' Class in Govt. of Gujarat (R&B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state government). The concerned Contractor shall submit the certificate of registration as in concerned State/ Government bodies/ Authority along with the tender.

1.1 SPECIAL ATTENTION

This tender consists for the work **“Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.**

- (i) A pre- bid conference for the works, open to all intending bidders, shall be held on the date & venue as mentioned in the Tender Notice.
- (ii) All Bidders are urged to submit a written request immediately upon receipt of the tender documents for the matter where clarification and/or additional information are desired, along with the details of work. The request shall be submitted not less than four days in advance of the pre-bid conference.
- (iii) The tender document shall be submitted as per procedure mentioned in tender documents.
- (iv) Earnest money deposit details & scanned copy shall be submitted as prescribed on line and after submission online, in form specified shall be submitted as per details given online in sealed envelope. If earnest money deposit is not received within prescribed time limit the bid shall be rejected.
- (v) Tender shall be opened as per procedure laid down as per detailed tender notice etc.

- (vi) All Bidders are cautioned that e-tender containing any deviation from the contractual terms and conditions, specifications or requirements shall be rejected as non- responsive.
- (vii) Conditional offer will be out right rejected. No condition shall be included in tender.
- (viii) Alternative tenders are not acceptable.
- (ix) Qualification of bidder will be done whose tender is considered responsive and meets the specified evaluation and qualification criteria as per tender conditions.
- (x) Bidders shall have to declare regarding the tender submitted in the prescribed format.
- (xi) The department reserves the right to qualify/ disqualify any applicant without assigning any reason thereof.
- (xii) **The bidder shall be disqualified if;**
 - a. The bidder had made misleading or false representation in the forms, statements and attachment submitted in proof of qualification requirements and/or
 - b. A record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history or financial failures etc.
 - c. The Bidder has been blacklisted by any Government/ Non Government / Private agencies/ Organizations/ Institutions/Government Undertakings and funding Agencies in the last 05 years.

The bidder should provide accurate information on litigation and/ or arbitration resulting from contract completed or under execution by him over the last five years. A consistent history of arbitration awards/ judgments against the applicant or any partner of a joint venture may result in disqualification for proposed work. If the details of litigation history is hidden by the applicant and later on it comes to knowledge of the employer the bidder shall be disqualified for the proposed work and other appropriate actions shall be taken against the bidder.

The bidder should submit undertaking on non judicial stamp paper of Rs. 300/- duly attested by notary public regarding document submitted, are true. Board would have the right to forfeit the EMD and black list to the bidder if any of the information given by the bidder is found faulty or incorrect or misleading.

- (xiii) If the bidder has submitted tender fee and EMD on line & in hard copy, the request of the bidder for not opening of bid shall not be accepted in any circumstances.
- (xiv) If bidder has not submitted in original, tender fee and E.M.D. offline, but same is scanned and submitted with his bid online or vice versa within stipulated period, to the designated officer as per Tender document, the bid shall be liable to be considered as non responsive.
- (xv) All those documents which are scanned and submitted should be numbered chronologically and with their reference in the self-appraisal of P.Q. will have to be given for the proof of qualification.
- (xvi) The bidder, whose contracts are earlier terminated on account of poor performance in Bhavnagar Municipal Corporation, will not be eligible for this tender.
- (xvii) Any bidder who has been barred by the state/central government or any entity control by them (Controlling Stake) from participating in any project and the bar subsists as on the day of issue of notice inviting tender and/or submission of bid, the bidder shall not be eligible to submit the tender document either individually or as a member of consortium. However the bidder submits the bid, the tender shall not be considered for evaluation.
- (xviii) The experience of works executed in Government (State / Central), Board, Corporation, and Government Undertaking / Organizations of state & central government including all Public Sector Units shall only be considered for evaluation.

The experience certificate from the client equivalent to not below the rank of Executive Engineer shall only be considered. The experience of sublet works / in house / private / foreign work shall not be considered..
- (xix) Bidders shall not be listed under a declaration of ineligibility for corrupt or fraudulent practices issued by the central/ state govt. Or not in the list of black listed contractors announced by Government (State / Central), Board, Corporation, and Government Undertaking / Organizations of state & central government including all Public Sector Units and Bhavnagar Municipal Corporation
- (xx) Bidder (individual or any member in case of JV/ consortium) shall not have suffered bankruptcy/ insolvency during the last 5 years. For this, Certificate of CA

appointed by the bidder must be produced along with a self-affidavit to same effect of prescribed stamp paper of affidavit.

- (xxi) Memorandum of Understanding (MOU) shall be done before online submission of Bid to Bhavnagar Municipal Corporation.
- (xxii) The approved Vendor list is enclosed with tender document. If any additional items are required beyond above Vendor List, Contractor should take prior approval of Bhavnagar Municipal Corporation before order placement.
- (xxiii) Bhavnagar Municipal Corporation shall provide ROU (Right of Use) of adequate width for laying of pipeline once as per availability. During excavation, laying, back filling, any damages to the hidden object beneath the earth like pipelines, cables etc. shall be the responsibility of contractor. The contractor has to rectify the same without any financial implication on Bhavnagar Municipal Corporation within stipulated time as instructed by EIC. The crop compensation (if any) only for single time is the responsibility of Bhavnagar Municipal Corporation.
- (xxiv) However, if any delay, due to any reasons in contractor's part, if the next crop compensation is required to be paid, it will be the responsibility of the contractor and in event of failure by contractor, to do so, Bhavnagar Municipal Corporation shall deduct and recover the same amount from contractor's bills. Any damage in the area will be responsibility of the contractor. After successful completion of the pipeline works like laying, excavation, back filling etc the contractor is also required to level the field where pipelines are laid in original condition with caution.

Further ROU (Right to Use) in terms of length shall be provided as per site availability by Bhavnagar Municipal Corporation and it may be in selective available length also. Any demand by the contractor to get continuous length to start the work will not be considered by Bhavnagar Municipal Corporation under any circumstances.

- (xxv) The contractor shall have to pay the labour registration fee of Rs. 25/ labour and annual contribution of Rs. 75.00 vide Ref: PB/Monitoring Cell/ Standard Contract Document/2013-14/2294, Dated: 07/09/2013. (Circular Enclosed).

(xxvi) It shall be the sole discretion of the competent authority to decide the total numbers of packages for evaluation/award to the bidder based on the facts and circumstances of the cases.

This will be based on the least cost combination and as may be the most advantageous to

Bhavnagar Municipal Corporation and shall be final and binding to all the bidders.

(xxvii) In the event of any rectification of a defect or replacement of any defective goods during the defect liability period, the contractor has to rectify or replace such goods at his own cost as per decision of EIC.

(xxviii) Not Applicable

(xxix) Since this is an EPC and item rate contract, the bidders are to quote their rates based on the actual market scenario. Any rates which are found to be abnormal higher/lower or unworkable shall lead to rejection of the bid. The decision of the BhavnagarMunicipal Corporation shall be final and legally binding to all the bidder.

(xxx) Excise duty exemption certificate shall be provided for DI pipes only above 100mm diameter. The prices quoted by the bidder shall be inclusive of above benefits.

(xxxi) The Employer wishes to clarify that regardless of the contents of a bid, the successful Bidder shall be required to conform in all respects to the requirements of the Contract, and all proposals shall be subject to the approval of the Engineer In-charge. Acceptance of the Bidder's proposal for the purposes of bid evaluation and award of tender shall not be construed as approval by the BhavnagarMunicipal Corporation. All details will subsequently be subject to the approval of the Engineer In-charge during execution of the Contract. No claim for additional payments shall be entertained, other than in accordance with the Contract

(xxxii) The Contractor shall completely indemnify and hold harmless BhavnagarMunicipal Corporation and its employees against any liability, all claims by statutory authorities, losses under various Labour Laws, statutes or any civil or criminal laws in connection with employees deployed by him or damages sustained by it or them by reason of any breach of contract, wrongful act or negligence by the Contractor

or any of its employees engaged in the provision of the manpower services to Bhavnagar Municipal Corporation

GENERAL DESCRIPTION OF THE WORK

This is a bid documents for

“Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer up gradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

The successful bidder shall have to undertake site surveys, route surveys for ascertaining the terrain and planning the scheme as well as to conduct geotechnical investigations for designing of foundation system of various structures. The contractor shall submit the good for construction drawings for review and approval before executing the same. This is applicable to all the components of this project.

The successful bidder shall have to prepare and submit ‘As Built Drawings’ depicting the exact construction carried out on site, in soft and hard copy format. The detailed description of the works is included in the “Extent of Work” under Volume–III

PARTICULARS PROVISIONAL

The particulars of the proposed works given as well as in the accompanying brief note are provisional and must be considered only as advance information to assist applicants.

1.2 DEFINITION

In this document the following words and expressions have the meaning hereby assigned to them.

1.2.1. BIDDER / TENDERER / APPLICANT:

Means individual, proprietary firm, firm in partnership, Limited Company, Corporation, MOU Partner applying to become eligible to tender.

1.2.2. ONLINE :

Any activity that is done on website is referred as 'online' activity for e.g., Submission of Bid online would mean that technical & price Bid has to be submitted on website.

1.2.3. OFFLINE :

Any activity that is done in conventional route is referred as 'Offline' activity for e.g. "Submission of Tender fee ,Earnest Money Deposit , Registration Certificate, Solvency Certificate, qualifying documents, tender volumes with sign and sealetc in Offline mode" would mean that the tender fee, Earnest Money Deposit, Registration Certificate, Solvency Certificate etc is to be Submitted to the Office of the concerned Municipal Department.

1.2.4. E- TENDER :

Tender in which the bidder can participate online by means of logging in onto the respective website is called E- Tender.

1.2.5. DIGITAL SIGNATURE :

Any electronic documents, which contains encrypted message digest using hash algorithm and Tender public key is known as Digitally Signed Documents and the process of generating such document is called digitally signing it.

1.2.6. SCANNED COPY :

Electronic Copy of any document generated using a Scanner is called scanned copy.

1.2.7. SYSTEM :

Means the computer which hosts the website www.nprocure@ncode.in, using which Bidder participates in the tendering process.

1.2.8. UPLOAD :

The process of transferring electronic document from Bidder's computer using internet connection to the website (www.nprocure@ncode.in) is called uploading.

1.2.9. IT ACT-2000:

Means Information Technology Act, 2000 of Government of India

1.2.10. APPROVED / APPROVAL:

Means approval in writing.

1.2.11. B.I.S:

Means Bureau of Indian Standards.

1.2.12. **Deleted**

1.2.13. **CONSTRUCTION PLANT:**

Means all equipment, appliances or things of whatsoever nature required for the execution, completion or maintenance of the primary work or temporary works but does not include materials or other things intended to form or forming part of permanent work.

1.2.14. **CONTRACT:**

Means the instruction and information to bidders, general and special conditions of contract, specifications, drawings, schedules of quantities & tender prices, other parts of the Bid Document, the formal agreement between the employer and contractor and all addenda and attachments related to the above.

1.2.15. **CONTRACTOR:**

Means the bidder with whom the contract has been made for executing the works.

1.2.16. **CONTRACT PRICE / CONTRACT AMOUNT :**

Means the agreed amount stated in the Contract Agreement for Designing, Development and Maintenance of the works for the stipulated period and to remedy of any defects, and includes adjustments (if any) in accordance with the Contract.

1.2.17. **CONTRACTOR'S EQUIPMENT:**

Means all equipment, tools, apparatus, machinery, vehicles and other things required for the execution and completion of the works and the remedying of any defects. However, Contractor's Equipment excludes Temporary works, Departmental equipment (if any) or plant, materials and any other things intended to form or forming part of the permanent works.

1.2.18. **COMPLIANCE WITH LAWS:**

The Contractor shall, in performing the Contract, comply with all applicable Laws related to all actions of his obligation as per the contract.

1.2.19. **CONTRACTOR'S OBLIGATIONS:**

Means the obligation to execute the Project in all its entirety and shall, without limitation, include Operation and Maintenance.

1.2.20. **CONTRACTOR'S USE OF EMPLOYER'S DOCUMENTS:**

As between the Parties, the Employer shall retain the copyright and other intellectual property rights in the Employer's requirements and other documents made by (or on behalf of) the employer. The contractor may at his own cost, copy, use, and obtain communication of these documents for the purposes of the contract. They shall not, without the Employer's consent, be copied, used or communicated to a third party by the Contractor, except as necessary for the purposes of the Contract.

1.2.21. **COUNTRY:**

Means the Country in which the site (or most of it) is located, where the Permanent Works are to be executed.

1.2.22. **DAY:**

Means a day from midnight to midnight.

1.2.23. **DEFECTS LIABILITY PERIOD:**

1.2.24. Means the period of two years from the certified date of completion of work

1.2.25. **DRAWINGS:**

Means the drawings referred to in the specifications, any modifications of such drawings approved in writing by the Executive Engineer, and such other drawings as may from time to time be furnished or approved in writing by the Engineer-in-charge.

1.2.26. **EMPLOYER / OWNER / DEPARTMENT:**

Bhavnagar Municipal Corporation, Gujarat, or the person named as Employer or Owner in the Contract Agreement and the legal successor in title to this person.

1.2.27. **EMPLOYER'S EQUIPMENT:**

Means the apparatus, machinery and vehicles (if any) made available by the Employer for the use of the Contractor in the execution of the Works, as stated in the Employer's requirements but does not include plant which has not been taken over by the Employer. No any equipment will be provided by BMC to contractor.

1.2.28. EMPLOYER'S USE OF CONTRACTOR'S DOCUMENT:

As between the Parties, the Contractor shall retain the copyright and other intellectual property right of the Contractor's Documents and other design documents made by (or on behalf of) the Contractor.

The Contractor shall be deemed by signing the Contract to give the Employer a non-terminable, transferable, non-exclusive royalty-free license to copy, use and communicate the Contractor's Documents, including making and using modifications of them. This license shall:

- Apply throughout the actual or intended working life (whichever is longer) of the relevant parts of the Works.
- Entitle any person in proper possession of the relevant part of the works to copy, use and communicate the Contractor's documents for the purposes of completing, operating, maintaining, altering, adjusting, repairing and demolishing the works, and
- In the case of Contractor's Documents which are in the form of computer programs and other software, permit their use on any computer on the site and other places as envisaged by the Contract, including replacements of an computers supplied by the Contractor. The Contractor's Documents and other design documents made by (or on behalf of) the Contractor shall not, without the Contractor's consent, be used, copied or communicated to a third party by (or on behalf of) the Employer for purposes other than those permitted under this Sub-Clause.

1.2.29. ENGINEER-IN-CHARGE:

Means the Engineer-in-Charge of the works, or in-charge of specified parts of the works under the contract or such other assistants or sub-ordinates to whom the Engineer-in Charge may have delegated certain duties, acting separately within the scope of the particular duties entrusted to them.

The contractor will be given a copy of the Bhavnagar Municipal Corporation authorization designating the Engineer-in-charge by name and delegating him his authority, at the time when contract is signed. It is however, to be distinctly understood

that, no delegation of powers shall be made to such assistants or sub-ordinates, except in respect of supervision to ensure compliance of the contract conditions.

1.2.30. **EXECUTIVE ENGINEER/CITY ENGINEER:**

Means the Executive Engineer / City Engineer in overall charge of the works i.e. Engineer In- Charge.

1.2.31. **FACILITY:**

Means the entire system to be designed and constructed in accordance with the provisions hereof, including the equipments, buildings, structures, ramps, pits, pipes, pipeline appurtenances, fencing, lighting, testing and analysis equipment, tools, computers, software programs, safety equipment, plant machinery, supplies, instruments and inventory incorporated therein, as well as all open areas within the site, and including any additions, modifications, alterations, adjustments, replacements and repairs as may be made thereto from time to time.

1.2.32. **GOODS:**

Means Contractor's Equipment, Materials, Plant and Temporary Works, all or any of them as appropriate.

1.2.33. **GOVERNMENTAL AUTHORITY / GOVERNMENT:**

Means any Indian entity, authority or body exercising executive, legislative, judicial, regulatory or administrative functions, including, without limitation, any Government authority, agency, department, board, commission or instrumentality of Indian or any political subdivision thereof, court, tribunal, arbitrator or self-regulatory organisation.

1.2.34. **JOINT AND SEVERAL LIABILITIES:**

If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons:

- These persons shall be deemed to be jointly and severally liable to the Employer for the performance of the contract.
- These persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and

The contractor shall not alter its composition or legal status without the Prior consent of the Employer.

1.2.35. LAWS:

Means and includes all the provisions of all National (or state) legislation, Indian statutes, regulations, ordinances, codes, official or other standards, administrative or other rules, zoning and other plans and restrictions, building and other permits, judgements awards and decrees of, or agreements with any Governmental, semi-Governmental or quasi- Governmental Authority as currently in effect or as may be in effect from time to time and /or as may be amended or supplemented from time to time.

1.2.36. MAINTENANCE STANDARD:

Means the requirements for maintaining, repairing, and renewing the Facility:

- As set forth in the Operation & Maintenance Manual; bidder shall provide this at the time of commissioning of the project.
- Required pursuant to applicable Law;
- As may be necessary for keeping the facility in a satisfactory working condition such that the Facility will continuously comply with the Operation Standard; and
- As may be necessary to ensure that the Facility shall continuously be in an optimum working condition and state in relation with the lifetime of the Facility.

1.2.37. MATERIALS:

Means things of all kinds (other than Plant) intended to form or forming part of the Permanent Works, including the supply (only materials if any) to be supplied by the Contractor under the Contract.

1.2.38. MATERIAL SUPPLIER:

Means the person who supplies goods or services. A supplier may be distinguished from a contractor or subcontractor, who commonly adds specialized input to deliverables also called vendor.

1.2.39. MONTH:

Means from the beginning of a given date of calendar month to the end of preceding date of the next calendar month.

1.2.40. PERFORMANCE GUARANTEES:

Means the List of Guarantees offered / provided by the Contractor in his Bid Submission pursuant of the Bid Documents.

1.2.41. PERMANENT WORKS:

Means the works to be designed and executed by the Contractor under the Contract.

1.2.42. PIPE SUPPLIER:

Means the person that supplies pipes.

1.2.43. RUPEE:

Means Indian National Rupees (INR)

1.2.44. SITE:

Means the specific areas / lands and other places on, under, in or through which, the works are to be executed or carried out and any other lands or places provided by the owner for the purposes of the contract together with such other places as may be specifically designated in the Contract or subsequently approved as forming part of the site.

1.2.45. TAKING OVER:

Means, the Owner shall take over the project after contractual completion of the Defect Liability period and meeting all contractual obligations, Terms & Conditions as agreed by the contractor however BMC may take over during any time if the contractor fails to perform his responsibilities. Such take over will be at the cost and risk of contractor..

1.2.46. TEMPORARY WORKS:

Means all temporary works of every kind required for successful execution of the Contract.

1.2.47. TESTS ON COMPLETION:

Means the tests which are specified in the Contract or agreed by both Parties or instructed as a Variation, and which are carried out (Test on Completion) before the works or a section (as the case may be) are taken over by the Employer.

1.2.48. WEEK:

Means seven consecutive days.

1.2.49. WORKS:

Means the works / action to be executed in accordance with the contract.

1.2.50. COMMISSIONING:

Means the successful operation of the project after successfully running for a period of Three month as a part of trial run..

1.2.51. COMPLETION:

Means the date of successfully commissioning of all the equipments in the scheme after satisfactory running for one as a part of trial run.

1.2.52. TRIAL RUN/ TRIAL OPERATION:

“Trial Run/ Trial Operation” shall demonstrate that the works or section perform reliably and in accordance with the contract. A period of 3 months unless specified, otherwise for Trial and Run to be included post construction.

1.2.53. SUBSTANTIAL COMPLETION:

Substantial Completion of the work means when the work or designated portion thereof is Sufficiently completed in accordance with the contract except for any minor outstanding Works and defects which will not substantially affect the use of works or section for their Intended purpose

1.3 BID INVITATION:

Means the call/invite by The Bhavnagar Municipal Corporation from all interested and eligible bidders for Sewerage Project as per Tender Notice.

1.4 DOWNLOAD OF TENDER DOCUMENTS:

The tender documents are available in electronic form, from the website <https://bmc.nprocure.com>. Interested bidders can view these tender documents online, and can down load tender documents.

1.5 Particular Provisional

The particulars of the proposed works given herein as well in the accompanying brief note are provisional and must be considered only as advance information to assist applicants.

1.6 Present Status of Work:

This is a proposed Seweragescheme needs to be designed and executed as per the specifications and BOQ etc.

2.0 Time of Performance:

The successful bidder will be expected to complete the works within stipulated time including Trial and Run Period as per time limit given in memorandum of work from the 10th day of date of Letter of Intent.

The successful bidder will be expected to complete the works within **16 Months (Including Monsoons & 3 Months Trial Run Period)**, as per time limit given in memorandum of work from the date of Letter of Intent.

The DLP time period shall be 2 years from the date of issue of Successful Commissioning Certificate and it may be extended for further five years subjected to mutual agreement between both the parties

3.0 Project Implementing Agency:

The “**Bhavnagar** Municipal Corporation **shall** be the project implementing agency. This contract shall be administered and managed by The Municipal Commissioner / Executive Engineer / City Engineer for and on behalf of Bhavnagar Municipal Corporation and shall act as the "Engineer In-charge."

4.0 Allocation of Risk & Responsibilities:

4.1 Contractor:

- a) The preliminary designs and details contained in the bid documents are based on limited and indicative field data as available with the Employer at the time of preparation of the bidding documents. Bidder shall be responsible to verify/ examine/ check and make his own assessment of the site, site data, soil data and the schematic details shown in the bid documents based on his own investigations and/ or additional surveys, if required, at bidder's own cost.

The contractor shall be responsible to make good and bring to original position road and land surface, etc. damaged during laying of pipelines and construction of structures or while carrying out any activities related to this contract, at his cost.

The Contractor shall be responsible for all the damages that may occur during the execution of the work, to the underground cables, power lines, telephone lines, other water/sewer lines and other infrastructure facilities etc. while executing the works under this contract and shall bear all costs relating to repairs / replacements.

- b) The contractor shall be responsible for failure of any components of the works executed by him during the full period of contract and the defect liability period. The contractor shall have to replace defective/ damaged/non-standard components of the executed works as may be identified by the engineer in charge at the cost of the contractor.

The Contractor will prepare and present interim/running and final bills with required copies of attachments in three sets.

The Contractor shall be responsible for the safety and performance of all civil and other structure up to the end of period of defect liability period. The damages/defects identified by the "Engineer in charge" shall be made good, as per Standards, by the contractor at his cost and risk. In case of collapse of structures in part or full replacement/ reconstruction shall be done by the contractor at his cost and risk.

The defects liability period shall commence from the date of successful commissioning of work and will be **two Years** from the certified date of completion of work.

5 The Employer:

- a) The Bhavnagar Municipal Corporation assures all participants for the contract that, adequate financial resources are available to cover the financial requirements and funds are available to meet the disbursement needs of the construction contracts in accordance with the provisions of tender documents.

All the material shall be inspected by Bhavnagar Municipal Corporation internal system and/or through Third Party Agency appointed.

Bhavnagar Municipal Corporation will provide indicative drawings and design parameters as may be required for works to be executed by the contractor.

Bhavnagar Municipal Corporation will approve and pay all interim/ running/final bills presented by the Contractor after due verification against the provisions of contract.

The contractor will prepare documents and will be responsible to get all statutory permissions and clearances from the concerned central/ state or local statutory

authorities. However, the contractor shall have to manage the day-to-day co-ordination and follow up activities based on these clearances on site. Bhavnagar Municipal Corporation shall provide required help and assistance for such day-to-day activities. Fees to pay for such permissions will be borne by BMC.

The Bhavnagar Municipal Corporation will make available land for laying the pipeline & will be responsible for payment of crop compensation etc. in case of laying the pipeline in private/ government land. However, once clearance/ possession is obtained and established through mutual consent of the owner, its day-to-day management on site shall be the responsibility of the contractor for which Bhavnagar Municipal Corporation shall provide only necessary help and assistance.

- b) All bids are to be completed and returned to the Employer in accordance with these Instructions to Bidders.
- c) A copy of the available reports and data has been kept for reference in the office of:
(Name, Address, Contact Person & nos. of Executing Authority as per appendix to bid details)

6. ONE BID PER BIDDER:

Each bidder shall submit only one bid. A bidder who submits or participates in more than one bid under this proceed will cause all those bids to be rejected.

7. COST OF BIDDING:

The bidder shall bear all costs associated with the preparation and submission of its bid, up to acceptance of the offer. The Employer will in no case be responsible or liable for those costs.

8. SITE VISIT: The day of pre-bid meeting.

- 8.1 The bidder is advised to depute a suitable team to visit and examine the Site of Works and its surroundings for fully understanding of the job and ascertain the difficulties that may be encountered during execution of the works and for obtaining for himself, on his own responsibility, all information that may be necessary for preparing the bid and entering into the Contract. The cost of visiting the Site shall be entirely at bidder's own expense.

- 8.2 **COMMUNICATION:** Deleted

9 DETAILS OF APPROACH

Approach to the site of works: The bidder has to make own arrangements for approaching the site

10 GENERAL FACILITIES

10.1. Deleted

10.2. Housing:

The Bhavnagar Municipal Corporation has not envisaged any provision of house colony for contractors. The contractor, therefore, has to make his own arrangement for housing his staff and labourers. However remained plot area of site can be used.

10.3. Deleted

10.4. Water Supply

The contractor shall have to make his own arrangement for water supply for work as well as for colonies of camps which may be established by him.

10.5. Medical Aids

Government and private Hospital facilities are available at all districts. However, the contractor will have to make own arrangement for Medical services for his labour and staff.

10.6. Electric Power

The contractor will have to arrange with Gujarat Electricity Board, Gujarat for his power requirements during construction phase. All charges during trial run and maintenance period shall be borne by the Bhavnagar Municipal Corporation (up to the guaranteed levels & anything beyond guarantees penalty shall be).

10.7. Post. Telegraph and Telephones

Post and Telephone services are available for public use at all district places.

10.8. Supply of Diesel, petrol and Oil

Petrol and diesel pumps are installed by private agencies in all district places. The contractor shall have to make his own arrangement for procuring the lubricants required by him.

11 CLIMATE AND WORKING SEASON**11.1. Temperature**

Gujarat State has tropical climate. The temperature varies in the ranges from 10° Celsius to 43° Celsius in Bhavnagar town.

11.2. Rainfall

Average annual Rainfall ranges from less than 550 mm the North West region to over 2000 mm in the South, with most part of the State receiving 200mm to 1000mm of rainfall. About 95% of rainfall occurs during the months June to September leaving remaining period of the year almost dry.

11.3. Working Season:

Since rainfall spreads over the period starting from middle of June to the end of September, It is generally not contentions and intense except for few days.

The above information of Climate of the project area is given only as helping information in good faith and Bhavnagar Municipal Corporation does not carry any liability for providing this information. The interested parties may refer the reports and forecast issued by the Indian Meteorological Department or other weather agencies for their use.

B. BIDDING DOCUMENTS**12. CONTENT OF BIDDING DOCUMENTS**

12.1 The bidding documents are those stated below, and should be read in conjunction with any Addenda issued there to in accordance with Clause 14.

VOLUME: I	<ul style="list-style-type: none"> • Section I : Tender Notice • Section II : Instruction to Bidders • Section III : Qualification criteria & Evaluation Procedure
VOLUME – II	<ul style="list-style-type: none"> • General conditions and conditions of particular applications
VOLUME – III A & B	<ul style="list-style-type: none"> • Extent of works • Tech. Specifications/ work specifications
VOLUME –IV	<ul style="list-style-type: none"> • Price bid • Bid Form • Price Schedule
VOLUME-V	<ul style="list-style-type: none"> • Bid Conceptual Drawings

- 12.2 The bidder is expected to examine carefully the contents of the Bidding documents. Failure to comply with the requirements of bid submission will be at the bidder's own risk. Pursuant to **Clause 28** under “**E. Opening of Tender**” bids which are not substantially responsive to the requirements of the bidding documents will be rejected.

13 CLARIFICATION OF BIDDING DOCUMENT:

A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by fax (hereinafter the term "fax" is deemed to include electronic transmission such as facsimile, cable and telex) at the Employer's address indicated in the Invitation for Bids. The Employer will respond to any request for clarification, which it receives earlier than 4 days prior to Pre-bid meeting. Copies of the Employer's response, including a description of the enquiry, will be communicated on www.nprocure@ncode.in.

14. AMENDMENTS OF BIDDING DOCUMENTS:

- 14.1 At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder modify the bidding documents by issuing amendment.
- 14.2 Any addendum/amendment thus issued shall be part of the bidding documents pursuant to Sub-Clause 12.1, and shall be communicated on online.
- 14.3 To afford prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may extend the deadline for submission of bids, in accordance with Clause 26, Submission of Tender.
- 14.4 All amendments and modifications issued by the Employer shall be deemed to be integral part of the contract to be signed with the successful bidder.

C. PREPARATION OF BIDS

15. 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.

16. DOCUMENTS COMPRISING THE BID:

- 16.1 The bid submitted by the bidder shall comprise two envelopes submitted simultaneously, one containing only the “**Technical Proposal**” and the other the “**Price Proposal**”.
- 16.2 The technical proposal shall contain the following;

- (i) Bid Form for Technical Proposal and Appendix to Technical Proposal;
- (ii) Power of Attorney
- (iii) Information on Qualification
- (iv) Confirmation of Eligibility
- (v) Schedule of Major items of equipments
- (vi) Schedule of major items of Constructional plant
- (vii) Schedule of key personnel
- (viii) Schedule of compliance with the bidding documents
- (ix) Schedule of construction facilities
- (x) Schedule of construction method
- (xi) Any other material required to be completed and submitted by bidders in accordance with these instructions to bidders.
- (xii) Form of Bid Security

16.3 The price proposal shall contain the following;

- (i) Bid form for price proposal and Appendix to price proposal;
- (ii) Schedule of prices:
- (iii) Schedule of Payment
- (iv) Any other materials required to be completed and submitted by bidders in accordance with these Instructions to Bidders.

17. BID FORM & PRICE SCHEDULE:

The Bidder shall complete the Bid Forms and schedules furnished in the bidding documents in the manner and detail indicated therein, following the requirements of Clause 15 and Clause 16.

18. BID PRICES:

18.1 Unless specified otherwise in Employer's requirements, Bidders shall quote for the entire facilities on a "single responsibility" basis such that the total bid price covers all the Contractor's obligations mentioned in or to be reasonably inferred from the bidding documents in respect of the design, manufacture, including procurement and subcontracting (if any), delivery, construction, installation and completion of the facilities. This includes all requirements under the Contractor's responsibilities for testing, pre-commissioning and commissioning of the facilities and, where so required by the bidding documents, the acquisition of all permits, approvals and licenses, etc. services as may be specified in the bidding documents, all in accordance with the requirements of the Conditions of Contract.

18.2 The bidders shall have to give detailed rate analysis in justification of the prices as may be required by the employer as a part of the evaluation process, if so desired by the employer.

19. BID CURRENCIES:

The prices shall be quoted on fixed and firm price basis in Indian currency i.e., Indian currency (INR) Only.

20. BID VALIDITY:

20.1 Bids shall remain valid for a period mentioned in NIT from the last date of submission of bid.

20.2 In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request that the bidders extend the period of validity for a specified additional period. The request and the responses thereto, shall be made in writing. A bidder may refuse the request without forfeiting its bid security. A bidder agreeing to the request will not be required or permitted to modify its bid, but will be required to extend the validity of its bid security for the period of the extension, and in compliance with Clause 18 in all respects.

21 BID SECURITY:

21.1 The bidder shall furnish, as part of its bid with the technical proposal, a bid security amount as specified in the Tender Notice.

21.2 The bid security shall, at the bidder's option, be in one of the following form:

- (a) A Demand Draft payable to the officer inviting bid as per tender notice and issued by short listed bank as per tender notice.
- (b) Fixed deposit receipt pledged in the name of the officer inviting bid as per tender notice and issued by short listed bank as per tender notice and valid up to 28 days from the date of closure of the bid validity period of 180 days. **i.e. (Total of 180+28=208 days).**
- (c) Unequivocal and unconditional Bank Guarantee in the prescribed format given in this document issued by short listed bank as per tender notice and valid up to 28 days from the date of closure of the bid validity period of 180 days. The format of the bank guarantee shall be in accordance with the sample form included in Section-IV as Form-19. Other formats may be permitted subject to the prior approval of the Employer. The bid security shall remain valid for 28 days beyond the original validity period for the bid and beyond any period of extension subsequently requested under Sub-Clause 20.2. **i.e. (Total of 180+28=208 days)**

- 21.3 Any bid not accompanied by an acceptable bid security shall be rejected by the Employer as non-responsive.
- 21.4 The bid securities of unsuccessful bidders will be returned as promptly as possible.
- 21.5 The bid security of the successful bidder will be returned when the bidder has signed the Contract Agreement and furnished the required performance security.
- 21.6 Within 10days from the date of issue of the letter accepting his tender, the successful Bidder shall furnish the required Security Deposit for performance and plus additional security if any for unbalanced bids in accordance with the condition of the Contract and attend the office of the Engineer In-charge for execution of the Contract documents. If he fails to furnish the Security Deposit for performance or to execute the Contract for the work offered to him, his EMD shall be forfeited and the Bidder may be disqualified from tendering for further works for three years.
- 21.6 The bid security may be forfeited;
- (a) If the bidder withdraws its bid, during bid validity period specified
 - (b) If any document submitted by the bidder are false and fraudulent
 - (c) If the successful bidder fails
 - i. To furnish security deposit in accordance with the relevant clause in the bid.
 - ii. To sign the contract with in time limit specified in the bid.
- 21.7 In case of forfeiture of EMD, Bidder shall be disqualified and shall not be allowed to bid for further works under Bhavnagar Municipal Corporation for three years.

22. ALTERNATIVE PROPOSALS BY BIDDERS:

Bidders are not permitted to give any alternative offer containing technical or other alternatives. Their bid proposals shall be in total conformity of the employer's requirement as described in the bidding documents.

23. PRE- BID MEETING:

- 23.1 The bidder or its official representative is invited to attend a pre-bid meeting, which will take place at:

Venue : As mentioned in Tender Notice

Date : As mentioned in Tender Notice

- 23.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage.

- 23.3 The bidder is requested to submit any questions in writing, to reach the Employer not later than four day before the pre-bid meeting.
- 23.4 Minutes of the meeting, including the text of the questions raised and the responses given, will be transmitted without delay to all of the bidding documents. Any modification/ corrections/ amendments to the bidding documents shall be declared after the pre-bid meeting and shall be the listed as part of the minutes of the pre-bid meeting or separately thereafter as may be necessary. The pre bid minutes and the modifications/corrections/ amendments issued by the employer will publish online only and contractor has to down load it and submit with sign and seal with submission of documents.
- 23.5 Non-attendance at the pre-bid meeting will not be a cause for disqualification of a bidder.

D. SUBMISSION OF BIDS

24 METHOD OF TENDERING:

- 24.1. If the tender is uploaded by an individual, it shall be digitally signed by the individual.
- 24.2. If the tender is uploaded by a proprietary firm, it shall be digitally signed by the proprietor.
- 24.3. If the tender is uploaded by a firm, in partnership, it shall be digitally signed by all the partners of the firms or alternatively by a partner holding 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, full name, current address of the firm, current addresses of all the partners of the firm shall also accompany the tender.
- 24.4. If the tender is uploaded by a limited company or a corporation, it shall be digitally signed by a duly authorized person holding the powers of attorney for signing the tender. Such limited company or corporation may be required to furnish satisfactory evidence of its existence before the contract is awarded. They should also furnish Articles of Memorandum of Association.
- 24.5. Each bidder shall submit only one bid for the particular work. A bidder who submits more than one bid in the particular work will be disqualified.
- 24.6. Deleted
- 24.7. Deleted.
- 24.8. Deleted.
- 24.9. All witnesses and sureties shall be person of status and probity their full name, occupation and addresses when they fill the vendor registration form provided in the website. www.tender.nprocure.com

- 24.10. In case at time of tender uploading, if any of the above information has changed then the Bidder shall correct the same by making the modification in his personal profile.

25 ACCOMPANIMENTS TO TENDER

The Bidder shall have to upload following documents which are digitally signed by Bidder's Digital Certificate with his tender.

- 25.1. Scanned Copy of the latest Income Tax Return with permanent account number (PAN) and Income Tax ward where assessed.
- 25.2. Scanned copies of client certificate showing, performance of the Bidder working with Bhavnagar Municipal Corporation or any employer for ongoing works as per prescribed Performa mentioned in Section-III.
- 25.3. A scanned copy of declaration showing the details of all works completed and works on hand with the contractor and the value of works that remain to be executed.
- 25.4. Scanned copy of contractor's registration certificate 'AA' Class in Govt. of Gujarat (R&B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state government).
- 25.5. Scanned copies of the Power of Attorney duly authorized by a notary public, if power is delegated for signing the Bid to other person by the Bidder.
- 25.6. Scanned copy of E.M.D. in accordance with relevant clause in "**Tender Notice**" of tender notice and the original shall also be submitted in physical form by RPAD/Speed Post/Courier.
- 25.7. Scanned Copy of the Solvency Certificate from Bank of required amount as per Tender Notice.
- 25.8. Scanned copy of Account payee Demand Draft for Tender Fee in accordance with relevant clause of Tender Notice, and also in physical form shall also be submitted by RPAD/Speed Post.
- 25.9. Scanned copy of all the prescribed Forms & Annexure mentioned in Section-III, also in physical form in separate sealed cover by RPAD/Speed Post.in the office of The Executive Engineer of Projects, Bhavnagar as mentioned in Tender Notice.
- 25.10. Scanned copy of the detailed statement of the turnover (Civil Engineering Works Only) of last seven completed financial years audited and certified by the Chartered Accountant.
- 25.11. The bidder should submit undertaking on non judicial stamp paper of Rs. 300/- duly notarized regarding document submitted, are true. Bhavnagar Municipal Corporation

would have the right to forfeit the EMD and black list to the bidder if any of the information given by the bidder is found faulty or incorrect or misleading.

- 25.12. If the Bidder Firm is a member of a Group of Companies (with a common name), scanned copies of all relevant documents clearly indicating the stake of the bidding Firm in the equity of each firm of the Group, Turnover, Net Tangible Worth and Cash Flow of each company wherein the stake of the Bidding Firm is 51% or more in terms of equity.
- 25.13. All MOU's shall be on a Non Judicial stamp paper of appropriate value duly notarised and signed by respective authorised representatives.

26. SUBMISSION OF TENDER:

- 26.1. The Bidder must submit online duly filled in the entire tender document i.e. technical bid and price-bid available on website the rate and the along with other details in Volume IV of tender document.
- 26.2. The bidder shall fill the required details/ data/ information in the prescribed form of tender document.
- 26.3. Tender in offline mode will not be accepted.
- 26.4. The tender i.e. Technical bid and Price bid, dully filled in shall be uploaded on bmc.nprocure.com in up to the date and time mentioned in the Tender Notice.
- 26.5. The employer at his discretion can extend the last date for submission of tender by amending the bidding document in which case all rights and obligations of the employer and bidder will thereafter be subject to the last date as extended. The bidder shall be responsible for extending the validity of tender accordingly, failing which his bid shall be rejected as non-responsive.
- 26.6. Bidders will have to submit F.D.R. or Bank Guarantee for Earnest Money Deposit and Demand Draft of tender fee in a separate sealed envelope and other technical documents in another sealed envelope. The documents shall be submitted by RPAD/Speed Post only to the designated officer, as mentioned in the Tender Notice & submission made by courier shall not be considered. Each cover must clearly be marked with the contents i.e. **“TENDER FEE & EMD”** and **“TECHNICAL BID DOCUMENT”**

27. LATE AND DELAYED TENDER:

As a rule the system will not accept any Tender after the due date and time and hence in case of E-Tenders there will be no late tender. Physical submission also must be on or before stipulated date & time as per NIT.

27.1 STATING OF RATES

The Rates for items in Schedule – B, Price Bid must be submitted in figures only on the website. Amount in words will be automatically generated by system. Total amount of

each item and the grand total in figures and the respective words will be automatically calculated by the Computer and displayed.

E. OPENING OF TENDER

28. OPENING OF TENDERS

The Designated Officer of Bhavnagar Municipal Corporation will open the e-Tender on the date as mentioned in the tender notice, if possible in his office at the address specified in the Tender Notice. The intending Bidders, if they wish may participate in online Tender opening process and view the result on www.tender.nprocure.com to participate in online tender opening, bidder will have to log in with his user ID and password and click on “Mark my attendance button” to view Tender result. For more details please refer “Vendor Training Manual.”

1. Opening of Technical Bid :

The designated officer of Bhavnagar Municipal Corporation will open technical bid first at the address specified in the Tender Notice. The evaluation of Technical Bid will be done as per “**Clause F: Evaluation of Tender**”.

2. Opening of Price Bid :

The price Bid of only qualified bidders shall be opened as decided here after.

The designated Officers of Bhavnagar Municipal Corporation will open each price bid on or after the date and time mentioned in the Tender or time and date pre-intimated to qualified bidders on and the print out of total amount quoted in the tender along with rate quoted for each item in the Bid Schedule and the condition if any put forth by the Bidder. The Bidder can see his price bid as well as other Bidders’ entire price Bid who have participated in the E-Tender.

All Tenders will be opened online irrespective of the presence of the Bidder.

F. EVALUATION OF TENDER

EVALUATION & COMPARISON OF TECHNICAL PROPOSAL:

The Employer will carry out a detailed evaluation of the bids in order to determine whether the bidders are qualified and whether the technical aspects are substantially responsive to the requirements set forth in the bidding documents. In order to reach such a determination, the Employer will examine the information supplied by the Bidders and other requirements in the bidding documents, taking into account the following factors:

QUALIFICATION

The determination will take into account the Bidder's financial, technical, production capabilities and past performance; it will be based upon examination of the documentary evidence of the Bidder's qualifications submitted by the Bidder, pursuant to Clause 24, as well as such other information as the Employer deems necessary and appropriate; and

An affirmative determination will be a prerequisite for the employer to continue with the evaluation of the technical proposal; a negative determination will result in rejection of the Bidder's bid.

TECHNICAL:

Overall completeness and compliance with the Employer's Requirements

29 EVALUATION OF TECHNICAL BIDS

- 29.1. The bidder shall be qualified on the basis of information furnished by the bidder in accordance with Clause-25 above, in support of his capability with reference to qualification criteria laid down.
- 29.2 Even though the bidder meets the above qualification criteria, he shall be disqualified if:
- a. The bidder had made misleading or false representation in the forms, statements and attachment submitted in proof of qualification requirements and/or
 - b. A record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history or financial failures etc.
 - c. Bidder has been blacklisted by any Government/ Non Government / Private agencies/ Organizations/ Institutions/ Government Undertakings and funding Agencies in the last 05 years.

The bidder should provide accurate information on litigation and/ or arbitration resulting from contract completed or under execution by him over the last five years. A consistent history of arbitration awards/ judgments against the applicant may result in disqualification for proposed work. If the details of litigation history is hidden by the applicant and later on it comes to knowledge of the employer the bidder shall be disqualified for the proposed work and other appropriate actions shall be taken against the bidder.

The bidder should submit undertaking on non judicial stamp paper of Rs. 300/- dully attested by notary public regarding document submitted, are true. Bhavnagar Municipal Corporation would have the right to forfeit the EMD and black list to the bidder if any of the information given by the bidder is found faulty or incorrect or misleading.

- 29.3 During the process of evaluation the Bhavnagar Municipal Corporation may visit and inspect the works carried out by the bidder in order to assess the performance of the work. The bidder shall have to make arrangement for inspection of work at the respective

worksite only. This shall also be considered for evaluation with reference to performance of the bidder.

29.4 Depending upon the actual bid capacity assessed and other qualifying requirements, the applicant will be qualified for the work. However at the price bid evaluation stage, a careful check of the appropriate references with reference to the information submitted by the bidder will be done and in no case, a contract will be awarded to a bidder lacking in the financial criteria.

30. **Evaluation of Price bid**

30.1. Quoted Tender rates shall have to be reasonable and competitive to meet with the timely and satisfactory performance of the contract.

30.2 Reasonability of Tenders' proposed method and technique of construction, construction programme, sequence of components of the work and proposed resources assigned to the work shall be seen where it has been called for in the tender.

30.3.(a) If the Bid of the successful bidder is seriously unbalanced in relation to the estimated cost of the work/ item (s) to be performed under the Contract, Bhavnagar Municipal Corporation, may require the bidder to produce detailed rate price analysis for any of all Items of the Bid of the quantities to demonstrate the internal consistency of this rate Price with the construction methods proposed. After evaluation of the rate analysis, the Bhavnagar Municipal Corporation may require, that, the amount of the Performance Security set forth in "**Clause No.21 under Bid Security**" above of the contract be increased at the expense of the successful Bidder to a level sufficient to protect the Bhavnagar Municipal Corporation, against financial loss in the event of default of the successful Bidder under the contract.

(b) In respect of those items for which the quoted rates are more than 10% above the overall percentage of accepted tender, the payment of such items in the running bills shall be made at rate of that item which was used for the estimate plus or minus overall variation percentage of the accepted tender plus 5% of the estimated rate of that item. The balance amount as per accepted tender rate shall be withheld from the running bills and will be released as per R&B Department Circular no .PARCH/102008/(61) dated 03-05-2013. No interest will be payable for such withheld amount. This shall be taken care by way of payment schedule and quoted rates need not be changed.

(c) The contract performance for actual execution and the payments to be made for the work shall be based on such bid rates as per (a) and (b) above wherever applicable for the purpose of running account bills. However the final payments shall be made based on the item wise quoted rates.

- (d) Any decision of Bhavnagar Municipal Corporation regarding the interim rates at which payment shall be made in accordance with the above Clauses shall be final and binding to the Bidder.
- (e) The application of the above clause (a)&(b) above shall be at the discretion of the employer.

30.4. To assist in the examination, evaluation and comparison of Tenders, the Bhavnagar Municipal Corporation may ask the Bidders individually for clarification of their tenders including break up of work done. The request for clarification and the response shall be in writing but no changes in the price or substance of the tender shall be sought, offered or permitted.

31 Bhavnagar Municipal Corporation reserves the right to accept or reject any Tender without assigning any reason.

32. PROCESS TO BE CONFIDENTIAL:

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. Any effort by a bidder to influence the Employer's processing of bids or award decisions by any way may result in the rejection of the bidder's bid.

33 PRELIMINARY EXAMINATION OF TECHNICAL PROPOSAL:

The Employer will examine the bids to determine whether they are complete, whether the documents have been properly signed, whether-the required security is included, and whether the bids are generally in order. Any bids found to be non-responsive for any reason or not meeting the minimum levels of the performance or other criteria specified in the bidding documents will be rejected by the Employer and not included for further consideration.

34 DELETED

35. DELETED

G. AWARD OF CONTRACT

36 SUCCESSFUL BIDDER:

The Employer will award the Contract to the bidder whose bid has been determined to be substantially responsive in terms of minimum qualification requirement and technical requirements to the bidding documents and who has offered the Lowest Evaluated Bid Price, provided that such bidder has been determined to be eligible & qualified in accordance with the provisions mentioned under "**Clause F. Evaluation of Tender**" in **Section-II**. A substantially evaluated responsive Tender is one, which conforms to all the

terms, conditions and specifications of tender documents without material deviation or reservation. The material deviation or reservation is one,

- 36.1. Which affects in any substantial way the scope, quality or performance of the works.
- 36.2. Which limits in any substantial way inconsistent with tender documents, the Employer's 'right' or the Bidder's obligations to the contractor.
- 36.3. Whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive tender.

37 EMPLOYER'S RIGHT TO ACCEPT ANY BID OR TO REJECT ANY OR ALL BIDS:

- 37.1. Those Tenders which do not have Digital Signature attached shall be rejected.
- 37.2. Tender without Earnest Money Deposit, will be treated as non responsive and will be out rightly rejected.
- 37.3. Notwithstanding the above, the Bhavnagar Municipal Corporation reserves the rights to accept or reject any bid or to cancel the Bidding process and reject all Bids at any time prior to award of contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders on the grounds of the Bhavnagar Municipal Corporation action.
- 37.4. In addition to the above, the Tender will also be liable to be rejected out rightly if, the Bidder or in the case of a firm, each partner or the person holding the Power of Attorney thereof does not digitally sign.

38 NOTIFICATION OF AWARD:

- 38.1 Prior to the period of bid validity prescribed by the Employer, the Employer will notify the successful bidder by mail, confirmed by registered letter, that its bid has been accepted. This letter (hereinafter and in the Conditions of Contract called the "Letter of Intent") 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 (hereinafter and in the Conditions of Contract called "the Contract Price").
- 38.2 The notification of award will constitute the formation of the Contract.
- 38.3 Upon the furnishing by the successful bidder of a performance security (and domestic preference security where required).

39 SIGNING OF CONTRACT AGREEMENT:

- 39.1 At the same time that he notifies the successful bidder that its bid has been accepted, the Employer will send the bidder the Form of Contract Agreement, incorporating all agreements between the parties.
- 39.2 Within 15 days of receipt of the Form of Agreement, the successful bidder shall sign the Form and return it to the Employer.

40 PERFORMANCE SECURITY:

40.1. The successful bidder shall have to pay Performance Security in the form of Unequivocal bank guarantee issued by any shortlisted bank as per Notice Inviting Tender having branch at Bhavnagar and the same shall become refundable as per Clause No. 01 under General Conditions of Contract.

41 CORRUPT OR FRAUDULENT PRACTICES:

41.1 The Bhavnagar Municipal Corporation requires that bidders/suppliers/contractors have followed the highest standard of ethics during the procurement and execution of such contracts. In pursuance of this policy:

- (a) Defines for the purposes of this provision, the terms set forth below as follows:
 - (i) **“Corrupt practices”** means behaviour 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
 - (ii) **“Fraudulent practice”** means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the determination 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;
- (b) Will reject a proposal for award if it determines that the bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;
- (c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded an contract if it at any time determines that the firm has engaged in corrupt and fraudulent practices in competing for, or in executing, an contract.

If at any stage it is found that bidder had hidden material information or had submitted information which is false and fraudulent shall be debarred from bidding in Bhavnagar Municipal Corporation tender for three years and EMD shall be forfeited. The matter shall also be brought to notice to the registration authority of the contractor.

42 GENERAL RULES AND DIRECTIONS:

- 42.1. No receipt for any payment alleged to have been made by a Contractor in regard to any matter relating to this tender or the contract shall be valid and binding on Bhavnagar Municipal Corporation unless it is signed by the Engineer-in-Charge.
- 42.2. The measurements of work will be taken according to the usual method in use in Bhavnagar Municipal Corporation and no proposal to adopt alternative methods will be accepted. The decision of the 'Engineer-in-Charge as to what is the usual method in use in the Bhavnagar Municipal Corporation, will be final.
- 42.3. Under no circumstances shall any contractor be entitled to claim enhanced rate for any item covered in this Contract except price variation for specified items as per contract.
- 42.4. The Contractor shall not be permitted to tender for the work in which his near relative is working in that Division or its sub-division as an Engineer of any category, Divisional Accountant, Store Keeper, and in the Circle Office as a Superintending Engineer Controlling that division as on date when Tender is submitted.
- 42.5. The contractor shall compulsorily furnish his latest address(es) including the latest address of his partners and place(s) of filing his/their income tax returns along with the tender (in the annexure form appended hereinafter). Any changes, if occur, in such address, during the tenure of contract, the latest address(es) shall invariably and forthwith be intimated by the Contractor to the concerned Engineer-in-Charge.
- 42.6. Receipt for payment made on account of the work, when executed by a firm shall be signed by all the partners except where the contractors are described in their tender as firm in which case the receipt shall be signed in the name of the firm by one of the partners or by some other person having authority to give effectual receipts for the firm.
- 42.7. Every Blank (fields) in the Tender document (Forms, Schedule, etc.) must be filled up by the Bidder and shall be submitted online.
- 42.8. Erasures and corrections:
Persons tendering are informed that no erasures or alternations by them in the text of document downloaded from website will be allowed and such erasure and alterations will be disregarded. If there is any error in writing, Bidder can edit the same and correct it. Please refer to the Vendor Training Manual.

- 42.9. The contract will normally be made within 180 days from last date of receipt of Tenders.

43.0 DECLARATION FORM: (FORM-H)

- 43.1. In conjunction to Sub Clause 'C' under "29. Evaluation to Technical bids" the bidder should submit undertaking as per Form-H on non judicial stamp paper of Rs. 100/- dully attested by notary public regarding document submitted, are true. Bhavnagar Municipal

Corporation would have the right to forfeit the EMD and blacklist the bidder if any of the information given by the bidder is found faulty or incorrect or misleading.

44.0 REQUIREMENTS OF A BIDDER

44.1 The applicant in the same name and style shall be a well established Civil Engineering Contractor and shall have Registration in the required class for the work. The agencies whose contracts have been terminated on account of non-performance / poor performance in Bhavnagar Municipal Corporation work and debarred contractors will not be eligible for this Tender.

44.2 COMPETENCY OF TENDER:-

Contract will be awarded to responsive Bidders on the basis of prequalification criteria and evaluation of price-bid accordingly.

44.3 The Bidders/ Bidders are required to deploy the necessary machineries/ equipments (by owning/ hiring/ leasing) for the execution of work as specified in Clause 3.0, Section-III of this Volume

44.4 The Bidder shall employ Project Manager, Engineers, technicians and other key personnel and other Civil/Mechanical/Electrical Technical Staff as specified.

**BHAVNAGAR MUNICIPAL CORPORATION
BHAVNAGAR**

VOLUME – I

SECTION-III

QUALIFICATION CRITERIA & EVALUATION PROCEDURE

QUALIFICATION CRITERIA & EVALUATION PROCEDURE

A. GENERAL

1.0 GENERAL:

All information requested for in the down loaded forms should be furnished against the respective columns in the forms in electronic formats. If information is nil it should also be mentioned as nil or no such case. If any particular query is not applicable in case of the applicant, it should be stated as not applicable. However, the tender/ Bidders are cautioned that not giving complete information called for in the tender Documents in the form required or not giving it in clear terms or making any charge in the prescribed forms may result in the Bidder being summarily disqualified.

- 1.1 The tender's/ Bidder's name shall appear on each page of the prescribed Proforma.
- 1.2 Reference, Information and certificates from the respective clients certifying suitability, technical know-how or capability of the Bidder shall be signed by that client, in full with his name underneath in block letter and designation in that organization.
- 1.3 No further information will be entertained after submission of Tender Document unless it is called for by the Bhavnagar Municipal Corporation
- 1.4 Any effort by a Bidder/Bidder to influence the Bhavnagar Municipal Corporation in the process of examination, Clarification, evaluation of Tender and in decision concerning qualification, may result in disqualifying the Bidder.
- 1.5 The successful per-qualification made in the case of any Bidder for any other work of Bhavnagar Municipal Corporation will not be considered valid for the present work.
- 1.6 The time for completion of the work is **as per detailed tender notice** from the 10th day of date of 'Letter of Intent'.
- 1.7 The intending Bidders shall get himself registered with www.tender.nprocure.com for obtaining his unique identification number and digital signature required for participating in the bid.
- 1.8 The bids received under this single stage, two envelope procedure, shall be assessed and evaluated based on the qualification criteria and evaluation procedure prescribed hereunder.
- 1.9 BMC reserves the right about to ask contractor to submit lacking documents for qualifying purpose.

2.0 LIST OF ACCOMPANIMENT:

Bidder shall include following accompaniment to tender documents while submission.

2.1 Letter of transmittal (Scanned Copy)

2.2 Power of attorney:

A power of attorney on Non Judicial stamp paper of appropriate value duly notarised by a notary public, if power is delegated for signing the bid to other persons by applicant. (Scanned Copy)

2.3 Certificate of registration:

A Certificate of contractor's registration certificate 'AA' Class in Govt. of Gujarat (R&B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state government). (Scanned copy).

2.4 Supporting document:

Every blank (Fields) in the tender documents (Forms, Schedules, etc.) must be filled by the Bidder and submitted online. Tender forms which are not completed will not be accepted online use of dash (-) is not permitted. Please write "Not applicable" or "Nil" as and where required by Bidder.

SL. NO.	FORM NO.	DESCRIPTION OF PROFORMA
1	Form-0	List of Submittals
2	-	Performa for "Letter for submission of tender".
3	Form-1	Details of organization structure of the bidder
4	Form : 2	Details of Personnel
5	Form : 3	Details of Machinery Equipments and work Plan
6	Form : 4	Information relating to Financial Criteria
7	Form-5	Financial data

SL. NO.	FORM NO.	DESCRIPTION OF PROFORMA
8	Form-6	List of works already completed by the Bidder
9	Form-7	Details of works on hand with Bidder
10	Form-8	Details of experience of completed work (similar nature)
11	Form-9	Additional Information and Litigation History / Debarment / Blacklisting
12	Form-10	Information for tenders submitted but not awarded
13	Form-11	Certificate for experience of work
14	Form-12	Joint Venture data (Deleted)
15	Form-13	Personnel/ staff proposed for the project
16	Form-14	Curriculum Vitae of Project Manager and all key Technical Staff
17	Form-15	Proposed site organization and Management
18	Form-16	Details of experience for physical qualification criteria
19	Form-17	Approach & Methodology.
20	Form-18	Form-H (Declaration)
21	Form-19	Proforma for Bank Guarantee (EMD)
22	Form-20	Work wise details of work completed/ in progress by the contractor.
23	Form-21	Proforma for Performance bond/ Performance guarantee Proforma for bid security
24	Form-22	Proforma for Joint Venture Agreement (Deleted)
25	Form-23	"Assured Pipe Supply Declaration" – (To be filled without proposed dispatch schedule at the time of Bidding)
26	Form-24	Proforma for memorandum of understanding (MOU) with pipeline

SL. NO.	FORM NO.	DESCRIPTION OF PROFORMA
		supplier

3.0 **ELIGIBILITY FOR QUALIFICATION:**

- 3.1 The Bidder in the same name and style shall be a well established Civil Engineering contractor with at least 7 (seven) years experience and capability for construction of all types of Civil / Mechanical / Electrical Engineering works.
- 3.2 The Bidder in the same name and style must give evidence of having adequate experience in mobilizing equipment and personnel for large value contracts and in the deployment of heavy construction equipment for the type of work described earlier.
- 3.3 The Bidder must have adequate staff and equipments for carrying out work in accordance with time schedule.
- 3.4 The Bidders/Bidder must have a Project Manager with not less than 7 (seven) years experience in managing construction in the field of Civil Engineering works, similar works, as mentioned in Clause 3.1 along with minimum number of engineering, technical and other key personnel with adequate experience in civil engineering work as under:

(1)	Civil Engineers (Degree holders)	3 Nos
(2)	Mechanical Engineers (Degree holders)	1 Nos
(3)	Electrical Engineers (Degree holders)	1 Nos
(4)	Construction Engineer (Degree holders)	2 nos
(5)	Supervisors (Diploma holders)	3 Nos
(6)	Technical Assistants (Diploma / ITI)	3Nos

Note:

1) If sufficient staff does not exist at the time of bidding, an undertaking for employing the necessary staff shall be given by the Bidder.

2) If the bidder will not deploy manpower as per stated above, then the penalty shall be deduct for Sr No 1 to 3, @ Rs.1000/day will be imposed & for Sr No 4 to 6, @Rs. 500/ Day will be imposed.

3) Attendance register will be maintain by Agency for the deployed staff and duly signed by PMC/TPI and BMC officials.

3.5. The Bidder must provide evidence of having adequate experience. The Bidder should upload the digitally signed scanned copies to supporting certificate, reports relating to physical, financial, technical, machinery and other capability of the applicants in their original language along with certified translation of all relevant portions of the certificate/reports in English duly attached with their Digital Signature. The applicant should upload the financial capabilities in Rupees only.

3.6 The Bidders are required to upload digitally signed scanned copies along with their applications certificates obtained from the concerned authorities/ employers towards proof.

3.7 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 submit the bidder.
- (b) Submit Qualification requirements specifying financial capacity, technical capacity, minimum acceptable levels with regards to Bidder's experience in relevant projects and other relevant factors such as work in hand, future commitments, and litigation history as given and described in the **Appendix 1** to Instruction to Bidders.
- (c) Submit proposals regarding work methods, scheduling and resourcing which shall be, provided in sufficient detail to confirm the bidders' capability to complete the works in accordance with the specifications and the time for completion.
- (d) Submit Memorandum of Understanding (MoU) with pipe manufacturer clearly stating the terms & conditions of the MoU. Such MOU shall not be amended or modified without prior consent from Bhavnagar Municipal Corporation during the period of performance of contract; Bhavnagar Municipal Corporation shall not allow such change except for special reasons In the interest of expeditious implementation of the project.

Note:

Bidder is requested to submit the MOU in mutually agreed format by Bidder & pipe Manufacturer keeping in view the applicable tender clause and commitment of pipe manufacturer to supply the pipe as per the specification (Form-23,Section-IV,Volume-1).

3.8 DELETED

3.9 Bidders shall also submit proposals of work methods and schedule, in sufficient detail to demonstrate the adequacy of the bidders' proposals to meet the Employer's Requirements.

3.10 DELETED.

4.0. MINIMUM QUALIFYING CRITERIA:

To qualify, each bidder in the same name and style should have achieved the following performances:

4.1. FINANCIAL

4.1.1 TURNOVER:

Bidder must have Average Annual Financial Turnover during the last three years ending 31st March of the previous financial year should be at least 30% of the estimated cost (with GST).

Note : The details pertaining to turnover for the year 2020-21 to 2022-23 shall be certified by Chartered Accountant on his own letter head and duly attested.

SIMILAR NATURE OF WORK:

The bidder must have completed similar nature of work i.e. **Drainage/ Sewerage Projects** within last 07 financial years i.e. from Year 2016-17 to 2022-23 and up to one month prior to last date of submission of the bid of value not less than:

One similar completed work costing not less than the amount equal to 80 (eighty) percent of the estimated cost with GST)

Or

Two similar completed work costing not less than the amount equal to 50 (Fifty) percent of the estimated cost with GST)

Or

Three similar completed work costing not less than the amount equal to 40

(Forty) percent of the estimated cost with GST)

4.1.2 AVAILABLE BID CAPACITY:

The Bidder who fulfils the qualifying criteria mentioned above shall be qualified only if he fulfils the requirement of bidder's capacity. The bidding capacity of any tender/ Bidder is required to be more than or equal to the estimated cost of the work i.e. **Rs. 8,70,34,501.17+ GST /- (100% of the estimated cost with GST)** The bidder's capacity shall be computed as shown below.

$$\text{Available Bid Capacity} = [(A \times N \times 2) - B]$$

Where :

A	=	Performance of the Bidder for maximum annual turnover for last seven financial year updated at the current price level financial year 2023-24. Bidder must submit CA certificate for the same.
B	=	Value of the existing commitments as on date of bid submission for works (complete or partial) to be completed in the next 1.3 Year (Equivalent to duration of the project) The details shall be countersigned by the Executive Engineer or the equivalent officer of the employer on whose behalf the firm is carrying out the works. In the case of a Joint Venture (If Applicable), parameters A and B shall be determined based on details pertaining to such partners who propose to undertake physical execution of work and in proportion to their participation/stake as specified in respective clause in the tender documents.
N	=	Years prescribed for completion of the work for which bids are invited. (1.3 Year) (Equivalent to duration of the project)

If the Tender has been invited as a Package/Slice Minimum aggregate required Bid Capacity shall be considered and accordingly the Bidder may qualify for less number of Packages/Slices. In case of individual Tenders (not invited in a single Basket) the Bidder may qualify for a particular work (based on his Technical Bid), but at the time of evaluation of Price Bid, if more number of such individual Bids are evaluated simultaneously, aggregate Bid Capacity shall be considered. In such a case, if the Bidder does not have adequate capacity for all the Bids in which his Bid is the lowest responsive Bid, he may be considered for less number of Bids. Decision of the Employer based on the least cost combination as may be the most advantageous to Bhavnagar Municipal Corporation shall be final and binding to all the Bidders.

Note:

- (a) The statement showing the value and details of completed works, existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the work listed should be countersigned by the officer not below the rank of an Engineer-In-Charge.
- (b) The certificate for past performance should be as per prescribed Proforma in Form11...
- (c) The Bidders are required to upload latest client's certificates in Form-11 (or in any format with yearly breakup) obtained from the concerned authorities/ employers towards proof of their having executed contracts satisfactorily along with their bids. The quantities involved should be certified by the top executive of the firm in the prescribed Performa in Form 11 (or in any format with yearly breakup) of Volume-I.
- (d) Physical and Financial Performance of Any Work Not Supported By Client Certificate in Form-11 or In Any Form Will Not Be Considered For Qualification.
- (e) The applicant Bidder must provide by uploading evidence of having adequate experience. The bid should include supporting certificate or report relating to physical, financial, technical and other capability of Bidder in their original language along with certified translation of relevant portion of the certificate/ report in English. The Bidder should furnish the information about financial capability in Rupees only.
- (f) Depending upon the actual bid capacity assessed and other qualifying requirements, the applicant will be qualified for the work.

- (g) The bidder is required to submit the declaration of his financial liabilities, work on hand/completed projects on Rs.300/- Non Judicial stamp paper. In case of false statement/ declaration the bidder shall be liable for penal action. Further, the details furnished in the relevant form as per tender should be in line to the declaration by the bidder.
- (h) The criteria mentioned above at shall be evaluated based on the details submitted with the documents. Such bidder shall have to submit the details in the prescribed proforma which are applicable to them. Bidders should read the note under each Form/Annexure carefully and submit the details accordingly.

Note on Financial Criteria:

This note is applicable to "4.1. Financial Criteria" i.e. Turnover, Similar nature of Work, Available Bid Capacity.

- (i) Turnover of previous year and cost of completed / executed similar nature of work shall be given additional weightage of ten percent per year to bring them to current price level to account for price escalation as illustrated below:

Financial Year	Turnover/ Cost of Executed work/O&M	Effective cost of executed work at previous completed financial year's price level
2016-17	H	1.88 x H
2017-18	G	1.77x G
2018-19	F	1.61 x F
2019-20	E	1.46 x E
2020-21	D	1.33 x D
2021-22	C	1.21 x C
2022-23	B	1.10 x B
2023-24	A	1.00 x A

Note:

- (i) Financial year means period beginning from the 1st April to 31st March of the next year.
- (ii) The details pertaining to Turnover for the year 2018-19 to year 2022-23 shall be certified by Chartered Accountant on his own letter head and duly attested.

- (iii) The cost of material supplied by the Government/ Client shall not be taken into account for experience against Turnover & Similar nature of work.

4.2. PHYSICAL CRITERIA:

The bidder must have successfully carried out minimum quantities of the following work in any one project during last seven (7) i.e. From Year 2016-17 to year 2022-23 and up to one month prior to last date of submission of the bid.

4.2.1. PIPELINE:

a) Non Metallic Pipeline:

Procure, Lowering, Laying, Jointing, Testing and Commissioning of minimum cumulative length (as under) of non-metallic pipeline during last seven (7) financial years i.e. from Year 2016-17 to year 2022-23 and up to one month prior to last date of submission of the bid. If the pipeline work has been completed along with successful hydro testing/Flow Test, such works shall also be considered for the evaluation based on the facts and circumstances as certified by the client.

The material supplied by the client will not be considered for procurement purpose.

Type of Pipeline	Min. Diameter (In mm)	Min. Length (In km)
Non Metallic	≥ 150 mm	4.0 Km

b) Deleted

4.2.2. Deleted:

4.2.3. Deleted:

Note to 4.2 Physical Criteria:

- 1) In case the bidder has successfully completed the work of Pipeline in any of the Government (State / Central), Board, Corporation, or Government Undertaking Organizations of State / Central Government, and it is fully commissioned after hydraulic testing, but the entire awarded work under the contract is yet to be completed, the bidder shall have to submit the completion issued by the Engineer In-

charge not lower than rank of Executive Engineer of the respective organization giving the details like length, diameter, type of pipe etc., along with mention of successful testing.

- II) The works for which bidder have not entered in to contract agreement will not be considered
- III) The above experience shall be within during last Seven (7) financial years i.e. from Year 2016-17 to year 2022-23 and up to one month prior to last date of submission of the bid for which Form -3A/11 must be submitted.
- IV) Experience as sub-contractor shall not be considered.
- V) The experience of works executed in Government (State/Central), Board, Corporation, and Government Undertaking /Organisations of state & central government shall only be considered for evaluation. The experience certificate from the client equivalent to not below the rank of Executive Engineer shall be considered. The experience of sublet works shall not be considered.
- VI) All MOU's shall be on a Non Judicial stamp paper of appropriate value duly notarised and signed by respective authorised representatives.
- VII) The Bidder/ MOU partners contract should not have been terminated/blacklisted/debarred in any State Govt/ Municipal Corporations/ Central Govt./ Any state Govt Organisation, Urban Local body and/or its undertaking company or its SPV, Asian Development Bank/ World Bank or similar international funding agencies organisations due to delay in projects during last five years.

BHAVNAGARMUNICIPAL CORPORATION

VOLUME – I

SECTION-IV

QUALIFICATION DATA SHEET TO BE FILLED UP BY THE BIDDER

The qualification questionnaire contains the following forms:

SL. NO.	FORM NO.	DESCRIPTION OF PROFORMA
1	Form-0	List of Submittals
2	-	Proforma for "Letter for submission of tender".
3	Form-1	Details of organization structure of the bidder
4	Form : 2	Details of Personnel
5	Form : 3	Details of Machinery Equipments and work Plan
6	Form : 4	Information relating to Financial Criteria
7	Form-5	Financial data
8	Form-6	List of works already completed by the Bidder
9	Form-7	Details of works on hand with Bidder
10	Form-8	Details of experience of completed work (similar nature)
11	Form-9	Additional Information and Litigation History / Debarment / Blacklisting
12	Form-10	Information for tenders submitted but not awarded
13	Form-11	Certificate for experience of work
14	Form-12	Deleted
15	Form-13	Personnel/ staff proposed for the project
16	Form-14	Curriculum Vitae of Project Manager and all key Technical Staff
17	Form-15	Proposed site organization and Management
18	Form-16	Details of experience for physical qualification criteria
19	Form-17	Approach & Methodology with conceptual design & supporting calculations of the system.

SL. NO.	FORM NO.	DESCRIPTION OF PROFORMA
20	Form-18	Form-H (Declaration)
21	Form-19	Performa for Bank Guarantee (EMD)
22	Form-20	Work wise details of work completed/ in progress by the contractor.
23	Form-21	Performa for Performance bond/ Performance guarantee Proforma for bid security
24	Form-22	Deleted
25	Form-23	"Assured Pipe Supply Declaration" – (To be filled without proposed dispatch schedule at the time of Bidding)
26	Form-24	Performa for memorandum of understanding (MOU) with pipeline supplier

Note:

1. If necessary, additional sheets may be added to the forms. Each page of each form should be clearly marked in the right top corner as follows: Form-0, page 1; Form I, page 2, etc.
2. Some of the forms will require attachments. Such attachments should be clearly marked as follows: Attachment 1 to Form I, Attachment 2 to Form I, etc.

FORM- O

SR NO	LIST OF SUBMITTALS		CONFIRM IF SUBMITTED (YES/NO)	PAGE NO
1	Covering Letter	Letter of transmittal (Scanned Copy)		
2	Power Of Attorney	Power of attorney on Rs. 300/- Non Judicial stamp paper duly notarised, if power is delegated for signing the bid to other persons by applicant. (Scanned Copy)		
3	Certificate Of Registration	Contractor's registration certificate 'AA' Class in Govt. of Gujarat (R&B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state government). (Scanned copy).		
4	Permanent Account Number (PAN) And Income Tax Details	Copy of the latest Income Tax Return with permanent account number (PAN) and Income Tax ward where assessed. (Scanned copy).		
5	Company Establishment Details	Letter of Incorporation of the company		
6	List Of Work On Hand And Work Completed	A scanned copy of declaration showing the details of all works completed and works on hand with the contractor and the value of works that remain to be executed. (List of Work on hand to be supported with non-judicial stamp paper of Rs. 300/ duly notarized).		
7	Earnest Money Deposit	Scanned copy of E.M.D. in accordance with relevant clause in "Tender Notice" of tender notice and the original shall also be submitted in physical form by RPAD/Speed post		
8	Tender Fee	Scanned copy of Account payee Demand Draft for Tender Fee in accordance with relevant clause of Tender Notice, and also in physical form shall also be submitted by RPAD/Speed post		

9	Solvency Certificate	Scanned Copy of the Solvency Certificate from Bank of required amount as per Tender Notice.		
10	Undertaking Regarding Document Submitted, Are True.	The bidder should submit undertaking on non judicial stamp paper of Rs. 300/- duly notarized regarding document submitted, are true.		
11	Joint Venture Agreement(Not Applicable)	Deleted		
12	Bidder Past Performance	The bidder, whose contracts are earlier terminated on account of poor performance in BhavnagarMunicipal Corporation works, will not be eligible. For this tender Self Declaration by bidders is required		
13	Supporting Document	Form-0 to Form-24		
14	MOU Allowed For Qualifying Criteria On Non Judicial Stamp Paper Of Rs. 100/- Duly Notarized	1-Pumping Machineries (If Applicable)		
15	MOU To Be Submitted On Non Judicial Stamp Paper Of Rs. 100/- Duly Notarized	1-Pipe Supply assurance		
16	Other Documents	Schedule of construction method		
		Work plan		
		Schedule of Major items of equipments		
		Schedule of key personnel		

Note: All submittals shall be numbered chronically and reference of page nos shall be mentioned in “**FORM-0**”. The same is to be uploaded online and submitted in physical form as well

LETTER FOR SUBMISSION OF TENDER**To**

The Municipal Commissioner,
BhavnagarMunicipal Corporation

Sub: SUBMISSION OF TENDER APPLICATION FOR (NAME OF WORK)

Sir,

- 1 Having examined the details given in the invitation to Bidder for qualification and brief note, the condition of contract, Specification, Drawings and bill of quantities and Nos. for the execution of above named work, we the undersigned, offer to execute and complete such works and remedy any defects therein in conformity with the conditions of contract, Specifications, Drawings, Bill of Quantities and quoted amount in accordance with the said conditions.
- 2 We hereby certify that all the statements made and information supplied in the enclosed forms and accompanying statements are true and correct.
- 3 We have furnished all information and details necessary for qualification and have no further pertinent information to supply.
- 4 We submit the certified solvency certificate of Rs. _____ Crores and authorize the BhavnagarMunicipal Corporationto approach the Bank issuing the solvency certificate to verify the correctness thereof. We also authorize, BhavnagarMunicipal Corporationto approach individuals, employers, firms and Corporation to verify our competency and general reputation.
- 5 We hereby apply for qualification for (Name of work).
- 6 We undertake, if our Tender is accepted, to commence the works immediately after the receipt of the Engineer's notice to commence, and to complete the whole of the works comprised in the contract within the time stated in the Appendix to tender.
- 7 We agree to abide by this Tender for the period of 180 days from the last date fixed for receiving the same and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
- 8 We enclose here with fixed Deposit receipt / Deposit at call receipt / cross demand draft / Bank Guarantee amounting to Rs. Towards Earnest Money Deposit which is to be absolutely forfeited by BhavnagarMunicipal Corporationshould we not Deposit the amount of Security Deposit specified in the Clause 1, General Conditions of Contract, Volume-IB
- 9 We enclose DD in favor of Field officer's designation & office name (as applicable) amounting to Rs. _____ towards tender fees.
- 10 Unless and until a formal Agreement is prepared and executed this Tender, together with your written acceptance thereof, shall constitute a binding contract between us.
- 11 We also submit a general description on the approach to the construction methods,

technologies proposed etc. and the detailed Work Plan proposed for execution.

- 12 We submit the following certificates in support of our suitability, technical know-how and capability for having successfully completed the following works.

Sr. No.	Works	Client / owner
---------	-------	----------------

- 13 We hereby confirm that there are no deviations to the terms & conditions of the contract and we are liable for execution of this contract in accordance with the stipulated conditions of the contract.

- 14 We understand that you are not bound to accept the lowest or any tender you may Receive. Dated this _____ day of _____ (Year) Signature _____ in the capacity of _____ Duly authorized to sign tender for and on behalf of _____

- 15 We are enclosing herewith "Form H"

- 16 Irrespective of whatsoever has been stated to the contrary anywhere else in our offer no technical deviations have been taken and the entire work shall be performed as per your specifications and Tender documents.

Signature of Applicant.

(NAME IN BLOCK CAPITALS)

Address _____

Seal of Applicant

Date of submission

Witness _____

Address _____

Occupation _____

Enclosures :

FORM - 1

DETAILS OF ORGANIZATION STRUCTURE OF THE BIDDER

1.	Name of Bidder	
2.	Nationality of Bidder	
3.	Office address Telegraphic Address Telephone Number Fax Number E-mail address.	
4.	Year of Establishment	
5.	Location of Establishment	
6.	Bid is submitted as a) An individual b) A proprietary firm c) A firm in partnership d) A limited Company or Corporation e) A Group of Firms / Joint Venture (if applicant is of category "f" give complete information in respect of each other). f) A Group of Companies	
7.	Attach the Organization chart showing the structure of the organization including the names of the Directors and Position of officers	
8.	Number of years of experience a) as a prime contractor (Contractor shouldering main responsibility) i) in own country ii) other countries (Specify countries) b) in a joint venture i) in own country ii) other countries (Specify countries)	
9.	For how many years has your organization been in business of Civil Engineering works under its present name? What were your fields when your organization was established?	
9a	Whether any new fields have been added in your organization? and if so, when?	
10	Whether you were required to suspend construction for a period of more than six months continuously after the work was started? If so, give the name of project and reasons thereof.	

11	Have you ever left the work awarded to you incomplete? (If so, give name of project and reasons for not completing work)	
12	In how many of your projects penalties were imposed for delays? (Please give details)	
13	In which fields of civil engineering construction do you claim specialization and interest?	
14	Give details of experience includes water supply & sewerage projects, pipe laying works, Installation of large capacity of Pumps with modern technology and quality control.	
15	Give details of experience for construction of large water supply and sewerage projects.	
16	Give details of experience in using heavy earth moving machinery, machineries for pipe laying	
17	Give details of testing laboratory, if any.	
18	In how many of your works cases of litigations have arisen?	
19	If the applicant intends to enter into a Joint Venture for the project, please give the following information otherwise state.	
	<ol style="list-style-type: none"> I. Name and Address of Joint Venture II. Name of Lead Firm III. Name and address of each of the partner/member of JV IV. Indicating the responsibility of planning, construction equipments and execution of the work of each of the JV partner. V. Name and address of the bankers to the JV VI. Details regarding financial responsibility and participation (percentage share in the total) of each firm in the JV. Attach a certified copy of the JV (in prescribed Proforma) 	

FORM – 2
DETAILS OF PERSONNEL

Give details of key Technical and Administrative Personnel who could be assigned the work in the following Proforma.

A)	1) 2) 3)	Details of the Board of Directors Name of the Director Address Organization of the Board of Director	
B)	1) 2) 3) 4) 5) 6) 7)	Key Technical and administrative Personnel and Consultants Individual's Name Professional Qualification Present position in the firm Professional experience and details of works carried out No. of years worked with the applicant. Languages known Additional information	
(C)	Key Technical , Administrative Personnel		
	Sr. No.	Key Personnel	Nos. Professional Experience Qualification
	1.	Project Manager	
	2.	Civil Engineer	
	3.	Civil Supervisor	
	4.	Technical Assistant	
(D)		Skilled and other labor (indicate number category wise) 1) Skilled labor 2) Other labor	

SIGNATURE OF BIDDER

FORM – 3

DETAILS OF MACHINERY EQUIPMENTS AND WORK PLAN

Plant & Equipments Owned & Proposed for the Project

Name of Applicant:

The Applicant will provide adequate information to demonstrate clearly that it has the capability to meet the requirements for each and all items of equipment listed in the Employers requirements. A separate Form-3 will be prepared for each item of equipment proposed by the Applicant. For each item of equipment, the applicant should attach a copy of ownership certificate or lease agreement.

Name of Equipment		
Equipment information	1. Name of manufacturer	2. Model and power rating
	3. Capacity	4. Year of manufacture
Current status	5. Current location	
	6. Details of current commitments	
Source	7. Indicate source of the equipment <input type="checkbox"/> Owned <input type="checkbox"/> Rented <input type="checkbox"/> Leased <input type="checkbox"/> Specially manufactured	

Owner	8. Name of owner	
	9. Address of owner	
	Telephone	Contact name and title
	Facsimile	Telex
Agreements	Details of rental / lease / manufacture agreements specific to the Project	

SIGNATURE OF BIDDER

FORM - 4

INFORMATION RELATING TO FINANCIAL CRITERIA

Name of Applicant

All applicants are requested to complete the information in this form. The information supplied should be the annual turnover of the Applicant, in terms of the amounts billed to clients for each year for work in progress or completed.

Applicants should not enclose testimonials, certificates, and publicity material with their applications; they will not be taken into account in the evaluation of qualifications.

Annual turnover data for the last seven financial years i.e. to (Rs. In lacs)

Year	Turnover	Annual income from contracting	Annual income from other sources
2018-19			
2019-20			
2020-21			
2021-22			
2022-23			

Note: The declared figures as mentioned above shall be supported with balance sheet certified by Chartered Accountant and duly notarized for the respective financial year.

FORM - 5
FINANCIAL DATA

1)	Name of Firm	
2)	Name of Partner / Director	
3)	Capital (a) Authorized (b) Issued and paid up	
4)	<p>Furnish Balance sheet and profit and loss statement with Auditor's Reports and Income Tax assessment orders for last Seven (7) financial years. It should, interlaid include the following information</p> <p>i) Working Capital</p> <p>ii) Foreign Investment</p> <p>iii) Turnover for the last seven (7) financial year, the contract receipts for Civil Engineering works (Furnish reference page number to balance sheet attached)</p>	
Sr. No.	Year	Turnover (Rs in Crores)
(III)	2018-19	
(IV)	2019-20	
(V)	2020-21	
(VI)	2021-22	
(VII)	2022-23	
GROSS INCOME IN THE LAST FIVE (5) FINANCIAL YEAR		
Sr. No.	Year	Gross Income (Rs in Crores)
(II)	2018-19	
(III)	2019-20	
(IV)	2020-21	
(V)	2021-22	
(VI)	2022-23	
5.	Maximum gross income from contract works during last seven (7) financial year	

6.	What is the maximum cost of the project that has been handled? (Please give details)	
7.	Have you ever been denied tendering facilities by any Government / Government Undertaking Organisations / Public sector under taking etc.? (If Yes, Please give details)	
8.	List your sources of finance	
9	Amount of financial soundness certified by Bank. (Attach copy of certificate)	
10.	Name and address of Bank from whom reference can be obtained	
11.	Have you ever been declared bankrupt? (If yes, please give details)	

Note:

- Firms owned by individuals, and partnerships, may submit their balance sheets certified by a registered accountant, and supported by copies of tax returns. Attach Certificate(s) issued by any Bank or Financial Institution for available credit to the Lead partner and joint venture partner.

SIGNATURE OF BIDDER

FORM-6

List of works already completed by the bidder during last 7 financial years i.e. from year 2016-17 to year 2022-2023& up to one month prior to last date of submission of the bid

Sr. No.	Name of work	Place/ Dist / State	Tendered amount Rs. In Lac	Cost on completion Rs. In lac	Date of starting	Original time limit in months	Extended time limit in months	Time taken in month to complete the work	Actual date of completion	Reason for delay in completion	Remarks
1.	2.	2a.	3.	4	5a	5b.	5c.	5d.	5e	6	7

Note:

- Necessary completion certificate showing the year wise breakup of amount of work done from concerned officers shall be attached with the tender.

Date:

Signature of the Bidder.

FORM-7

DETAILS OF WORKS ON HAND WITH BIDDER

Work performance and Value of the existing commitments (Work on Hand) as on the date of bid submission for works (complete or partial) to be completed in the next 1.5 Year. (In separate form for each work)

1)	Name of Work	
2)	Agreement No. & Date	
3)	Country and Location	
4)	Client's Name and Address	
5)	Tendered Cost of work (Rs. in Lacs)	
6)	Brief description of works including principal features and quantity of main items.	
7)	Details of work on hand i) Date of Starting ii) Percentage of Physical completion iii) Amount billed for the work completed iv) Cost of work remaining to be executed v) Stipulated date of completion vi) Anticipated date of completion.	
8)	Name of Applicant's Engineer - in - Charge with Professional Qualification.	
9)	Explain for non-completion of work within stipulated time limit if so.	
10)	Whether any Penalties / Fine / Stop notice / Compensation/ Liquidated Damages imposed? (Yes or No), (If Yes, give amount and explanation)	
11)	Details of Litigation / Arbitration cases, if any pertaining to ongoing works.	

12)	Attach Client's certificate for the details furnished in the Form-3A/ Form-11 (Not below the rank of Executive Engineer or equivalent).	
-----	---	--

Note:

- Necessary certificates showing the year wise breakup of amount of work done from the officer concerned shall be attached with the tender.

SIGNATURE OF BIDDER

FORM – 8

DETAILS OF EXPERIENCE OF COMPLETED WORKS (SIMILAR NATURE)

Give details of the similar type of work completed during last Seven(7) financial year from i.e. year 2016-17 to year 2022-23& up to one month prior to last date of submission of the bid in the following Performa. (Separate form for each work)

1)	Name of Work	
2)	Agreement No. & Date	
3)	Country and location	
4)	Client's Name and Address	
5)	Total Tendered cost of work (Rs. in Lac)	
6)	Cost of completed work	
7)	Brief description of works including principal features and quantity of main items.	
8)	Annual achievement (duly supported by certificate from Engineer In -Charge) a) Of key quantities, total physical output of last seven (7) financial year (Separately for each item) (For EPC contract for Water Supply Projects/Sewerage Projects) b) Financial Output in Rupees (Cost of Work) (Including cost of materials supplied by the client)	
9)	Period of completion (a) Originally stipulated time limit. (b) Date of starting (c) Stipulated date of completion (d) Extended time limit	

	if any, Actual time taken to complete the work. Reasons for non completion of work in stipulated time limit / extended time limit if so. (e) Actual Cost of Work Done	
10)	Name of applicant's Engineer - in -charge of the work and his educational qualification	
11)	Were there any Penalties/ Fines / Stop notice / Compensation / Liquidated Damage imposed? (Yes or No. If yes, give case wise details)	
12)	Give the details of Annual Financial Performance and your experience in execution in mobilizing Lift Irrigation, Pipeline Project	
13)	Details of Litigation / Arbitration cases, if any pertaining to work completed.	
14)	Attach Client's certificate in Form-3A (Not below the rank of Executive Engineer or equivalent)	

SIGNATURE OF BIDDER

- (*) **If the information is hidden or misleading by the bidder, he shall be disqualified for the Tender and debarred for three financial years.**

Note:

FORM - 9

ADDITIONAL INFORMATION AND LITIGATION HISTORY / DEBARMENT / BLACKLISTING

Name of Applicant :

1. PLEASE DESCRIBE:

Company's history of litigation or arbitration / Debarment / Blacklisting from contract executed in the last ten years or currently under execution. Please indicate for each case the year, name of employer, cause, matter in dispute, disputed amount, and whether the award was for or against the company.

2. Please add any further information that you consider to be relevant to the evaluation of your application. If you wish to attach other documents, please list below:

SIGNATURE OF BIDDER

FORM – 10

INFORMATION FOR TENDERS SUBMITTED BUT NOT AWARDED

- a) Please add any further information which the applicant considers relevant in regard to his capabilities.
- b) Please give a brief note indicating by applicant considers himself eligible for qualification for the work.
- c) List of works for which tender have already submitted to the client but not awarded

Sr. No	Name of Work	Estimated amount (In Crores Rs.)	Date of Submission of Offer	Name of Client	Likely date of award	Position with ref. to lowest bid.

Note: Giving additional information as per (a) and (b) shall not automatically lead to prequalification.

SIGNATURE OF BIDDER

Note

FORM – 11

Name of Office:-

Date:

CERTIFICATE FOR EXPERIENCE OF WORK

This is to Certify that M/s _____ was awarded the work of _____ (Agreement / contract No. & Year ____). As individual / in a Joint Venture with _____ other details of the work are as under.

1(a)	Name of Joint Venture (If applicable)	
1(b)	-Office address. -Name of state - Telegraphic address -Telephone number with STD code -Fax number. -E-mail address.	
2)	Percentage of share of the agency as per Joint Venture agreement (If applicable)	
3)	Tendered amount Rs. in Lac.	
4)	Actual cost of work completed, including price escalation	
5)	Time Limit in months	
6)	(A) Actual date of starting. (B) Stipulated date of completion	
7)	Actual / expected date of completion	
8)	Whether any fine imposed for not carrying the work as per stipulated time Schedule? (If Yes please give details)	
9)	Execution of pipe line work, type of pipe, diameter in mm & length in kms	
10)	Execution of Elevated storage with capacity and ground storage with capacity in million liters	
11)	Execution of pumping machinery in KW (excluding standby)	
12)	Operation & Maintenance of Sewerage Scheme	

Note:

- 1 The agency has carried out the work timely/ late and satisfactorily/ unsatisfactorily.
- 2 Details of quantities of main items of similar nature of work shall be given in the respective column.
- 3

SIGNATURE OF ACCOUNTANT

NAME OF ACCOUNTANT

DATE:

PLACE:

SIGNATURE OF ENGINEER-IN-CHARGE

NAME AND SEAL OF ENGINEER-IN-CHARGE

DATE:

PLACE:

FORM – 12

FORM – 12
(Deleted)

FORM - 13

PERSONNEL/STAFF PROPOSED FOR THE PROJECT

Name of Applicant

For specific positions essential to contract implementation, applicants should provide the names of at least two candidates qualified to meet the specified requirements stated for each position. The data on their experience should be supplied in separate sheets using one Form-14 for each candidate.

1.	Title of position: Project Manager
	Name of prime candidate:
	Name of alternate candidate:
2.	Title of position: Civil Engineer
	Name of prime candidate
	Name of alternate candidate
3.	Title of position: Mechanical Engineer
	Name of prime candidate
	Name of alternate candidate
4.	Title of position: Procurement Engineer
	Name of prime candidate
	Name of alternate candidate
5	Title of position: Electrical Engineer
	Name of prime candidate
	Name of alternate candidate
4.	Title of position: Construction Engineer
	Name of prime candidate
	Name of alternate candidate

Note: Attach **Manning (Personnel) Schedule** stating each personnel's roles and responsibility for work to be carried out for the project.

FORM - 14

CURRICULUM VITAE OF PROJECT MANAGER & ALL KEY TECHNICAL PERSONNEL's

Name of Applicant

Proposed Position:	Candidate <input type="checkbox"/> Prime <input type="checkbox"/> Alternate	
<i>Candidate information</i>	1. Name of candidate	2. Date of birth
	3. Professional qualifications:	
<i>Present employment</i>	4. Name of employer	
	Address of employer:	
	Telephone:	Contact (manager / personnel officer):
	Facsimile:	Telex:
	Job title of candidate:	Years with present employer:

Summarize professional experience over the last ____years, in reverse chronological order.

Indicate particular technical and managerial experience relevant to this Project.

From	To	Company / Project / Position / Description of relevant technical & managerial project specific experience

FORM - 15

PROPOSED SITE ORGANIZATION & MANAGEMENT

Name of Applicant

- A. Preliminary Site Organization Chart at HO level & at field level:
- B. Narrative Description of Site Organization & Project Management Chart
- C. Description of Relationship between Head Office and Site Management¹
- D. Description of Approach & Methodology to carried out work of this project.

Note: Indicate clearly which responsibility and what authority will be delegated to site management.

FORM – 16

DETAILS OF EXPERIENCE FOR PHYSICAL QUALIFICATION CRITERIA

Sr.No	Name of work	Cost of work in Rs. Lakhs	Work completed/ in progress	Particulars of item	Unit	Qty in tender	Executed Quantity
				Supply & Laying Non Metallic Pipe			
				Supply & Laying Metallic Pipe			
				Sewage Pumping Station			
				Electromechanical Works			
				Road Works			
				Operation and Maintenance works			

Note: For each experience criteria Form-11 shall be submitted by the contractor duly signed by the employer

- In case the bidder has executed the works mentioned above in Joint Venture, he shall mention their stake in the works executed. The client certificate along with copy of joint venture agreement mentioning the JV stake shall also be attached.

FORM – 17

Approach and Methodology

Bidder may submit their work plan, detail methodology to be adopted for this work.

SIGNATURE OF THE BIDDER

FORM-18**PROFORMA FOR LETTER OF UNDERTAKING (FORM-H)**

***(TO BE EXECUTED ON NON-JUDICIAL STAMP PAPER OF Rs. 300/- AND SUBMITTED
BY THE TENDERER ALONG WITH HIS TENDER IN A SEPARATE COVER)***

To,

Municipal Commissioner,

Bhavnagar Municipal Corporation

Dear Sir,

- i. I/We hereby declare that I/We have visited the site and fully acquainted myself / ourselves with local situations regarding materials, labor and other factors pertaining to the work before submitting this tender.
- ii. I/We hereby declare that I/We have read the Tender Documents published on website www.nprocure@ncode.in and accordingly submitted online price Bid for the work of -----

- iii. I/We hereby declare that I/We have carefully studied the conditions of contract and specifications and other documents of this work and agree to execute the same accordingly.
- iv. I/We hereby declare that my/our near relatives are not working in this division or in its sub-divisions as an Engineer of any category, Divisional Accountant, Store Keeper, and in the Circle Office as a Superintending Engineer as on today.
- v. I/we hereby declare that I/we are not declared ineligibility for corrupt or fraudulent practices issued by the central/state govt. In accordance with **Sub Clause No. 41 Corrupt or Fraudulent Practices** or not in the list of black listed contractors announced by Bhavnagar Municipal Corporation/ Govt of Gujarat or its Public Sector Undertakings, Government of India, Other states Government or Public Sector Units.
- vi. I/ We hereby submit our tender and undertake to keep our tender valid for a period of 180 days from the date of opening of tenders i.e. up-to ----- . I/We shall not vary/ alter or revoke my/ our tender during the validity period of tender. This undertaking is in consideration of Bhavnagar Municipal Corporation agreeing to open my/ our tender, consider and evaluate the same for the purpose of award in terms of provisions of tender documents. Should this tender be accepted, I/ We also agree to abide by fulfill and comply with all the terms and conditions and provisions of the above mentioned tender documents.
- vii. I/We also declare that the bid duly filled in online and digitally signed and the required Earnest Money Deposit, Tender Fee and other required documents (scanned copy submitted

online) will be handed over in physical form to theby **RPAD/Speed Post/ Courier only.**

If this declaration is found to be incorrect then without prejudice to any other action that may be taken I/weshall be debarred from bidding in BhavnagarMunicipalCorporationtender for three years and my/our security deposit may be forfeited by BhavnagarMunicipalCorporationin full & the tender, if any, to the extent accepted, may be cancelled.

Signature along with seal of the Company

(Duly authorised to sign the tender on behalf of the Bidder)

Name:

Designation:

Name of Company (BLOCK LETTERS)

WITNESS :

Signature :

Date :

Date :

Postal Address :

Name & Address :

Telephone/Fax No.

Form-19
FORM OF BANK GUARANTEE
(Earnest Money Deposit)

Whereas M/s..... (herein after called the Tenderer) is desirous and prepared to tender for work in accordance with Terms & Conditions of Tender Notice of (financial year) dated and whereas We, Bank; agree to give the Tenderer a guarantee for the Earnest Money Deposit.

1. Therefore, we hereby affirm that we are Guarantors on behalf of the Tenderer upto a total of Rupees(i.e. Rs.) and we undertake to pay theMunicipal Commissioner, upon his first written demand and without demur, without delay and without necessity of previous notice of individual or administrative procedure and without necessity to prove the bank the defects or shortcomings or debit of the contractor any sum within the limit of Rupees.....
2. We further agree that the guarantee here in contained shall remain in full force and effective during the period that would be taken for the acceptance of the tender. However, unless a demand or claim under this guarantee is made only in writing on or before the 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 theMunicipal Commissioner, in writing.
4. We lastly undertake not to remove the guarantee for any change in constitution of the Tenderer or the Bank.

Signature and Seal of the
Guarantor Bank:

Address:

Date:

Form-20 (Form-3A)**WORK WISE DETAILS OF WORK COMPLETED/ IN PROGRESS BY THE CONTRACTOR**

1. Name of Contractor :
2. Name of Work :

3. Estimated Cost Of Work Put To Tender :

4. Tendered Amount :

5. Date of starting of the work :

6. Date of completion of the work :
(As per contract agreement)

7. Actual Date of Completion of Work :
8. Amount of work done upto :
9. Brief history of the work :

Sr. No.	Particular	Unit	Qty.

- 10 State whether details as above given by the contractor correct, if not as to what is the correct information. :

- 11 State whether the contractor has executed the work in progress satisfactory as per specification/ has completed the work, satisfaction, if any give the correct position of the work. :

Form-21PERFORMANCE GUARANTEE

(See clause No. 1)

(The date of this bond must not be prior to the date of the instrument in connection with which it is given)_____

Principal (Contractor) _____

Surety (Scheduled or Nationalized Bank) _____

Sum of bond (express in words and figures) _____

Contract No. and date of contract _____

KNOW ALL MEN BY THESE PRESENTS THAT WE, THE PRINCIPALS AND SURETY above named are held and firmly bound unto the _____ hereinafter called the Employer in the amount stated for payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors jointly and severally, firmly by these presents subject to the provisions of which the aforesaid Contractor on demand and without demand on a claim being made by the Employer.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the principals have entered in to a contract with the Employer numbered and 'dates as shown above and hereto attached for the execution _____ of work _____

NOW THEREFORE, if the Principal shall well and truly perform and fulfil all the undertakings, covenants, terms, conditions and agreements of said contract during the original terms of the said Contract and any extensions thereof that may be granted by the Employer with or without notice to the surety and during the life or any guarantee required under the contract and shall also well and truly perform and fulfil all the Undertakings, covenants, terms, conditions and agreements of any all duty and unduly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the surety being hereby waived or shall pay over, make good and reimburse to the Employer all loss and damages which the employer may sustain by reason of failure or default on the part of said Principal so to do.

We _____ further agree that the guarantee herein Contained shall remain in full force and effect during the period that would be taken for the validity of the said Contract, and that it shall continue to be enforceable till all the dues of the employer under or by virtue of the Contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the Contract have been

fully and properly carried out by the said Contractor and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ we shall be discharged from all liability under this guarantee thereafter.

IN WITNESS WHERE OF, the above bounded parties have executed this instrument under their several seals on the date indicated above the name and corporate seal, of each corporate party being hereto affixed and these presents duly signed by is undersigned representatives, pursuant to authority of its governing body.

In the presence of witness _____ individual

Principal

1. _____ as to _____ (seal)

2. _____ as to _____ (seal)

3. _____ as to _____ (seal)

4. _____ as to _____ (seal)

By _____ affix Corporate Seal

Attested

Corporate Surety

Business address

Affix by _____ Corporate Seal

Title _____

For and on behalf of the Employer

Form-22

JOINT VENTURE AGREEMENT

Deleted

Form-23
“Assured Pipe Supply Declaration”

In the interest of timely completion of the Project, after discussions and getting assurance from the manufacturer, the following schedule for Pipe supply is proposed in order to meet the milestones and desire target of the Projects.

Name of the Pipe Supply Firm	Location of Manufacturing Unit	Size of Pipe		Quantity (In MT)	Assured date of delivery at site (zero date starts from date of work order)
		Diameter (In mm) (FID)	Length (In Km)		

Total number of days for supply of pipe shall be ___ days from the date of work order. We hereby declare that the supply of pipes for the Project will be ensured by us (within ___ days) as per the above mentioned schedule. We are aware, that, in case the above schedule is not met with by us, we shall be liable for paying the Liquidated damages as prescribed in the tender documents for non fulfillment of assured supply of pipes.

Authorised Signatory of the Contractor Authorised Signatory of the Manufacturer.

FORM - 24**MEMORANDUM OF UNDERSTANDING (MOU)-**

This MEMORANDUM OF UNDERSTANDING hereinafter referred to as MoU made on ___ Day _____(month and year) at _____by and between.

(Name and Pipe Manufacturer with address) _____, represented by _____ Authorized Signatory, which expression shall unless repugnant to the subject or context include its administrators, Successors and assigns.

(Name of Bidder with Address) _____, represented by _____ (Authorized Signatory), which expression shall unless repugnant to the subject or context includes its administrator, successor and assigns

Hereinafter referred to as "Parties" in the collective sense and each of which is referred to as " _____(Name of Pipe Manufacturer)" & " _____(Name of Bidder)" in the individual sense.

WHEREAS Bhavnagar Municipal Corporation(hereinafter referred to as Employer) has invited tender (hereinafter referred to as the ("project")) for the following work:

Name of Project: _____

WHEREAS if the said project is awarded to " _____"(Name of Bidder) to execute the said project and it would also need _____ pipes and we the " _____"(Name of Bidder) hereby enter into this MoU with " _____(Name of Pipe Manufacturer)" for timely execution of _____ pipe line work and supply of pipes as per "Form 23 - Assured pipe Supply Declaration" attached herewith and as per the tender conditions and further we mutually agree to execute the said project jointly and both the parties would be jointly and severally responsible for execution of the said projects as per the Bidding Documents.

IN WITNESS WHEREOF all the parties mentioned herein above have signed this MOU on the day, month and year first above mentioned.

No change shall be made in this agreement without prior consent of Employer and other party. However, If the Employer direct the parties to make changes in MOU agreement so as to fulfill the tender condition / requirement, the parties shall discuss with the employer and shall mutually agree for such changes as may be required to be made in the agreement.

In the interest of timely completion of the project, after discussion and getting assurance from manufacture of _____ pipe, the following schedule for _____ pipe supply is proposed in order to meet the milestones and desired target of the projects .

Total number of days for supply of pipe shall be _____ days from the date of work order. We hereby declare that the supply of pipes for the Project will be ensured by us (within _____ days) as per the above mentioned schedule. We are aware that , in case the above schedule is not met with by us , we shall be liable for paying the Liquidated damages as prescribed in the tender documents for non fulfilment of assured supply of pipes.

For, (Name of Bidder)

For, (Name of Pipe Manufacturer)

Authorised Signatory

Authorised Signatory

Encl. : Form 23 - Assured Pipe Supply Declaration

BHAVNAGAR MUNICIPAL CORPORATION

Tender Notice (online) No. BMC/DRAINAGE/AMRUT 2.0 /DR/13/2024



Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

PROJECT FUNDED UNDER AMRUT 2.0 SCHEME

VOLUME – II

GENERAL& SPECIAL CONDITIONS OF CONTRACT

Milestone Dates	
Online Downloading of Technical Bid & Price Bid	AS Per Volume I
Pre – Bid Conference	AS Per Volume I
Last Date of Online Submission of Technical Bid & Price Bid	AS Per Volume I
Last Date for Physical Submission of Tender Fee, EMD and other Documents	AS Per Volume I
Online Opening of the Technical Bid	AS Per Volume I

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GENERAL CONDITIONS OF CONTRACT

(CLAUSE-1) Security Deposit:

Within ten days from the date of issue of the letter accepting his Tender, the successful Bidder shall furnish the required Security Deposit for performance and attend the office of the Engineer In-Charge for execution of the Contract documents. If he fails to furnish the security deposit for performance or to execute the Contract for the work offered to him, his EMD shall be forfeited and the Bidder may be disqualified from tendering for further works.

The successful bidder shall have to pay initial performance security deposit in the form of an unequivocal bank guarantee equivalent to **5%** of the contract value issued by any nationalized bank or as per list mentioned in GR of. Finance Department, GR No: EMD/10/2018/18/DMO, Date: 16.04.2018 (Enclosed). Further amount equivalent to **5%** shall be deducted from the running bill as retention money so that total performance security deposit turns out to be **10%** of the contract value.

The contractor will be permitted to give an unequivocal composite bank guarantee from any nationalized bank or as per list mentioned in GR of. Finance Department, GR No: EMD/10/2018/18/DMO, Date: 16.04.2018 (Enclosed), to cover the performance security and the retention money. In case if the contractor does not give a composite bank guarantee, and if he so desires, the employer shall allow conversion of the money recovered from running bills towards retention money into an unequivocal bank guarantee from any nationalized bank or as per list mentioned in GR of. Finance Department, GR No: EMD/10/2018/18/DMO, Date: 16.04.2018 (Enclosed).

Without limitation to the provisions of the preceding paragraph, whenever the Employer's representative determines an addition to the Contract price as a result of a change in cost and/or legislation or as a result of variation amounting to more than 25 percent of the portion of the Contract Price payable in a specific currency, the Contractor, at the Employer's representative's written request, shall promptly increase the value of the performance security in that currency by an equal percentage.

The performance security for the works shall be valid beyond 30 days from the date of issue of the taking-over-certificate at the end of defect liability period.

5% performance security and 5% retention money recovered from each running bills till successful completion of the work (Total 10% of contract value) shall be released as mentioned below:

- (i) 50% of total security amount shall be released after 30 days from the date of successful commissioning.
- (ii) Remaining 50% of total security deposit shall be released after 30 days from the date of successful completion of the defect liability period i.e. 5 year from the date of successful completion.

~~If the contractor quotes O & M price of estimated project cost less than 4% for 5 years, the contractor shall have to submit BG or FDR equivalent to 5% of 4% of project cost per year for the period of 5 years plus 90 days at the time of submission of final bill for O&M security deposit.~~

Prior to making any claim under the performance security, the Employer shall, in every case, notify the Contractor stating the nature of the default for which the claim is to be made.

(CLAUSE-2) Liquidated damages for delay:

2.1 Overall Physical Progress of work :

a) The schedule of completion of the work shall be as under:-

Time	Percentage of work (Financial)	MODE OF DEDUCTION AT EACH MILE STONE
25%	15%	DEPOSIT
35%	25%	DEPOSIT
50%	40%	DEPOSIT
60%	50%	DEPOSIT
75%	75%	DEPOSIT
100%	100%	LD Deduction

- b) However if the contractor fails to meet any of the milestone both in time (e.g. 25 % for first milestone) and corresponding Physical progress (e.g. 15 % for first milestone) as mentioned above, amount to be retained at the rate of 0.1 percentage of that milestone value per day till said designated part (s) is completed. In case, if the contractor executes and meet the subsequent milestone criteria, then the earlier retained amount shall be released. However, such retention / release for the slippage of subsequent / other milestones shall be applicable in the similar manner.
- c) However, if the contractor meets any of the next milestones of financial completion of work within the corresponding time limit as per the table above, the amount kept as deposit as per para (b) above, shall be returned to the contractor after completing that milestone.
- d) If the contractor does not complete the entire work under the scope on the date of Completion, (i.e. 100% of the financial progress at the end of 100% of the time of completion), Liquidated damages at the rate of 0.1% of contract value per day of delay shall be recovered from the contractor. In such case, the amount retained as deposit shall be converted into liquidated damages.
- e) In case the time limit for completing the work is extended under any circumstances by BHAVNAGARMUNICIPAL CORPORATION the milestone for completing the works will get changed according to the table as specified in Clause (a) above. Subsequently in event of any amount deposited as per Clause (b) above shall be released to the contractor. But in case, the work is not completed within the extended time limit and no further time extension to be granted, the liquidated damages shall be payable as 0.1% of the total contract value per day subjected to the maximum amount of 10% of the total contract value.

2.2 Pipeline Crossing Works:

- f) The contractor must complete the pipeline crossing works requiring permissions of following authorities, within stipulated time limit as mention below. The contractor is required to plan and frame his project execution schedule accordingly.

NO.	AUTHORITY	TIME LIMIT IN MONTHS
		Contractor must start procedure within one month from date of LOI
1.	Railway	2 months from the date of receiving the work permit or 2 months from the date of receiving caution order from Railway or 2 months from the date of issue of LOI, whichever is later (While calculating the total time limit for completion of the structures of Railway, the relevant rules of the railway authority should also be taken into account.)
2.	National Highway	2 months from the date of receiving the permission from Concerned Authority or from the date of issue of LOI, whichever is later
3.	State Highway	3 months from the date of receiving the permission from Concerned Authority or from the date of issue of LOI, whichever is later
4.	Major Canal Crossing	2 months from the date of receiving the permission from Concerned Authority or from the date of issue of LOI, whichever is later
5.	Minor Canal Crossing	2 months from the date of receiving the permission from Concerned Authority or from the date of issue of LOI, whichever is later
6.	Gas / Oil / Petroleum & Other underground utility Pipeline	2 months from the date of receiving the permission from Concerned Authority or from the date of issue of LOI, whichever is later
7.	Forest	2 months from the date of receiving the permission from Concerned Authority.

- a) If contractor fails to execute the works as in (a) above within stipulated time limit as mention above, he shall attract compensation at 0.1% cost of respective work per day of delay and maximum up to 10 %, calculated on the basis of BOQ, and it will have cumulative effect till the actual date of completion of the delayed work. The compensation recovered under this clause will be of permanent nature and will remain non-refundable under any circumstances.

2.3 Supply of Pipes:

- a) The contractor shall pay specific attention to timely supply of pipes under the project. The contractor is bound to supply pipes as per the specification laid within the time period stipulated in work plan approved by EIC. For ensuring the same, the contractor has to upfront declare at the time of bidding, their method of procurement of pipes i.e. (i) Through cash (if yes, this has to be reflected in their cash flow / fund flow plan to be submitted by contractor within one month from the date of signing of contract

agreement) (ii) Through credit (iii) Through Letter of Credit (LOC); etc. In case of LOC, the contractor will enter into/ open LOC with the approved vendor within one month from the date of approval of QAP of pipes matching with delivery schedule. The maximum ceiling for number of times for opening of LOC is four, however the date of opening of last LOC with approved vendor for supply of pipes will be 4 month prior to stipulated end date for supply of pipes as per approved work plan.

- b) The event of non-supply of pipes, as per approved work plan / delivery schedule shall attract compensation at the rate 0.25% of cost of pipes, calculated on the basis of BOQ, to be supplied per month, per day of delay and will be having cumulative effect till the date of actual supply of pipe. The compensation levied under this clause shall be of permanent nature and is non refundable under any circumstances. However, the maximum ceiling limit of 10% of Contract Price as specified above shall also apply to liquidated damage deducted under this clause.
- c) The bidder shall furnish declaration for arrangement of supply of pipes of specified nature as per contract and shall submit as per proforma for 'Assured Pipe Supply Declaration' as per Volume-I, Section-IV, Form-23.
- d) deleted

2.4 The aggregate maximum amount of liquidated damages recoverable under this Clause-2 "LIQUIDATED DAMAGES "shall be subject to ten percent of the total contract value.

2.5 The reasons requiring recovery of liquidate damages of ten percent of the contract value for performance shall be sufficient cause for termination of contract and for forfeiture of security deposit including amount of performance bond/security and registration of the contractor shall also be kept in abeyance for three years from the date as fixed in all cases.

(CLAUSE-3) Default by Contractor:

If the Contractor shall neglect or fail to proceed with the work with due diligence or if he violates any of the provision of the Contract, the Engineer -in-Charge shall give the Contractor a notice, identifying deficiencies in performance and demanding corrective action, Such notice shall clearly state that it is given under the provision of this clause. After service of such notice, the contractor shall not remove any plant; equipment and material from the site. The commissioner shall have a lien on all such plant; equipment and material from the date of such notice till the, said deficiencies have been corrected as mentioned in the said notice.

If the contractor fails to take satisfactory corrective action within ten day after receipt of such notice, the Engineer In-charge on behalf of commissioner shall terminate the contract in whole. In case, the entire contract is terminated, the amount of security deposit and performance bond if any together with the value of the work done but not paid for, shall stand forfeited to the BMC. The plants, equipment and materials, held under this clause shall then be at the disposal of the BMC to recover the amount equivalent to the liquidated damages and registration of the contractor shall be kept in abeyance for three years from the date as fixed in all such cases.

The Engineer In-charge, if necessary, shall direct that a part of the whole of such plant, equipment and material be removed from the site within a stipulated period, if the Contractor fails to do so, the Engineer- in-charge shall cause them or any part of them to be sold holding the net proceeds of such sale to the credit of the Contractor. After settlement of accounts, the lien by the commissioner of the contractor's remaining plant equipment and balances of materials shall be released.

Termination of the contract in whole shall be an adequate authority for the Engineer In-charge to demand discharge of the obligations from the guarantors of the security for the obligations from the guarantors of the security for the performance.

(CLAUSE-4) Actions when the progress of any particular portion of the work is unsatisfactory.

If the progress of any particular portion of the work under Contract is unsatisfactory, the Engineer-in-charge shall, notwithstanding that the general progress of the work is satisfactory, in accordance with Clause-2 be entitled to take necessary action under Clause-3, after giving the Contractor ten day's notice in writing and the contractor shall have no claim whatsoever for any compensation for any loss caused to him due to such action.

(CLAUSE-5) Non exercise of power under Clause-3 not a waiver.

In any case in which any of powers conferred upon the Engineer -in-charge by Clause 3 hereof shall have become exercisable and the same shall not have been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable at any future date.

(CLASE-5A) Powers to seize tools, plants, machineries, materials and stores of the contractor on invocation of clause 3

In the event of the Engineer- in charge taking action under clause 3, he may, if so desire, take possession of all or any tools, plants, machineries, materials and store in or upon the work or the site thereof or belonging to the contractor or procured by him and intended to be used for upon the work of the site thereof or belonging to the contractor or procured by him and intended to be used for the execution of the work or any part thereof, by paying or allowing for the same in account at the contract rate or in case of contract rates not being applicable at such reasonable rates, as may be comparable to current market rates where ascertainable of similar articles and comparable condition, to be certified by the Engineer-in-charge. In the alternative the alternative the Engineer-in-charge may by notice in writing to the contractor or his clerk of the works foreman or other authorized agent require him to remove such tools, plants, machineries, materials or store from the premises within a time to be specified in such notice and in the event of the contractor failing to comply with any such requisition, the Engineer- in- charge may remove them at the contractor's expense or shall remove them by auction or private sale at the risk and cost of the contractor in all respects, and the certificate of the Engineer-in -charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such removal shall be final and conclusive against the contractor.

(CLASE-6): Extension of time limit:

If the contractor shall desire an extension of the time for completion of the work on the ground of his having been unavoidably hindered in its execution or any other ground he shall apply in writing to the Engineer -in-charge before the expiration of the period stipulated in the tender or before the expiration of 30 days from the date on which he was hindered whichever is earlier and the Engineer-in-charge may, if in his opinion, believe that there are reasonable grounds for granting an extension, grant such extension, as he thinks necessary or proper. The decision of the competent authority of BHAVNAGARMUNICIPAL CORPORATION in this matter shall be final.

(CLASE-7): Final measurement and final bill on completion of work:

As soon as the work is completed, the contractor shall give a notice of such completion to the Engineer-in-charge and on receipt of such notice the Engineer-in-charge shall inspect the work and if he is satisfied that the work is completed in all respects then Engineer In-charge shall take final measurements :-

No certificate of completion shall be issued not shall the work be considered to be complete till the contractor shall have removed from the premises, on which the work has been executed, all scaffoldings, sheds and surplus materials, except such, as are required for rectification of defects; rubbish and all huts and sanitary arrangements required for his workmen on the site in connection with the execution of the work, as shall have been erected by the contractor for the workmen and cleared all dirt from all parts of building(s) in, upon or around which the work has been executed or of which he may have possession for the purpose of the execution thereof and cleared floors, gutters and drains, cased doors and sashes, oiled locks and fastening labelled keys clearly and handed them over to the Engineer- in- charge or his representative and made the whole premises fit for immediate occupation or use to the satisfaction of the Engineer-in-charge. if the contractor shall fail to comply with any of the requirements of these conditions as aforesaid, on or before the date of completion of the works, the Engineer-in-charge may, at the expense of the contractor, fulfil such requirements and dispose of the scaffolding, or surplus materials and rubbish etc. as he thinks fit and the contractor shall have no claim in respect of any such scaffolding or surplus materials except for any sum actually released by the sale thereof less the Cost of fulfilling the requirements and any other amount that may be due from the contractor. If the expenses of fulfilling such requirements are more than the amount realised such disposal as aforesaid the contractor shall forthwith, on demand, pay such excess. The Engineer- in-charge shall also have the rights to adjust the amount of excess against any amounts that may be payable to the contractor.

(CLAUSE-8): Intermediate and final payments:

No payments shall be made for any work, estimated to cost less than rupees one thousand till after the whole of the said work shall have been completed and a certificate of completion given. But in the case of works estimated to cost more than rupees one thousand, the contractor shall on submitting a monthly bill therefore, be entitled to receive payment proportionate to the part of the work then approved and passed by the Engineer- in-charge, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the contractor. All such intermediate payments shall be regarded as payments by way of advance against the final payments only on not as payments for work actually done and completed and shall not preclude the Engineer- in-charge from requiring bad, unsound, imperfect or unskilled work to be removed and taken away and reconstructed, or re-erected, nor shall any such payment be considered as an admission of the due performance of the contractor or any part therefore in any respect or the accruing of any claims, nor shall it conclude, determine, or affect in any way the power of the Engineer-in-charge as to the final settlement and adjustment of the account or otherwise or in any other way vary or effect the contract. The final bill shall be submitted by the contractor within one months of the completion of the work, otherwise the Engineer-in-charge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

(CLAUSE-9): Payment at reduced rates:

The rates for items of works shall be valid only when the items concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In cases where the items of work are accepted as not so completed, the Engineer In-charge can make payments at reduced rates.

(CLAUSE-10): Bill to be submitted monthly (with copies of the required documents, registers etc in 3 copies)

A bill shall be submitted by the contractor each month on or before the date fixed by the engineer-in-charge for all works executed in the previous month and engineer-in-charge shall take or cause to be taken the requisite measurement for the purpose of having the same verified and the claim, so far as it is admissible, shall be adjusted, if possible, within ten days from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer-in-charge may depute a subordinate to measure up the said work in the presence of the contractor or his duly authorized agent whose countersignature to the measurement list shall be sufficient warrant and the Engineer-in-charge may prepare a bill form such list which shall be binding on the contractor in all respects.

(CLAUSE-11): Bills and rates payable:

The contractor shall submit all the bills on the printed forms at the office of the Engineer-in-charge. The charges to be made in the bills shall always be entered at the rates specified in the agreement or at the partly reduced rates subject to the approval by the Engineer-in-charge in the case of items not completed/executed as per agreements or in the case of any extra work ordered in pursuance of these conditions and not mentioned or provided for the tender, at the rate here in after provided for such work. Contractor has to submit EPF, muster and salary paid receipt with every running bill to client office. Contractor has to submit invoice of R. A bill with GST with every running bill.

Note: Contractor has to submit necessary documents i.e, Bar Bending Schedule, Material Consumption and supply register, progress report up to date, Release notes, as built drawing, Measurement sheet and abstract verified and certified by PMC/TPI along with every bills to the BMC as directed by Engineer In charge.

(CLAUSE-12): Materials to be supplied by the department. (No Store Supply)

If the specification of the work provides for the use of any special description of materials to be supplied from the Department Store or if it is required that the contractor shall use certain stores to be provided by the Engineer-in-charge (Such materials and stores and the prices to be charged therefore as here in after mentioned being so far as practicable for the convenience of the contractor but not so as in any way to control the meaning or effect of this contract specified in the schedule or memorandum hereto annexed) the contractor shall be supplied with materials and stores as may be required from time to time to be used by him for the purpose of the contract only, and the value of the full quantity of materials and stores so supplied shall be set off or deducted from any sum then deposited, or the proceeds of sale thereof, if the deposit is held in government securities, the same or a sufficient portion thereof shall, in that case be sold for the purpose. All materials supplied to the contractor shall remain the absolute property of BMC and shall on account be removed from the site of the work and shall at all times, be open to inspection by the Engineer-in-charge. Any such materials, unused and in perfectly good condition at the time of completion or termination of the contract, shall be returned to the Departmental store if the Engineer-in-charge so requires by a notice in Writing given under his hand, but the contractor shall not be entitled to return any such materials except with the consent in writing of the Engineer-in-charge and he shall have no claim for compensation on account of any such material except with the consent in writing of the Engineer-in-charge and he shall have no claim for compensation on account of any such material supplied to him as aforesaid but remaining unused by him or for any wastage in or damage thereto.

For materials provided in Schedule-A and consumed in excess quantities, the rates provided in Schedule A shall be increased/ decreased corresponding to the increased/ decreases in the new rate payable for excess quantity as compared to date of issue of such quantity of materials.

(CLAUSE-12A): Consumption and return of materials supplied by the department.

The contractor shall be entitled to use the material supplied by the Department only to the extent of quantities of such materials required for execution of the work as per theoretical calculation. The Engineer-in-charge may however, on being satisfied that a large quantity of such materials is required for the execution of the work permit the contractor to use such large quantity of the materials. Such permission shall be given in writing.

The contractor is bound to return in good condition such materials issued in excess of the requirements so worked out or in excess of the quantities so permitted to be used by the Engineer-in-charge. If the contractor fails to return such extra materials within a period of 15days from the date of the demand in writing of such materials being made by the Engineer- in charge, he shall be charged for the excess materials at double the issue rate for materials specified in Schedule A of contract Agreement.

(CLAUSE-12B):-Safe custody of materials supplied by the department

All stores and materials supplied by the department shall be in safe custody .The store shall be accessible to the Engineer-in-charge or his agent at all times, No materials shall be allowed to removed from the site of the work and any material required for the execution of the work shall be taken out form the store only in the presence of a duly authorized agent of the Engineer-in-charge.

(CLAUSE-13): Drawings, designs, instructions of the engineer-in-charge and specifications, order of precedence in case of discrepancies

(1) The contractor shall execute the whole and every part of the work in the most substantial and workmen-like manner and both as regards materials and in other respects in strict accordance with specifications.

The contractor shall also conform exactly, full and faithfully to the design, drawings and instructions in writing for the work signed by the Engineer-in-charge. The design and the drawings shall be lodged in the office of the site engineer-in-charge to which the contractor shall be entitled to have access or the purpose of inspection at such office during office hours.

Where the instructions referred to above are not contained in separate letters addressed to the contractor the same shall be recorded in the work order book, which shall be maintained and kept on the site of the work. The contractor shall be required to sign such entries in the work order book in token of having noted the instruction. However, if the contractor fails to sign the work-order book for any reason whatsoever, the entry of the instructions in the work order book shall be deemed to be the due notice to him of the said instructors. The work-order book shall be open for inspections to the contractor on the site or the work during office hours.

(2) The contractor will be entitled to receive one copy of the accepted tender along with the work order free of cost.

(3) The several documents forming the contract are essential parts of the contract and requirements' occurring in one is binding as through occurring in all. They are intended to be mutually explanatory and complimentary and to describe and provide for a complete work.

In the event of any discrepancy in the several documents forming the contract or in any one document, the following order of precedence should apply:

- (a) Dimension and quantities: (i) Drawings (ii) Schedule-B of the Tender form (iii) specifications.

On drawings, figures dimensions, unless obviously incorrect, will be followed in preference to scaled dimensions.

- (b) Description: (i) Schedule-B of the Tender form: (ii) Drawings (iii) specifications.

In the case of defective description or ambiguity, the Engineer-in-charge is entitled to issue further instructions directing in what manner the work is to be carried out. The contractor cannot take any advantage of any apparent error or omission in drawings or specification and the Engineer-in-charge shall be entitled to make corrections and interpretations as necessary to fulfil the plans and specifications.

(CLAUSE-14) Excess over Tender Quantities, Extra Items and Variations

The Engineer-in-charge shall have power to make any alterations in or addition to the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the Engineer-in-charge and such alternation shall not invalidate the contract and any additional work which the contractor may be directed to do in the manner above specified as part of work shall be carried out by the contractor on the same conditions in all respects on which he agreed to do the main work and at the same rate as are specified in the tender for the main work.

- (14.1) 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.

- (14.2) If the additional or altered work includes any class or work of which no rate is specified in this contract, then such class of work shall be carried out.

- (i) At the rate derived from the item within the contract which is comparable to the one involving additional or altered class of work where there are more than one comparable items, the item of the contract which is nearest in comparison with regard to class or classes of the work involved, shall be selected and the decision of board shall be final and binding to the contractor.

- (ii) If the rate cannot be derived in accordance with (i) above, such class of works shall be carried out at the rate entered in the Schedule of GWSSB for the year in which the tender was received, increased or decreased by the percentage by which the tender amount is more or less as compared to the amount arrived at the rates in the in "Schedule of Rates" of the Division in the year in which the tender was received. If the Schedule of rates of GWSSB does not contain all the items, the percentage increase or decrease of the tender shall be calculated considering such items which were included in the "Schedule of Rates" of the Division for the year and for materials consumed on such item the rate to be charged would be the basic rate taken into account for fixing the rate in S.O.R. referred to above, instead of the rate stipulated in Schedule 'A'.

- (iii) If it is not possible to arrive at the rate from (i) and (ii) above, such class or work shall be carried out at the rate decided by the competent authorities on the basis of detailed rate analysis after hearing the contractor before a City Engineer stationed at the same place or the nearest place.

(14.3) If the additional or altered work, for which no rate is entered in the "Schedule of Rates" of GWSSB/R&B is ordered to be carried out before the rate is agreed upon, then the contractor shall within seven days of the date of receipt by him of the order to carry out the work inform the Engineer-in-charge of the rate, which it is his intention to charge for such class of work and if the Engineer in charge does not agree to this rates, he shall be intimated in writing be at liberty to cancel his order to carry out such class of work and arrange to care if out in such manner as he may consider it advisable, provided always that if the contractor shall commence work or incur any expenditure in regard thereof before the rates shall have been determined as lastly herein before mentioned, then in such cases he shall only be entitled to be paid in respect of the work carried out of expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer In-charge in the event of the dispute, the decision of the City Engineer of the Circle shall be final.

Where, however the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority, the alternation above referred to shall be within the scope of such designs, drawings and specifications appended to the tenders.

The time limit for the completion of the work shall be extended the proportion that the increase in the cost occasioned by alternations bears to the cost of the original contract work and the certificate of the engineer-in-charge as to such proportion shall be final and conclusive.

(CLAUSE-15) No. Claim to any payment or compensation for alterations or for restrictions of work

If at any time after the execution of the contract documents the Engineer-in-charge shall for any reason whatsoever, require the whole or part of the work, as specified in the tender, be stopped for any period or shall not require the whole or part of the work to be carried out at work, as specified in the tender, be stopped for any period or shall not require the whole or part of the work to be carried out at all or to be carried out by the contractor he shall give notice in writing, stating the fact to the Contractor who shall thereupon suspend or stop the work totally or partially, as the case may be. In any such case, except as provided hereunder, the Contractor shall have no claim to any payment or compensation whatsoever except as provided hereunder on account of any profit or advantage which he might have derived from the execution of the work in full but

which he did not so derive in consequence of the full amount of the work not having been out, or on account of any loss that he may be put to on account of materials purchased or agreed to be purchased or unemployment of labour required by him, He shall not have also any claim for compensation by reason of any alterations having been made in the original specifications, drawings, designs and instructions which may involve any curtailment of the work as originally contemplated.

The Contractor shall not be entitled for loss of any expected profit of such work.

(CLAUSE 16 :) Claims under the contract

Time limit for unforeseen claims: The contractor shall not be entitled to any compensation from BMCon any account unless where allowed by the conditions of his this contact.

(CLAUSE-17) Remedies for inferior or bad work, materials of workmanship and maintenance clause:

If, at any time before the expiry of Defects Liability period as detailed in Clause 17-A. It shall appear to the Engineer-in-charge or his sub-ordinate in charge of the work that/any work has been executed unsound, imperfect or unskilled workmanship or with materials or inferior quality or that any materials or articles provided by him for the execution of the work are unsound, or of a quality inferior to that contracted for or are otherwise not in accordance with the contract, it shall be lawful for the Engineer-in-Charge to intimate this fact in writing to the contractor and then notwithstanding the fact that the work, materials or articles complained of may have been passed, certified and paid or the contractor shall be bound forthwith to rectify, or remove and reconstruct the work so specified in whole or in part as the case may require, or if so required, shall remove the materials or articles so specified in whole or in part and provide other proper and suitable materials or articles at his own charge and cost, and in the event of his failing to do so within a period to be specified by the Engineer-in-charge in the written intimation aforesaid, the contractor shall be liable to pay compensation at the rate or percent on the amount of the estimate of the rectification for every day not exceeding ten days during which the failure so continues, and in the event of any such failure as aforesaid continuing beyond ten days, the Engineer-in-charge may rectify or remove, and re-execute the work or remove and replace the materials complained of as the case may be at the risk and expense in all respects of the contractor. Should the Engineer -in-charge consider that any such inferior work or materials as described above may be accepted or made use of, it shall be within his discretion to accept the same at such reduced rates as he may fix therefore.

However, the contractor shall be responsible for normal maintenance of the work till the final bill for the work is prepared by the Departmental Officer.

(CLAUSE-17A) Defect liability clause:

The contractor shall be responsible to make good and remedy at his own expense any defect in works (Items)carried out by the contractor including surface worn out which may develop or may be noticed or may be noticed before the period mentioned hereunder from the certified date of completion. The Engineer-in-charge shall give the contractor a notice in Writing about the defects and the contractor shall make good the same within 15 days of receipt of the notice. In the case of failure on the contractor, the Engineer- in charge may rectify or remove or re-execute the work at the risk & cost of the contractor. The Engineer-in-charge shall be entitled to appropriate the whole or any part of the amount of security deposit towards the expenses, if any, incurred by him in rectification, removal or re-execution. The Defect Liability Period shall be five years from the certified date of completion of work.

(CLAUSE-18) Work to be open to inspections- Contractor or responsible agent to be present:

All works under or in course of execution or executed in pursuance of the contract shall, at all times be open to the inspection and supervision of the Engineer-in-Charge and his subordinates and the Contractor shall, at all times during the usual working hours, and all other times for which reasonable notice of the intimation of the Engineer -in-charge or his subordinate to visit the works shall have been given to the contractor, either himself be present to receive orders and instruction or have a responsible agent duly accredited in writing present for the present for the purpose. Orders given to the contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the contractor himself.

Employment of a qualified site Engineer by the Contract. As per tender document clause 3.0 of qualifying criteria

(CLAUSE-19) Notice to be given before work is covered up:

The contractor shall give not less than five day's notice in writing to the Engineer-in-charge or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given or consent obtained. The same shall be uncovered at the contractor's expense and in default thereof, no payment or allowance shall be made for such work or for the materials which the same was executed.

(CLAUSE-20) Damage to contract work- in- progress and damages to surrounding properties.

If the contractor or workmen, or servants shall break, deface, injure or destroy any part of the building or the work in question in/on which they may be working or any building, road, fence, enclosure or grass- land or cultivated ground contiguous to the premises on which the work or any part thereof is being executed or if any damage shall be done to the work from any cause whatever before damage occurred /caused due to normal flood or rain or if any imperfections become apparent in it within three months from the grant of a certificate of completion, final or otherwise by the Engineer-in-charge, the contractor shall make good the same at own expenses or in default, the Engineer-in-charge may cause the same to be made good by other contractor, and deduct the expenses (of which the certificate of the Engineer-in-charge shall be final) from any sums that may thereafter become due to the contractor or from his security deposit or the proceeds of sale thereof or a sufficient portion thereof of a sufficient portion thereof,

(CLAUSE-20-A) Damages due to acts of God and unprecedented floods.

Neither party shall be liable. to the other for any loss of damage occasioned by or arising out of acts of God, such as Unprecedented flood, Volcanic eruption, earthquake of other convulsion of nature and other acts such as but not restricted to invasion, the acts of foreign countries, hostilities, or war like operations before or after declaration or war, rebellion, military or Usurped power which prevent performance of the contract and which could not have been foreseen or avoided by a prudent person.

Note: "Unprecedented flood" means the flood crossing the High Flood Level of the past 10 year(s) which is on the available record.

(Modified Vide R.& B.D.G.R. No. TNC- TNC-1096-IB-143-(16)-C dated 11-1-99)

(CLAUSE-21) Contractor to supply plant, ladders, Scaffolding etc. and is liable for damage arising from non- provision of lights, fencing etc-:

The contractor shall supply at his own cost all material (except such special materials if any, as may, in accordance with the contract to be supplied from the Public Works Department Store), plant, tools, appliances, implements, ladders, cordage, tackle, scaffolding, and any temporary works which may be required for the proper execution of the work whether in the original, altered or substituted form and whether included in the specifications. or other documents forming part of the contract or referred to in these conditions of not and which may be necessary for the purpose of satisfying or complying with requirements of the Engineer-in-charge as to any matter or to which under these conditions he is entitled to be satisfied or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials necessary for the purpose of settings out works and counting, weighing and assisting in the measurement of examination at any time and from time to time, of the work or the materials, failing this, the same may be provided by the Engineer -in-charge at the

expense of the Contractor and the expenses may be deducted from any money due to the Contractor under the contractor or from his security deposit, or proceeds of sale thereof or of a sufficient portion thereof. The contractor shall provide all necessary fencing and lights required to protect the public from accident and shall also be bound to bear expenses of defences of every suit, action or other legal proceeding at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person, or which may, with consent of the Contractor, be paid in compromising any claim by any such person.

(CLAUSE-21A) Regulations for scaffolds, working platforms, gangways and stairways

The Contractor shall provide suitable scaffolds and working platforms. Gangways and stairways, and shall comply with the following regulations in connection therewith,

- (a) Suitable scaffolds shall be provided for workmen for all works that cannot be safely done from a ladder or by other means.
- (b) A scaffold shall not be constructed, taken down or substantially altered except-
 - (i) Under the supervision of a competent and responsible person.
 - (ii) Appointed by contractor and by competent workers possessing adequate experience in this kind of work.
- (c) All scaffolds and appliances connected therewith and all ladders shall-
 - (i) be of sound material
 - (ii) be of adequate strength having regard to the loads and strains to which they will be subjected, and,
 - (iii) be maintained proper condition.
- (d) Scaffolds shall be so constructed that on part thereof can be displaced in consequence of normal use.
- (e) Scaffolds shall not be overloaded and so far as practicable the load shall be evenly distributed.
- (f) Before installing the lifting gear on scaffolds, special precaution shall be taken to ensure the strength and stability of the scaffolds.
- (g) Scaffolds shall be periodically inspected by a competent person.
- (h) Before allowing a scaffold to be used by his workmen, the Contractor shall, whether the scaffold has been erected by his workmen or not, take steps to ensure that it complies fully with the regulation herein specified.
- (i) Working platforms, gangways shall be so constructed that no part thereof can sag unduly or unequally. be so constructed and maintained having regard to the prevailing conditions as to reduce as far as practicable risks of persons tripping or slipping and be kept free from any unnecessary obstruction.
 - (i) In the case of working platforms, gangways working places and stairways at a height exceeding 2.00 metre (to be specified)
 - (ii) Every working platform and every gangway shall be closely boarded unless other adequate measures are taken to ensure safety.
- (j) Every working platform, gangway, working place and stairway shall be suitably fenced.

- (k) Every opening in the floor of a building or in a working platform shall, except for the time and to the extent required to allow the access of person or the transport or shifting or materials be provided with suitable means to prevent the fall of persons or material.
 - (l) When persons are employed on a roof where there is danger of falling from a height exceeding 3.00 (to be specified) meters suitable precaution shall be taken to prevent the fall of persons or material.
- (m) Suitable precautions shall be taken to prevent persons being struck by articles which might fall from scaffold of other working places.
- (n) Safe means of access shall be provided to all working platform and other working places.

(CLAUSE-21B) Regulations for hoisting appliance

The contractor shall comply with the following regulations as regards the hoisting appliances to be used by him-

- (a) Hoisting Machines and tackle including their attachments, anchorages and supports shall-
 - (i) be of good mechanical construction sound material and adequate strength and free from patent defect, and
 - (ii) be kept in good repair and in working order.
- (b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of suitable quality and adequate strength and free from patent defect.
- (c) Hoisting machines and tackles shall be examined and adequately tested after erection on the site and before use and be re-examined in position at intervals to be prescribed by Engineer-in-charge.
- (d) Every chain, ring, hook, shackle, swivel and pulley block used in hoisting or lowering materials or as a means of suspension shall be periodically examined.
- (e) Every crane driver or hoisting- appliance operator shall be properly qualified.
- (f) No. person who is below age of 15years shall be in control of any hoisting machine, including any scaffolds, nor shall give signals to the operator.
- (g) In the case of every hoisting machine and of every chain, ring hook, shackle, swivel and pulley block used in hoisting or lowering or as a means of suspension the safe working load shall be ascertained by adequate means.
- (h) Every hoisting machine and all gears referred to in preceding regulation shall be plainly marked with the safe working load.
- (i) In the case of hoisting machine having a variable safe working load, each safe working load and conditions under which it is applicable shall be clearly indicated.
- (j) No part of any hoisting machine or gear referred to in regulation 'g' above shall be loaded beyond the safe working load except for the purpose of testing.
- (k) Motors, gears, transmissions, electric wiring and other dangerous parts of hoisting appliances shall be provided with sufficient safeguards.

- (l) Hoisting applications shall be provided with such means as will reduce to a minimum the risk of the accidental decent of the load.
- (m) Adequate precautions shall be taken to reduce to minimum the risk or any part of a suspended load becoming accidentally displaced.

(CLAUSE-22) Measures for prevention of fire:

The contractor shall not set fire to any standing jungle, trees, bush wood or grass without a written permit from the engineer-in-charge.

When such permit is given, and also in all cases when destroying cut or dug up tress, bush wood, grass etc, by fire, the contractor shall take necessary measures to prevent such fire spreading to or other-wise damaging surrounding property. When such permit is given, and also in all cases when destroying cut or dug up tress, bush wood, grass etc by fire, the contractor shall take necessary measures to prevent such fire spreading to or other- wise damaging surrounding property.

(CLAUSE-23) Liability of contractors for damages done in or outside work area:

Compensation for all damage done intentionally or unintentionally by Contractor's labourers whether in or beyond limits of BMC/Government property including any damages caused by the spreading of fire mentioned in the clause 22, shall be estimated by the Engineer-in - charge, or such other Officer as he may appoint and the estimates of the Engineer-in-charge, subject to the decision of the Superintending Engineer, on appeal, shall and the contractor shall be bound to pay the amount of the assessed compensation on demand, failing which the same will be recovered from the Contractor as damages in the manner prescribed in clause 1 or deducted by the Engineer-in-charge form any sums that may be due or become due form Government to the contractor under this contract or otherwise.

The Contractor shall bear the expenses of defending any action or other legal proceeding that may be brought by any person for injury sustained by him owing to neglect of precautions to prevent the spread of the fire and he shall also pay the damages and cost that may be awarded by the court in consequence.

(CLAUSE 24) Risk & Cost:

The Engineer-in-charge or the Competent Authority defined under rules may, without prejudice to his rights against the Contractor, in respect of any delay or inferior workmanship or otherwise, or any claims for damages in respect of any breaches of the contract and without prejudice to any rights or remedies under any of the provisions of this Contract or otherwise, and whether the date for completion has or has not elapsed, by notice in writing, absolutely determine the Contract in any of the following cases:

- (i) If the Contractor having been given by the Engineer-in-charge, a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in any inefficient or otherwise improper or un-workman like manner shall omit to comply with the requirements of such notice for a period of seven days, thereafter, or if the Contractor shall delay or suspend the execution of the work so that either in the judgment of the Engineer-in-charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion or he has already failed to complete the work by that date,
- (ii) If the Contractor, being a company, shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager, on behalf of a creditor, shall be appointed or if circumstances shall arise, which entitle the court or creditor to appoint a receiver or a manager or which entitle the court to make a winding up order,

- (iii) If the contractor commits breach of any of the terms and conditions of this Contract,
- (iv) If the contractor commits any acts mentioned in, clause 26 thereof. When the Contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in charge on behalf of the Governor of Gujarat shall have powers: -
- a) To determine or rescind the contract, as aforesaid (of which determination or rescission notice in writing to the Contractor under the hand of the Engineer-in-charge shall be conclusive evidence), upon such determination or rescission, the earnest money, full security deposit of the contract shall be liable to be forfeited and shall be absolutely at the disposal of Government.
- b) To employ labour paid by the Department and to supply materials to carry out the work or any part of the work, debiting the Contractor with the cost of the labour and the price of the materials (of the amount of which cost and price certified by the Engineer-in-charge shall be final and conclusive against the contractor) and crediting him with the value of the work done in all respects in the same manner and at the same rates, as if it had been carried out by the Contractor under the terms of this Contract. The certificate of the Engineer-in-charge, as to the value of the work done, shall be final and conclusive evidence against the Contractor provided always that action under the sub-clause shall only be taken after giving notice in writing to the Contractor. Provided also that; if the expenses incurred by the Department are less than the amount payable to the Contractor at his agreement rates, the difference shall not be paid to the Contractor.
- c) After giving notice to the contractor to measure up the work of the contractor and to take such part thereof, as shall be unexecuted out of his hands, and to give it to another contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him (of the amount of which excess, the certificate in writing of the Engineer-in-charge shall be final and conclusive) shall be borne and paid by the original Contractor and may be deducted from any money due to him by Government under this contract or on any other account whatsoever, or from his Earnest Money, Security Deposit, Enlistment Security or the proceeds of sales thereof, or a sufficient part thereof, as the case may be. In the event of any one or more of the above courses being adopted by the Engineer-in-charge, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of contract. And, in case action is taken under any of provisions aforesaid, the Contractor shall not be entitled to recover or be paid, any sum for any work thereof or actually performed under this contract unless and until the Engineer-in-charge has certified, in writing, the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified. No interest shall be payable to the Contractor on any payment due or awarded by any authority.

(CLAUSE 25) Recovery from Contractors:

Whenever any claim against the Contractor for the payment arises under the contract, the Department may be entitled to recover such sum by:

- a) Appropriating, in part or whole of the Performance Guarantee and/or Security Deposit and / or any sums payable under the contract to the contractor.

b) If the amount recovered in accordance with (a) above is not sufficient, the balance sum may be recovered from any payment due to the contractor under any other contract of the department, including the securities which become due for release.

The department shall, further have an additional right to effect recoveries as arrears of land revenue under the Gujarat Land Revenue Code.

(CLAUSE 26) Work not to be sublet; consequences for unauthorised subletting, bribing and becoming insolvent.

The Contractor shall not sublet the entire work under the contract or any part thereof under any circumstances, except the specialised work which is permitted as described in following clauses.

The contractor shall be permitted to sublet the specialised work of Railway Crossings, by the Box Pushing technique. The contractor to which the subletting is proposed to be done, shall be an experienced contractor, who has successfully carried out similar crossing works in the Western Railway region. The contractor shall propose the name of specialised agency to the Engineer In Charge, along with the details of work completed by the specialised agency, proposed time schedule, equipment to be deployed for the proposed crossing works, arrangement for seeking approval from Railway authorities etc, to the Engineer In Charge for his approval to the agency.

The actual work on site shall start only on approval from the Engineer In Charge. The extent of the work allocated to the specialised agency shall be only for the Box structure to be pushed under the railway track. All the approaches, pipe laying and other auxiliary works related to the crossing shall be responsibility of the Contractor.

The contractor shall be responsible for the safety of work and labour and other laws for the sublet work to be carried out by the specialised agency. All the safety, insurance and legal requirement of this contract shall be applicable mutatis mutandis to the work sublet to the specialised agency.

The payments to such approved specialised agency shall be directly made by the Contractor. However, BHAVNAGARMUNICIPAL CORPORATION will have a right to recover from any amount due to the Contractor, any amount payable by the contractor to the engaged specialised agency. A tripartite agreement shall be signed between the Contractor, Specialised Agency and BHAVNAGARMUNICIPAL CORPORATION to that effect.

Contract may be rescinded and security deposit forfeited for subletting the work without approval or for bribing a public officer or if contractor becomes insolvent.

(CLAUSE-27) Sums payable by way of compensation to be considered as reasonable compensation without reference to actual loss:

All sums payable by a contractor by way of compensation under any of these conditions shall be considered as a reasonable compensation to be applied to the use of Government without reference to the actual loss or damage sustained and whether any damage has or had not been sustained.

(CLAUSE-28) Change in the constitution of firm to be notified:

In the case of a tender by partners, any change in the constitution of a firm shall be forthwith notified by the Contractor to Engineer-in- charge for his information.

(CLAUSE-29) Works to be under directions of Executive Engineer:

All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of **Executive Engineer** of the Division for the time being, who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried on.

(CLAUSE-30) Settlement of Disputes & Arbitration:

A) SETTLEMENTS OF DISPUTES:

- i) If any dispute of any kind whatsoever may arise between the Employer and the Contractor in connection with or arising out of the Contract, including without prejudice to the generality of the foregoing any question regarding its existence validity or termination, or the execution of the works whether during the progress of the work or before or after the termination, abandonment or breach of the contract, the either parties shall have to raise/ refer their disputes/ differences / claims in writing to the other party, within a period of 30 days on occurrence of such events, to resolve any such dispute or difference.
- ii) The contractor shall have to refer their disputes to the concerned City Engineer. After receipt of the dispute from the contractor under this clause, the CityEngineer In-charge of works shall have to submit their report to the Municipal Commissioner within a period of 90 (Ninety) days. The Municipal Commissionershall offer an opportunity to the contractor to be heard and to furnish evidence in support of their disputes within 30 (Thirty) days after the receipt of the disputes duly compiled by CityEngineer. After hearing the contractor regarding their disputes along with their documentary support and the concern CityEngineer& Executive Engineer in charge of the work, Municipal Commissionershall give decision within a period of 120 (One Hundred Twenty) days or the contractor is dissatisfied with the decision within 120 (One Hundred Twenty) days after the contractor has been heard. If The Municipal Commissionerdoes not give decision within 120 (One Hundred Twenty) days or the contractor is dissatisfied with the decision of the Municipal Commissioner, the contractor shall within 30 (thirty) days after receiving the instruction or decision, appeal to the Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATION. After hearing both the parties the Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATIONwill give reasonable decision within 180 (One Hundred Eighty) days from the date of receipt of appeal by the contractor. The decision of theMunicipal Commissioner BHAVNAGARMUNICIPAL CORPORATION shall be final and binding on both the parties. If the Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATIONdoes not give decision within 180 (One Hundred Eighty) days after the date of appeal by the contractor, the contractor will have right to refer the dispute to arbitration tribunal as per provision of clause "Arbitration". The case must be represent within one year to arbitration.

B) ARBITRATION:

- i) Subject to Clause (A) mentioned above and in the event of any dispute or difference arising out of or in any way relating to all concerning these contracts or the construction or effect of these contracts shall on the initiative of either party to the contract be referred to "The Arbitration Tribunal Constituted Under The Provision Of Gujarat Public Work Contract Dispute Arbitration Tribunal Act, 1992".
- ii) Deleted
- iii) The arbitration shall be conducted in accordance with the provisions of the "Gujarat Public Work Contract Dispute Arbitration Tribunal Act, 1992" or statutory modifications there on. The Arbitration shall be held at such place and time as the Tribunal may determine.

- iv) The decision of the tribunal shall be final and binding upon both the parties. The expenses of the arbitration shall be paid as may be determined by the Tribunal or equally both the party.
- v) Performance of the contractor under the contract shall if reasonably be possible, continue during the arbitration proceedings and payments due to the contractors by the owner shall not be withheld, unless they are the subject matter of the arbitration proceedings.
- vi) The dispute is deemed to have arisen on the date, on which Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATION shall not give his decision as mentioned above in Clause (A) or in the case of intimation of any decision, the contractor intimates in writing that he has finally refused to accept the offer made by the BHAVNAGARMUNICIPAL CORPORATION
- vii) Where any dispute arises between the parties to the work contract either party shall irrespective of whether such works contract provides for any arbitration or not, refer, within one year from the date that Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATION has not given the decision as per Clause (A) such dispute in writing to the Tribunal for arbitration in such form and accompanied by such documents or other evidence any by such fees, as may be prescribed.
- viii) Legal jurisdiction: All question relating to this Tender shall be governed by the law of India and shall be subject to jurisdiction of court at Bhavnagar, Gujarat.

(CLAUSE-31) Deleted.

(CLAUSE-32) Lump sum in estimates:

When the estimate on which a tender is made includes lump sum in respect of part of the contractor shall be entitled to payment in respect of the items of works involved of the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not in the opinion of the Engineer-in-charge capable of measurement, the Engineer-in-charge may, as his discretion, pay the lump sum amount entered in the estimate in the estimate and the certificate in writing or the Engineer-in-charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him, under the provisions of this clause.

(CLAUSE-33) Action where no specifications:

In the case of work for which there is no such specification, such work shall be carried out in accordance with the Divisional Specification and in the event of there being no Divisional Specifications, then, in such case the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-charge.

(CLAUSE-34) Definition of work:

The expression 'work' or 'works' where used in these conditions shall, unless there be something in the subject or context repugnant to such construction be construed to mean the work, of the works, contracted to be executed under or in virtue of the contract, whether temporary or permanent and whether original, altered, substituted or additional.

(CLAUSE-35) Non refund of quarry fees & Royalties:

The contractor shall pay the royalty to the competent authority/ local body as per rules. The contractor shall furnish quarterly the statement showing quarterly or quarried materials, from whom purchased (with full address of the seller) and copies of bills for purchase to the District Officer of the Mining and Geology

Department or authority competent to levy royalty in the area of work. Contractor shall also furnish such additional information as regards royalty payment to the Royalty authority. The royalty charges paid shall be

borne by the Contractor and shall not be reimbursed by the Executive Engineer (Authority: R & BD Circular No. TNC-2286-UO-39(19)-C, dtd,23/10/1989). Contractor is solely responsible to pay royalties to concern departments.

(CLAUSE-36) Compensation under the workmen's compensation Act:

The contractor shall be responsible for and shall pay compensation to his workman payable under the Workmen's Compensation Act. 1923 (VII of 1923) hereinafter called the said Act) for injuries caused to the workmen. If such compensation is paid by Government as principal under sub- section 12(1) of the said Act on behalf of the Contractor it shall be recoverable by Government from the contractor under sub-section 12(2) of the said section. Such compensation shall be recovered in the manner laid down in clause-1 above.

(CLAUSE-36A) Liability of the contractor in case of accidents

The contractor shall be responsible for and shall pay the expenses of providing medical aid to any workmen who may suffer a bodily injury as a result of an accident. If such expenses are incurred by BMC, the same shall be recoverable from the contractor for with and be deducted, without prejudice to any other remedy of Government from amount due or that may become due to the contractor.

(CLAUSE-36B) Arrangements for personal safety requirements and first aid

The contractor shall provide all necessary personal safety equipment and first aid apparatus available for the use of the person employed on the site and shall maintain the same in suitable condition for immediate use at any time and shall comply with the following regulations in connection therewith.

- (a) The workers shall be required to use the equipment so provide be the Contractor and Contractor shall take adequate steps to ensure proper use of the equipment by those concerned.
- (b) When work is carried on in approximately to any place where there is a risk of drowning all necessary equipment shall be provided and kept for use and all necessary steps shall be taken for the prompt rescue of any person, in danger.
- (c) Adequate provision shall be made for prompt first aid treatment of all injuries to be sustained during the course of the work.

(CLAUSE-37) Quantities in the tender to be considered approximate and they are subject to variations.

The quantities shown in the tender are approximate and no claim shall be entertained for quantities of work executed being less than those entered in the tender. The rates for the increased quantities as aforesaid will be fixed in the manner specified in Clause-14.

(CLAUSE-38) Employment of famine or other labour:

The contractor shall employ any famine, convict or other labour of particular kind or class, if ordered in writing to do so by the Engineer-in-charge.

(CLAUSE -39) Claim for compensation for delay in starting the work

No compensation shall be allowed for any delay caused in the starting of the work on account of delay in making available the full site of land at a time.

(CLAUSE-40) Claim for compensation for delay in the execution of work

No claim for compensation shall be allowed for any delay in execution of the work on account of water standing in borrows pits or compartment. The rates are inclusive of hard or cracked soil, excavation in mud,

sub soil water or water standing in borrow-pits and no claim for an extra rate shall be entertained unless otherwise expressly specified.

(CLAUSE -41) Entering upon or commencing any portion or work:

The contractor shall not enter upon or commence any portion or work except with the written authority and instruction of the Engineer-in-charge or of his subordinate in charge of the work. Failing such authority, the contractor shall be no claim to ask measurement of or payment for work.

(CLAUSE-42) Minimum age of person employed:

(i) No contractor shall employ any person who is under the age of 18 years.

(CLAUSE -43) Method of Payment: Payment shall be made by cheques or RTGS directly into account of the contractor

(CLAUSE -43-A) Set off Clause

Any sum of money due and payable to the contractor (including the security deposit returnable to the contractor) executing and Government work or work of any District Panchayat wholly financed as grant-in-aid under this contract shall be appropriated by any District Panchayat/ Government and shall be set off against any claim of the Government/ District Panchayat of Gujarat State by the District Panchayat of Gujarat State/ Government for the payment of a sum of money arising out or under any other contract made by the contractor with the Government/ District Panchayat of Gujarat State for the work wholly financed as grant-in-aid by Government of Gujarat State. When no such amount for purpose of the recovery from the contractor against any claim of the Government / District Panchayat of Gujarat State is available, such a recovery shall be made from the contractor as arrears of land revenue.

(CLAUSE -44) Check Measurements

- 44.1. The department reserves to itself the right to prescribe a scale of check measurement of work in general or specific scale for specific works or by other special orders.
- 44.2. Checking of measurement by superior officer shall supersede measurements by subordinate officer(s), and the former will become the basis of the payment.
- 44.3. Any over/excess payments detected, as a result of such check measurement or otherwise at any stage up to the date of completion of the defect liability period specified in this contract, shall be recoverable from the Contractor, as per clause 24 above.

(CLAUSE -45) Termination by Engineer in Charge

If the Contractor fails to carry out any obligation under the Contract, the Engineer in Charge may by notice require the Contractor to make good the failure and to remedy it within a specified reasonable time.

- 45.1. The Engineer in Charge shall be entitled to terminate the Contract if the Contractor:
 - a. abandons the Works or otherwise plainly demonstrates the intention not to continue performance of his obligations under the Contract,
 - b. the Contractor is declared as bankrupt or goes into liquidation other than for approved reconstruction or amalgamation;
 - c. without reasonable excuse fails to comply with the notice to correct a particular defect within a reasonable period of time as specified in Clause-3, Clause 20, Clause 21 and Clause 23.
 - d. the Contractor does not maintain a valid instrument of financial security as prescribed;

- e. the Contractor has delayed the completion of the Works by such duration for which the maximum amount of liquidated damages is recoverable;
- f. If the Contractor fails to deploy machinery and equipment or personnel or set up a field laboratory as specified in the contract document.
- g. If the contractor, in the judgment of the Engineer in charge has engaged in corrupt or fraudulent practices in competing for or in executing the contract as specified in clause 26.
- h. Any other fundamental breaches as specified in the Contract.

45.2. In any of these events or circumstances, the Engineer in Charge may, upon giving 14 days' notice to the Contractor, terminate the Contract and expel the Contractor from the Site. However, in the case of sub-paragraph (c) or (g), the Engineer in Charge may terminate the Contract immediately.

45.3. Notwithstanding the above, the Engineer-in-Charge may terminate the Contract for convenience by giving notice to the Contractor.

(CLAUSE -46) Payment upon Termination

If the contract is terminated under clause 45.2, the Engineer shall issue a certificate for value of the work done less liquidated damages, if any, less recoverable advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed as indicated in the Contract. The amount so arrived at shall be determined by the Engineer-in-Charge and shall be final and binding on both the parties.

46.1. Payment on termination under clause 45.3 above -

If the Contract is terminated under clause 44.3 above, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

46.2. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be recovered as per clause 25 above.

(CLAUSE -47) Rates inclusive of taxes but Excluding GST.

The rates to be quoted by the contractor must be inclusive of all taxes but Excluding GST. No extra payment on this account will be made to the contractor.

GST is already in force from 01-07-2017, so bidder has to quote their rate accordingly, however any new tax comes in force after submission of tender will be compensated as actual paid; after producing of necessary proof. This is applicable only up to three months prior to date of completion.

Variation in rate of tax or replacement of tax will not be compensating. The bidder has to quote rates including all taxes. The contractor must have GST number which they need to give in invoice for bill processing.

(CLAUSE-47A) Income tax:-

Deduction will be made at source on the contractor's bill towards Income tax by the employers as per prevailing rules of the Income tax authority.

(CLAUSE -48) Employment through Employment Exchange and local labour

The contractor should as far as possible, obtain his requirement of labourers skilled and unskilled, from the nearest Employment Exchange so as to utilize the local employment potential. If there are no local Employment Exchange or such Exchanges are not able to provide the required labour locally, suitable labourers should be utilized to the maximum extent possible.

(CLAUSE -49) Fair Wages:

If a Contractor fails to pay within '7' (Seven) days to the labourer(s)/ worker(s) the minimum wages prescribed by the Government under the Minimum Wages Act-1948 as in force from time to time, the Engineer-in-charge shall be at liberty to deduct the amount payable to the labourers/ workers from his (Contractor's) bills or deposit(s) payable by the contractor after making due inquiries and establishing the claim(s) of the labourer(s)/ worker(s).

The contractor shall not be entitled to any payment of compensation on account of any loss that the contractor may have to incur on amount of the action as aforesaid. Before the action as aforesaid, is enforced, a notice in writing to the contractor shall be issued by the Engineer-in-charge to pay the wages as per Minimum Wages Act in force at the relevant time. If contractor does not act as afore said within seven days, then the action contemplated as above shall be taken against him.

(CLAUSE -50) Deleted

(CLAUSE -51) List of Machinery:

The contractors shall also give a list of machineries in his possession and which they propose to use in the work.

(CLAUSE -52) Deleted

(CLAUSE -53) Local labour on normal rates:

The contractor shall have to engage local labour and person seeking employment where available on current minimum wage rate of Gujarat Government and revision if any.

(CLAUSE -54) Land on Hire and rental charges

Rent will be recovered from the contractor for the land (if available) given to them for stacking materials as well as for construction of temporary hutments etc.

Land Measuring Charges

As per latest prevailing Government rates applicable from time to time.

(CLAUSE -55) Vaccination to labourers

The contractor shall employ only such labour who shall produce a valid certificate of having been vaccinated against small pox within a period of last three years.

(CLAUSE -56) Camp Facilities to Workers.

1. Huts:

The contractor shall build sufficient number of huts on a suitable of land for the use of the labourers according to the following specifications:

- (1) Huts of bamboos and grass may be constructed.

(2) A good site shall be selected. High ground removed from jungle but well provided with trees shall be chosen wherever it is available. The neighbourhood of rank jungle, grass or weeds should particularly be avoided. Camps should not be established close to large cuttings of earth-work.

(3) The lines of huts shall have open spaces of at least 10 m. between rows. When a good natural site cannot be procured, particular attention should be given to the drainage.

(4) There should be no over-crowding. Floor spaces at the rate of 2.8 Sq. m. per head shall be provided.

Care should be taken to see that the huts are kept clean and in good order.

(5) The contractor must find out his own land. If he wants Government land, he should apply for it and pay assessment for it.

2. Drinking Water:

The contractor shall as far as possible, provide an adequate supply of chlorinated pure potable drinking water for the use of labourers.

3. The contractor shall construct semi-permanent latrines for the use of labourers on the following scale, namely:

(a) Where female are employed, there shall be at least one latrine for every 25 females.

(b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that where the number of males or female exceed 100, it shall be sufficient if there is one latrine for every 25 males or females, as the case may be upto the first 100 and one for every 50 thereafter.

4. **Privacy in latrines:** Every latrine shall be under cover and so partitioned off as to secure privacy and shall have a proper door and fastenings.

5. Notice to be displayed outside latrines and urinals:

(1) Where workers of both sexes are employed there shall be displayed outside each block of latrine and urinal a notice in the language understood by the majority of the workers for Men Only or For Women Only : as the case may be.

(2) The notice shall also bear the figures of a man or of women, as the case may be.

6. **Urinals:** There shall be at least one urinal for male/ female workers upto 50 employed at a time. Provided that where the number of male or female workmen, as the case may be, exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to first 500 and one for every 100 males or females or part thereof.

7. Latrines and Urinals to be accessible:

(1) The latrines and urinals shall be conveniently situated and accessible to workers at all times at the establishment.

(2)(i) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

(2)(ii) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.

8. Water for latrines and urinals:

Water shall be provided by means of pipes of tanks or their wise, so also be conveniently accessible in or near the latrines and urinals.

9. Bathing and washing places:

- (1) The contractor shall construct sufficient number of bathing places; every unit of 20 persons being provided with a separate bathing place.
- (2) Washing places should also be provided for the purpose of washing clothes. Every unit of 30 persons shall have at least one washing place.
- (3) Such bathing and washing places should be suitably screened and separate places provided for male and female workers.
- (4) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

10. Drainage:

The contractor shall make sufficient arrangement for drainage away the sewerage water as well as water from the bathing and washing places and shall dispose of this waste water in such a way as not to cause nuisance. The contractor should obtain a permission from the Gujarat Water Pollution Control Board, Gandhinagar of Water is so be drained in rive or near the well. The contractor would put malarial oil once in a week in stagnant water round about the residence.

11. Medical Facilities:

The contractor shall engage a medical officer with a travelling dispensary for a camp having 500 or more persons if there is no Government or other private dispensary situated within 6 km from the camp.

12. Conservancy and cleanliness:

The contractor shall provide the necessary staff for effecting the satisfactory conservancy and cleanliness of the camp to the satisfaction of the Engineer-in-charge. At least one sweeper per 200 persons should be engaged. Conservancy staff should dump refuse in compost pit, away from the labour camp.

13. Health Provisions:

The District Health Officer of the District or the Deputy Director of Health services shall be consulted before opening a labour camp and his instructions on matters such as water supply, sanitary convenience, the camp-site accommodation and food supply shall be followed by the contractor.

14. Precaution against epidemic:

- (a) The authorities in charge of the colonies should get the labourers inoculated against cholera and plague and vaccinated against smallpox at the time of recruitment, if they are not inoculated or vaccinated within 6 months or 3 years respectively prior to the date of recruitment.
- (b) When, in any labour camp there is an epidemic disease or is threatened with such an outbreak, the authorized in charge of the labour camps should ensure that all the inmates of the labour colonies are inoculated or vaccinated as the case may be depending on the diseases, within 72 hours after the outbreak.

- (c) The authorities in charge of the labour colony should arrange to communicate by wire regarding the outbreak of the epidemic disease on the very day of the outbreak, to the Mamlatdar of the Taluka, the District Health officer or to the Deputy Director of the above officers in the prescribed form regarding the progress of the epidemic disease.
- (d) When the authorities in charge of the labour colony suspect or have reason to believe that any inmate of the labour colony is suffering from the infectious or contagious disease, they shall forthwith arrange for the segregation of such persons to isolated huts to be specifically provided for the purpose and also for their treatment.
- (e) As regional malaria epidemic outbreaks are likely to occur in such project areas, the authorities in charge of the labour colonies should report promptly the occurrence of unusual incidence of cases of malaria and also inform the District Health Officers of the District Deputy Director of Public Health (Malaria) and the Director of Public Health and also arrange to institute all necessary anti-malarial measures as may be advised by the officials of the Public Health Department.
- (f) The authorities in charge of the colonies should also arrange to carry out any other measures that may be recommended by the officials of the Public Health Department necessary to prevent or control the spread of disease.

15. Rest Rooms

- (1) In every place where in contract labour is required to halt at night in connection with the contract works and in which employment of contract labour is likely to continue for three months or more, the contractor shall provide and maintain rest rooms or other suitable alternative accommodation within fifteen days of the employment of contract labour.
- (2) If the amenity referred to in sub-rule is not provided by the contractor within the period prescribed the employer shall provide the same within a period of fifteen days of the expiry of the period laid down in the sub-rule(1).
- (3) Separate rooms shall be provided for women employees.
- (4) Effective and suitable provision shall be made in every room for securing and maintaining adequate ventilation for the circulation of fresh air and there shall also be provided and maintained sufficient and suitable natural or artificial lighting.
- (5) The rest room or other suitable alternative accommodation shall be of such dimensions as to provide at least a floor area of 1 sq. mt. for each person making use of rest rooms.
- (6) The rest rooms or other suitable alternative accommodation shall be so constructed as to afford adequate protection against heat, wind, rain and shall have smooth, hard and impervious surface.
- (7) The rest rooms or other suitable alternative accommodation shall be at a convenient distance from the establishment and shall have adequate supply of wholesome drinking water.

16. Canteen Facilities:

- (1) In every establishment of contract work and wherein work regarding the employment of contract labour is likely to continue for six months and wherein contract labour numbering one hundred or more are ordinarily employed, the adequate canteen facilities shall be provided by

the contractor for the use of such contract labour within sixty days of the commencement of the employment of contract labour.

- (2) If the contractor fails to provide the canteen facilities within the time laid down the same shall be provided by the principal employer within sixty days of the time allowed to the contractor.
- (3) The Canteen shall be maintained by the contractor or principal employees as the case may be in an efficient manner.

17. Accommodation in canteen:

- (1) The canteen shall consist of at least dining hall, kitchen, storeroom, pantry and washing place separately for workers and for utensils.
- (2)(i) The canteen shall be sufficient lighted at all times where any person has access to it.
- (ii) The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colour-washed at least once in each year, provided that the inside walls of the kitchen shall be lime-washed every four months/
- (3)(i) The premises of the canteen shall be maintained on clean and sanitary condition.
- (ii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as cause nuisance.
- (iii) Suitable arrangements shall be made for the collection and disposal of garbage.

18. Accommodation in dining hall:

- (1) The dining hall shall accommodate at a time, at least 30% of the contract labour working at a time.
- (2) The floor area of the dining hall excluding the area occupied per dinner to be accommodated shall as prescribed in sub-rule (1).
- (3) (i) A portion of the dining hall and service counter shall be partitioned and reserved for women workers, in proportion to their numbers (ii) Washing places for women shall be separate and screened to secure privacy.
- (4) Sufficient table, stools, chairs or benches shall be available of the number of dinners to be accommodated as prescribed in sub-rule-1.

19. Equipment in canteen:

- (1)(i) There shall be provided and maintained sufficient utensils, crockery, cutlery, furniture and any other equipment necessary for the efficient running of the canteen.
- (ii) The furniture utensils and other equipment shall be maintained in a clean and hygienic conditions.
- (2)(i) Suitable clean clothes for the employees serving in the canteen shall also be provided and maintained.
- (ii) A service counter, if provided, shall have a top of smooth and impervious materials.
- (i) Suitable facilities including and adequate supply of hot water shall be provided for the cleaning of utensils and equipment.

20. Food stuff to be served:

The food stuff and other items to be served in the canteen shall be in conformity with the normal food habits of the contract labour.

21. Prices to be displayed:

The charges of food stuffs, beverages and any other item served in the canteen shall be based on 'no profit, no loss' and shall be conspicuously displayed in the canteen.

22. Canteen to be run on 'No profit no loss' basis:

In deriving the prices of food stuffs and other articles served in the canteen, the following items shall not be taken into consideration as expenditure namely.

- (a) The rent for the land and building.
- (b) The depreciation and maintenance charges for the building and equipment provided for in the canteen.
- (c) The cost of purchase, repairs, and replacement of equipment including furniture, crockery, cutlery and utensils.
- (d) The water charges and other charges incurred for lighting and ventilation.
- (e) The interest on the amount spent on the provisions and maintenance of furniture and equipment provided for in the canteen.

The local officers should check up whether, facilities as offered and which are admissible under the existing rules and orders are made available to the workers and enforce upon the contractors the necessary of adhering the instructions for promotion of welfare of the workers according to the terms of the contract.

23. Books of accounts and registers of the canteen:

The books of accounts and registers and other documents used in connection with the running of the canteen shall be produced on demand to an inspector.

24. Audit of the Account of the Canteen:

The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors; provided that the Labour Commissioner may approve of any other person to audit the accounts, if he is satisfied that it is not feasible to appoint a registered accountant and auditor in view of the size or the location of the canteen.

(CLAUSE -57) Gum boots, hand gloves, masks etc, to labourers

Contractor shall have to arrange for the supply of gumboot, Hand gloves, and mask etc. invariably the labourers / workers engaged by the contractor on asphalt work.

(CLAUSE -58) No distinction between harijans and other workers

The contractor shall not show any distinction between Harijan and other class of labourers/ workers employed in carry out the Government work.

(CLAUSE -59) Price Variation Clause: Deleted

(CLAUSE -60) Fencing and lighting:

- (a) The contractor shall, unless otherwise specified, be responsible for the proper fencing, lighting grading and taking of the necessary safety measures for all works comprised in the contract and for the proper

provision of temporary road, ay, foot-way, guards, fences, caution notice etc. as far as the same may be rendered necessary by reasons of the work for the accommodation of workmen, foot passengers or other traffic and of owners and occupiers of adjacent property and the public and shall remain responsible for any accidents that may occur on account of his failure to take proper & timely precautions.

- (b) All the arrangements made for fencing and lighting shall be maintained by the contractor through the currency of the contract till the physical taking over of the work by department.

(CLAUSE -61) Liability of Accidents to Persons:

Responsibilities and liabilities of the contractor under workmen's compensation act are give in clause-37 in addition following shall also apply: (a) On the occurrence of an accident, which result 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 BMC against all loss or damage sustained by the Government resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines, if any, payable by the Government as a consequence of Government's 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 out 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 a liability. The opinion of the Engineer-in-charge shall be final in regard to all matters arising under this clause.

(CLAUSE -62) Access to site and work on site:

The Engineer may, if he considers fit from the time, enter upon any land(s) which may be in possession of the contractor his contract for the purpose of executing any work not included in this contract and may execute such works not included in this contract by agents or by other contractors, at his opinion and the contractor shall, in accordance with the requirements of the Engineer-in-charge, afford all reasonable facilities for execution of the work including occupation of lands by structure or otherwise for any other contractor employed by the Government and his workmen or for the workmen of the Government who may be employed in the execution on or near the site of the work not included in the contract or of any contract in connection with or ancillary to the work and in default, the contractor shall be liable to the Government for any delay or expense incurred by reason of such default. Provided always that if damage arising, make a statement of the same of the Engineer-in-charge who shall from time to time, assess the value in his judgment of such damage and the Government shall from time to time pay to the contractor the amount (if any) accepted as justified by the Engineer-in-charge.

(CLAUSE -63) Reports Regarding Labour:

The contractor shall submit the following reports to the Engineer-in-charge:

- (i) A daily report in the suitable format of the strength of labour, both skilled and unskilled employed by him on the work(s). The contractor shall increase or decrease the strength both skilled and unskilled. If directed by the Engineer-in-charge. The submission of such reports shall not, however, relieve the contractor of his responsibilities and duties regarding progress or any other obligation under the contract.

- (ii) A classified weekly return in the suitable form of the number of person employed on the works during the preceding week.
- (iii) A weekly return in the suitable form showing the health of the contractor's camp, the number of person's ill of in capacities and the nature of their illness.
- (iv) A report of any accident, which may have occurred, to be sent within 24 hours of the occurrence.
- (i) Such other report as may be prescribed.

(CLAUSE -64) Treasure Trove:

In the event of discovery by the contractor or his employees, during the progress of work of any gold, silver, oil or other minerals of any description and precious stones, treasures, coils, antiques, relic, fossils or other articles or value of interest whether geological, archaeological or any other such treasure & other things shall be deemed to be the absolute property of the Government and the contractor shall duly preserve the same to the satisfaction of the Engineer-in-charge from time to time, and relive the same to such persons as the Engineer-in-charge may appoint.

The contract shall take all reasonable precautions to prevent his workmen or any other person from removing or damaging any such articles or things, immediately after the discovery thereof the before removal acquaint the Engineer-in-charge with such discovery and carry out his orders for the disposal of the same.

(CLAUSE -65) Indemnity:

The contractor shall indemnify the Government against all actions, suits, claims and demands through or made against the department in respect of work of this contractor against any loss damage to Department in consequence of any action or suit being brought against the contractor for anything done or omitted to be done in execution of the work of this contract.

(CLAUSE -66) Insurance of Labourers:

The contractor shall be responsible to arrange for insurance of all labourers, skilled and unskilled workers, supervisors etc. employed by him as per labour regulation of the state.

(CLAUSE -67) Setting out:

The contractor shall be responsible for the true and proper setting out of the works and the correctness of positions, levels, dimensions and alignments of all parts of the work and for the provisions of all necessary instruments, appliance and labour in connection therewith. If, at any time, during the progress of the work, any errors, appear or arise in the position, levels, dimensions or alignments or any part of the work, the contractor, on being required to rectify such errors by the Engineer-in-charge shall at his own expense do so to the satisfaction of the Engineer-in-charge. If however, such error is based on incorrect data supplied in writing by the Engineer-in-charge, the expenses of rectifying the same shall be borne by the Department. The checking of and setting out of any line or level by the Engineer-in-charge or his representative shall not in any way, relive the contractor of his responsibilities for the correctness of the error. The contractor shall carefully protect and observe all bench-marks, site-nails, page and other things used in setting out of the work(s).

(CLAUSE -68) Cement & Steel Register:

A register in the prescribed form showing day-to-day receipt, consumption and balance of cement, steel on site of work will be maintained by the contractor, which shall invariably be signed daily by the contractor or his authorized representative in token of its correctness and get witness sign of PMC agency.

(CLAUSE -69) Materials and Works Test Register:

A register in the prescribed form showing day to day receipt, consumption and balance of cement on site of work by the Department, which shall invariably be signed by the Contractor or his authorized representative in taken of its correctness and get witness sign of PMC agency.

(CLAUSE -70) Progress Schedule:

- (a) The contractor shall furnish within one month (unless extended by the Engineer-in-charge) of the order to start the work, the progress schedule in quadruplicate indicating the date of starting, the monthly expected to be achieved and the anticipated completion date of each major item of work to be done by him, also indicating dates of procurement and setting up the materials, plants and machinery. The schedule should include a statement of proposed general and detailed arrangements for carrying out works, and of item, order and manner in which it is proposed general and detailed arrangements for carrying out works, and of item, order and manner in which it is proposed that these shall be executed. The schedule should be framed keeping requirement of the clause-2 of tender form in view and be such as in practice to the achievement towards completion of the work in the time limit and of the particular items on the dates specified in the contract and shall have to approval of the Engineer-in-charge. Further, the dates for the progress, as in this schedule shall be adhered to.
- (a) In case it is found necessary, at any stage to alter the schedule the contractor shall submit in good, time a revised schedule incorporating necessary modification proposed and get the same approved from the Engineer-in-charge. No revised schedule shall be operative without such acceptance in writing. The Engineer-in-charge is further empowered to ask for more detailed schedule or schedules, any week by week for any item or items and the contractor shall supply the same as and when asked for.
- (b) The Engineer-in-charge shall have at all times the right without in any way vitiating this contract forming grounds for any claim, to alter the order of the work of any part thereof and the contractor shall after receiving such direction, proceed in the order directed. The contractor shall also revise the progress, schedules accordingly and submit four copies of the revised schedule to the Engineer-in-charge within seven days of the said Engineer's direction to alter the order of works.
- (c) The contractor shall furnish sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress of the work as per approved progress-schedule. The working and shift hours shall comply with all the Government regulations in force and shall be such, as may be approved by the Engineer-in-charge and the same not be varied without the prior approval of Engineer-in-charge.
- (d) The contractor shall from time to time, as may be required by the Engineer-in-charge, furnish the Engineer-in-charge with a statement in writing of the arrangements he proposes to adopt for the execution of this contract and the Engineer-in-charge may, if he considers necessary at any time advise alternation in the same, which the contractor shall adopt on notice thereof.
- (e) The progress schedule(s) shall be in the form of progress chart, forms, statements, and/ or reports as may be approved by the Engineer-in-charge.

The contractor shall submit four copies showing the progress of the work in the form of a chart etc., at periodically intervals as may be specified by Engineer-in-charge.
- (f) The Approval of the progress schedules by the Engineer-in-charge shall not relieve the contractor of schedule require by the Engineer-in-charge shall not entitle the contractor to any extra payment.

(CLAUSE -71) Secured Advance : Deleted

(CLAUSE -72) Advance Payment : Deleted

(CLAUSE -73) Advance against Machineries : Deleted

(CLAUSE -74) DELETED:

(CLAUSE -75) License for contract labour

Before, starting the work, the contractor will have to obtain the license from the District Assistant Labour Commissioner under the Contract Labour (Regulation and Abolition) Act, 1970 and contract Labour (regulation and Abolition) Gujarat Rules 1972 after paying necessary fees and deposit on the basis of the number of labourers to be employed on the work and will have to supply two true copies of the said licence to the Executive Engineer before the work is started.

(CLAUSE -76): Recovery of Testing Charges and handing over empty cement bags

All testing charges such as steel, cement, cubes, destructive tests of pipe weld joints etc shall be paid by the contractor. All inspection charges payable to factory and laboratory inspection shall be borne by the contractor. The charge to be pay to PMC/TPI will be borne by BMC.

(Clause: 77): Recover of Sales Tax – Not Applicable

(Clause: 77A): Any other new tax comes inforce after submission of tender, it will be reimbursed by BMC in actual subject to produce the original receipts and documents to department for verification etc.

(Clause: 78): Building and other construction works welfare cess (Labour cess)

As per Building and other construction works welfare cess act and the provision under Rule No.5 of the rules of 1998 of Gujarat State, the 1% cess shall be recovered from the running account bill of the contractor.

(Clause: 79): Police Protection

If police is asked for protection by the contractor for special protection of his camp of work, the client may arrange for such protection so far as possible with the authority concerned and the full cost of such protection shall be debited to the contractor and recovered from his bills. The contractor shall launch FIR if needed.

SPECIAL CLAUSE

(A) ROYALTIES

The Contractor shall be liable to pay the royalty of the quarried materials /minerals used in the construction of works at the rates specified in the Narmada Water Resources, Water Supply & Kalpsar Dept. Resolution No. GEN-2010-595-(6) – M.I cell (k-1) Dtd.29/4/11 (Gujarati version, Copy enclosed)

The contractor shall furnish the statement showing the quantity of quarried materials / minerals from whom purchased (with full address of the seller) and copies of the bills for purchase to the Executive Engineer of the in charge of the work. The contractor shall also furnish such additional information as regards royalty payments to the competent authority.

(B) GENERAL DESIGN OBLIGATIONS:

The contractor shall be deemed to have scrutinized, the employer's requirements (including design criteria and calculations, if any). The contractor shall be responsible for the design of the works and for the accuracy of such employer's requirements (including design criteria and calculation). The employer shall not be responsible for any error, inaccuracy or omission of any kind in the employer's requirements as originally included in the contract and shall not be deemed to have given any representation of accuracy or completeness of the any data or information. Any data or information received by the contractor, from the employer or otherwise, shall not relieve the contractor from his responsibility for the design and execution of the works.

Technical Standards and Regulations: The design, the contractor's documents, the execution and the completed works shall comply with the Country's technical standards wherever available or with international standards, building construction and environmental Laws, Laws applicable to the product being produced from the works and other standards specified in the employer's requirements applicable to the works or defined by the applicable Laws.

(C) Additional security to be withheld for unbalance rates:

Payments for the items where contractor has quoted rate higher than 10% over estimated rates in the item:

If the contractor has quoted unbalanced rates for items i.e. more than 10 (ten) percent of the overall percentage of accepted tender. The payment of such items in the running bills will be made at estimated rate of that item plus or minus overall variation percentage of the accepted tender plus five percent of the estimated rate of that item, the balance amount as per accepted tender rate will be withheld from running bills and will be released as per R&B Department Circular no PARCH/102008/(61)C dated 03-05-2013. No interest will be payable for such withheld amount (R&B Department Circular no .PARCH/102008/(61) dated 27-11-2008).

(D) The contractor has to submit required design documents, Drawings, Design calculations etc in four sets for approval to department. The contractor is liable to submit all the documents for approval within three months from the date of LOI and will resubmit within 15 days after incorporating queries if arise any.

(E) Contractor will submit following documents along with final bill duly signed by contractor and PMC/TPI.

- a. All test reports – cement, steel, material consumption and material receipt original registers.
- b. All goods inspection reports original.
- c. flow test register original.
- d. As Built Drawing (UTM Cordinate)

Annexure-1

Providing, Lowering, Laying, Jointing, Testing and Commissioning of Sewer upgradation Network along with defect liability period for 2 years at different eastern areas of Bhavnagar under AMRUT 2.0 Grant.

INTEGRITY PACT

OUR COMMITMENT

We commit ourselves to trust, transparency and setting ethical standards in implementation of various works for ultimate long term benefits for society. We also reiterate our commitment to development to mutual respect and best practices for setting very high quality standards in works and attitude.

OUR CONDUCT

We abide to accomplish our work with

- Integrity and trust
- Ethics and courtesy
- Transparency and quality.

BHAVNAGARMUNICIPAL CORPORATION Commitment	Party's Commitment
<ul style="list-style-type: none">● To maintain high ethical standards● To ensure transparency in transactions● To ensure to abide by the terms of agreement of contract and to consider the views of parties objectively.● To try to ensure timely payments for work done.● To ensure that no improper demand is made by employees or by anyone on their behalf.● To provide maximum possible help to all contractors/ vendors/suppliers and any other party working with us so that the contracted assignment is completed in time. <p>Municipal Commissioner Bhavnagar Municipal Corporation Bhavnagar</p>	<ul style="list-style-type: none">● Not to bring pressure/recommendation from outside to influence decision.● To abide by general discipline to be maintained in our dealings.● To be prompt and reasonable in fulfilling the terms of agreement of contract and legal obligations.● To ensure high standards are set for quality of work or supplies at lowest possible cost.● Not to use any pressure, threat, intimidation or inducement of any kind of any of the employees.● To be true and honest in furnishing specification and information and make all efforts for completing the contracted assignment well in time. <p>Signature of Contractor</p>

Building ethical Partnership and working Together

Annexure-2

INSURANCE

The contractor shall without limiting his or the employer obligations and responsibilities insure:

- a) The works , together with materials and plants for incorporation therein, to the full replacement cost (Term "Cost" in this context shall include profit)
- b) The contractor equipments and other things brought onto the site by the contractor, for a sum sufficient to provide for their replacement at site.
- c) The insurance detailed above shall be in the joint names of the contractor and the employer at the contractor's cost and shall cover the employer and the contractor against all loss or damage from whatsoever cause arising from the start of date of work to the completion of operation and maintenance period as per the scope of work.

Any amount not insured or not recovered from the insurer shall be borne by the Employer or the contractor in accordance with their responsibilities under Clause-1.

The contractor shall except if and so far as the contractor provides otherwise, indemnify the Employer against all losses and claims in respect of,

- a) Death or injury to any person, or
- b) Loss of or damage to any property (other than the works) which may arise out of in consequent of the Operation and maintenance of the facility and the remedying of any defects therein, and against all claims proceedings, costs, charges, and expenses whatsoever in respect thereof or in relation thereto.

The "Expectations" referred to are:

- a) The permanent use or occupation of land by the works, or any part thereof,
- b) The right of then Employer to execute the works , or any part thereof on, under in or through any land
- c) Damage to property which is the unavoidable result of the execution and completion of the works or remedying of any defects therein, in accordance with the contract and
- d) Death of or injury to persons or loss of or damage to the property resulting from any act or neglect the Employer ,his agent, servant or other contractor not being employed by the Contractor or in respect of any claims proceedings, damages, cost, charges and expenses in respect thereof or in relation , where the injury or damages was contributed to by the contractor, his servant or agents, such part of said injury or damages as may be just and equitable having regards to the extent of responsibility of the Employer, his servants or agents or other contractor for injury or damage

The Employer shall indemnify the contractor against all claims, proceeding, damages, cost, charge and expenses.

The contractor shall without limiting his or the employer's obligations and responsibilities issue, joint name of the contractor and responsibilities, insure in the joint name of the contractor and the employer, against liabilities for death or injury to any person or loss of damages to any properties (Other than the facility) arising out of the operation and maintenance of the project other than the exceptions defined.

The insurance policy should include a cross liability clauses such that the insurance shall apply to the contractor and to the employer as separate insurer.

The employer shall not liable for or in respect of ant damages or compensation payable to any workman or other person in the employment of the contractor or any subcontractor, other than death or injury resulting from any act or default of the employer, his agent or servants. the contractor shall indemnify and keep indemnified the employer against al such damages and compensations, other than those for which the employer is liable as aforesaid, and against all claims ,proceeding, damages, costs, charges, and expenses what so ever in respect there of or in relation thereto.

The contractor shall insure against such liability and shall continue such insurance during the whole of the tie that any persons are employed by him or the facility provided that in respect of any person, employed by any subcontractor, the contractors obligation to insure as aforesaid under this sub clauses shall be satisfied if the subcontractor shall have insured against the liability in respect of such person in such manner that the employer is indemnified under the policy, but the contractor shall require such subcontractor to produce to the employer, when required such policy of insurance and receipt for the payment of the current premium.

In the event that the contractor or the employer fails to comply with the condition imposed by the insurance policy affected pursuant to the contract, each will indemnify the other against all loses and claims arising from such failure according to the contract conditions.

In view of circular no. vigilance cell/inspection note/188 dated 19/3/2012 of CEO, GWIL, Gandhinagar (copy of circular in Gujarati version is attached at Annexure-4)

1. Agency shall have to take insurance policy and intimate to BHAVNAGARMUNICIPAL CORPORATION along with the evidence within time limit. In case of noncompliance entire responsibility shall be rest with the agency and required amount shall be recovered from any due amount of the agency.
2. BHAVNAGAR MUNICIPAL CORPORATION can recover penalty amount from the agency for not taking the insurance. Though the penalty amount is recovered, responsibilities of the agency for taking insurance shall be continued and will not be escaped from this responsibility.

Annexure 3

- The contractor shall have to follow this:

ક્રમાંક : આ.ડા/ઇસેહે/ભાવ/૨૦૧૯/૨૨૩
આસિસ્ટન્ટ ડાયરેક્ટર, ઇન્ડસ્ટ્રીયલ સેફ્ટી એન્ડ હેલ્થની કચેરી
ટી-૮/બી, બહુમાળી ભવન, પેલેસ રોડ, ભાવનગર-૩૬૪૦૦૧
તા: ૨૦/૦૨/૨૦૧૯

પ્રતિ,
મ્યુનિસિપલ કમિશ્નરશ્રી,
ભાવનગર મ્યુનિસિપલ કોર્પોરેશન,
ભાવનગર-૩૬૪૦૦૧

વિષય: મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ રોજગારી) નુ નિયમન અને નોકરી ની શરતો અધિનિયમ ૧૯૯૬ હેઠળ (બાંધકામ કરતી સંસ્થા ની નોંધણી કરાવવાનો કલોસ ટેન્ડર/LOC/વર્ક ઓડર રાજચિટ્ટીમાં/ઉમેરવા બાબત.

મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ રોજગારી) નુ નિયમન અને નોકરી ની શરતો અધિનિયમ ૧૯૯૬ ની કલમ ૪૬ ()-તેમજ તે હેઠળ ન નિયમ ૫૫૧ મુજબ (બાંધકામ પ્રવૃત્તિ શરૂ કરવાના દિવસ પહેલા આવી પ્રવૃત્તિ ચાલુ કરવાની ચોક્કસ ૩૦ ૪ માં તેમના વિસ્તારના -તારીખ તથા પ્રવૃત્તિ પુરી કરવાની સંભવિત તરોખ તથા અન્ય વિગતોની નોટિસ નિયત નમૂના બાંધકામ નિરીક્ષકની કચેરીએ મોકલી આપવાની હોય છે .કલમ ૭ તેમજ તે હેઠળ ના નિયમ દરેક માલિકે કામકાજ શરૂ કર્યા ના ૬૦ દિવસમાં બાંધકામ સાઇટ ની નોંધણી www.ifp.gujarat.gov.in વેબસાઇટ પર જરૂરી દસ્તાવેજ સાથે ઓનલાઇન કરવાની રહે છે

વધુમાં બાંધકામ વ્યવસાયમાં રોકાયેલ અને ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગી કલ્યાણ બોર્ડમાં નોંધાયેલ શ્રમયોગીને ચાલુ કામે અત્રેની કચેરીએ નોંધાયેલ બાંધકામ સાઇટના સ્થળે અકસ્માતે મૃત્યુ થતાં મૃતક શ્રમિકના વારસદારને -/૩૦૦૦૦૦રૂપિયા ની નાણાકીય સહાય પૂરી પાડવામાં આવે છે તેમજ શ્રમયોગી ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગી કલ્યાણ બોર્ડમાં નોંધાયેલ ન હોય પરંતુ બાંધકામ સાઇટ ની નોંધણી અત્રેથી કચેરીએ કરાવેલ હોય તેવા કિસ્સામાં મૃતક શ્રમિકના વારસદારને -/૧૫૦૦૦૦રૂપિયા ની નાણાકીય સહાય પૂરી પાડવામાં આવે છે પરંતુ અનુભવે ધ્યાનમાં આવેલ છે કે અકસ્માત સમયે બાંધકામ સાઇટ નું રજીસ્ટ્રેશન અત્રેની કચેરીએ થયેલ હોતું નથી જેથી આપના દ્વારા આપવામાં આવતા ટેન્ડર/LOC/વર્ક ઓડર રાજચિટ્ટીમાં / રો) મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ “ સદર કાયદા હેઠળ બાંધકામ સાઇટનું રજીસ્ટ્રેશન કરાવવાનો આ મુજબનો જગારીનું નિયમન અને નોકરીની શરતો અધિનિયમ (, ૧૯૯૬ હેઠળ દરેક માલિકે બાંધકામ પ્રવૃત્તિ શરૂ કરવાના ૩૦ દિવસ પહેલા સદર ” ૪ માં નોટિસ બાંધકામ નિરીક્ષક-કાયદા હેઠળના નિયત નમૂના, આસિસ્ટન્ટ ડાયરેક્ટર, ઇન્ડસ્ટ્રીયલ સેફ્ટી એન્ડ હેલ્થની કચેરી, ટી-બી/૮, બહુમાળી ભવન, પેલેસ રોડ, ભાવનગર ખાતે મોકલી આપવાની રહેશે તેમજ કામકાજ શરૂ કર્યાના ૬૦ દિવસમાં બાંધકામ સાઇટની નોંધણી કરવાની રહેશે કલોઝ ઉમેરવામાં આવે તેમજ સંસ્થા દ્વારા સદર કાયદા હેઠળ બાંધકામ સાઇટની નોંધણી કરાવવામાં આવે તો આવા અકસ્માત સમયે મૃતક શ્રમિકના વારસદારને નાણાકીય શે આપી શકાય. આ ઉપરાંત પણ ઉક્ત બાંધકામ બોર્ડ દ્વારા બાંધકામ શ્રમિકો માટે વિવિધ ૨૦ થી વધુ પ્રકારની કલ્યાણલક્ષી યોજનાઓની અમલવારી કરવામાં આવે છે આથી તે અન્વયે પણ શ્રમિકોને લાભો મળી શકે તે સારું શ્રમિકોની સદર બોર્ડમાં લાભાર્થી તરીકે નોંધણી થવી જરૂરી છે.

૨૭ એપ્રિલ/૨૦૧૭

ક્રમાંક : આ.ડા./ઈસેઈ/ભાવ/૨૦૧૯/૨૨૩

આસીસ્ટન્ટ કાયરેક્ટર, ઇન્ડસ્ટ્રીયલ સેફ્ટી એન્ડ
હેલ્થની કચેરી, ટી-૮/બી, બહુમાળી ભવન, પેલેસ રોડ,
ભાવનગર-૩૬૪૦૦૧

તારીખ- ૨૦/૦૨/૨૦૧૯

પ્રતિ

મ્યુનિસિપલ કમિશનરશ્રી,
ભાવનગર મ્યુનિસિપલ કોર્પોરેશન,
સર મંગલસિંહજી રોડ, કાળનાળા,
ભાવનગર-૩૬૪૦૦૧

વિષય:- મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ (રોજગારીનું નિયમન અને નોકરીની શરતો)
અધિનિયમ, ૧૯૯૬ હેઠળ બાંધકામ કરતી સંસ્થાની નોંધણી કરાવવાનો કલોઝ ટેન્ડર/૧૦૧/વર્ક
ઓર્ડર/૨જાચિક્રીમાં ઉમેરવા બાબત.

ઉપરોક્ત વિષય અન્વયે જણાવવાનું કે, કેન્દ્ર સરકાર દ્વારા બાંધકામ શ્રમયોગીઓને લગતાં બે
કાયદાઓ "મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ (રોજગારીનું નિયમન અને નોકરીની શરતો)
અધિનિયમ, ૧૯૯૬" અને "મકાન અને અન્ય બાંધકામ શ્રમયોગીઓનું કલ્યાણ સેસ અધિનિયમ, ૧૯૯૬"
ઘડવામાં આવેલ છે. જે અનુક્રમે તારીખ ૦૧/૦૩/૧૯૯૬ અને તારીખ ૦૩/૧૧/૧૯૯૫ થી સમગ્ર ભારતમાં
અમલમાં છે. પ્રથમ કાયદાની જોગવાઈઓના અમલીકરણ માટે ગુજરાત સરકાર દ્વારા "ગુજરાત મકાન
અને અન્ય બાંધકામ શ્રમયોગીઓ (રોજગારીનું નિયમન અને નોકરીની શરતો) નિયમો, ૨૦૦૩" તારીખ
૧૮/૦૮/૨૦૦૩ના જાહેરનામાથી બહાર પાડવામાં આવેલ છે. બીજા કાયદાની જોગવાઈઓના અમલીકરણ
માટે કેન્દ્ર સરકાર દ્વારા "મકાન અને અન્ય બાંધકામ શ્રમયોગીઓનું કલ્યાણ સેસ નિયમો, ૧૯૯૮" ઘડવામાં
આવેલ છે.

"મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ (રોજગારીનું નિયમન અને નોકરીની શરતો)
અધિનિયમ, ૧૯૯૬" ની કલમ-૪૬ તેમજ તે હેઠળના નિયમ-૫૫(૧) મુજબ બાંધકામ પ્રવૃત્તિ શરૂ કરવાના
૩૦ દિવસ પહેલાં આવી પ્રવૃત્તિ ચાલુ કરવાની ચોક્કસ તારીખ તથા પ્રવૃત્તિ પુરી કરવાની સંભવિત
તારીખ તથા અન્ય વિગતોની નોટીસ નિયત નમુના-૪માં તેમના વિસ્તારના બાંધકામ નિરીક્ષકની
કચેરીએ મોકલી આપવાની હોય છે અને કલમ-૭ તેમજ તે હેઠળના નિયમ-૨૩ મુજબ દરેક માલિકે
કામકાજ શરૂ કર્યાનાં ૬૦ દિવસમાં બાંધકામ સાઇટની નોંધણી www.iip.gujarat.gov.in વેબસાઇટ પર
જરૂરી નિયત દસ્તાવેજો સાથે ઓનલાઇન કરવાની રહે છે.

વધુમાં બાંધકામ વ્યવસાયમાં રોકાવેલ અને ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ
કલ્યાણ બોર્ડમાં નોંધાયેલ શ્રમયોગીને ચાલુ કામે, અત્રેની કચેરીએ નોંધાયેલ બાંધકામ સાઇટના સ્થળે
અકસ્માતે મૃત્યુ થતા મૃતક શ્રીકર્મનાં વારસદારને રૂ.૩,૦૦,૦૦૦/-ની નાણાકીય સહાય પૂરી પાડવામાં

૧.૯.૩.૩.નં.૫૧૬/૧
તારીખ-૧૬/૧૧/૧૭


આજીવન સહાયક
આજીવન સહાયક
આજીવન સહાયક
આજીવન સહાયક

આજીવન સહાયક
આજીવન સહાયક

આવે છે તેમજ શ્રમયોગી ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગી કલ્યાણ બોર્ડમાં નોંધાયેલ ન હોય પરંતુ બાંધકામ સાઈટની નોંધણી અત્રેની કચેરીએ કરાવેલ હોય તેવા કિસ્સામાં મૂતક શ્રમિકનાં વારસદારને રૂ.૧.૫૦.૦૦૦/- ની નાણાકીય સહાય પૂરી પાડવામાં આવે છે. પરંતુ અનુભવે ધ્યાનમાં આવેલ છે કે, અકસ્માત સમયે બાંધકામ સાઈટનું રજીસ્ટ્રેશન અત્રેની કચેરીએ થયેલ હોતું નથી. જેથી આપના દ્વારા આપવામાં આવતાં ટેન્ડર/LOI/વર્ક ઓર્ડર/રજાચિઠ્ઠીમાં સદર કાયદા હેઠળ બાંધકામ સાઈટનું રજીસ્ટ્રેશન કરાવવાનો આ મુજબનો "મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ (રોજગારીનું નિયમન અને નોકરીની શરતો) અધિનિયમ, ૧૯૯૬" હેઠળ દરેક માલિકે બાંધકામ પ્રવૃત્તિ શરૂ કરવાના ૩૦ દિવસ પહેલાં સદર કાયદા હેઠળનાં નિયત નમુના-૪માં નોટીસ બાંધકામ નિરીક્ષક, આસીસ્ટન્ટ ડાયરેક્ટર, ઇન્ડસ્ટ્રીયલ સેફ્ટી એન્ડ હેલ્થની કચેરી, ટી-૮/બી, બહુમાળી ભવન, પેલેસ રોડ, ભાવનગર ખાતે મોકલી આપવાની રહેશે તેમજ કામકાજ શરૂ કર્યાનાં ૬૦ દિવસમાં બાંધકામ સાઈટની નોંધણી કરવાની રહેશે." કલેક્ટ ઉમેરવામાં આવે તેમજ સંસ્થા દ્વારા સદર કાયદા હેઠળ બાંધકામ સાઈટની નોંધણી કરાવવામાં આવે તો આવા અકસ્માત સમયે મૂતક શ્રમિકનાં વારસદારને નાણાકીય સહાય આપી શકાય. આ ઉપરાંત પણ ઉક્ત બાંધકામ બોર્ડ દ્વારા બાંધકામ શ્રમિકો માટે વિવિધ ૨૦ થી વધુ પ્રકારની કલ્યાણલક્ષી યોજનાઓની અમલવારી કરવામાં આવે છે. આથી તે અન્વયે પણ શ્રમિકોને લાભો મળી શકે તે સારું શ્રમિકોની સદર બોર્ડમાં લાભાર્થી તરીકે નોંધણી થવી જરૂરી છે.

વધુમાં ઉક્ત અધિનિયમ હેઠળનાં ઇન્સ્પેક્ટર ઓફ ઇન્સ્પેકશન ઓફ બિલ્ડિંગ એન્ડ અધર કન્સ્ટ્રક્શન વર્ગ-૨ ની સદર કાયદામાં વિવિધ બાંધકામ સાઈટોમાં કામ કરતાં બાંધકામ શ્રમયોગીઓની સુરક્ષા, સ્વાસ્થ્ય અને કલ્યાણલક્ષી જોગવાઈઓ અન્વયે તપાસ કરવાની જવાબદારી હોઈ. આપના દ્વારા આપવામાં આવતા દરેક વર્ક ઓર્ડર/રજાચિઠ્ઠી ની એક નકલ ઉક્ત કચેરીનાં સરનામે મોકલી આપવા અને તેઓને નોંધણી કરાવવા અર્થે જરૂરી સુચના આપવા વિનંતી છે.




આસીસ્ટન્ટ ડાયરેક્ટર
ઇન્ડસ્ટ્રીયલ સેફ્ટી એન્ડ હેલ્થ
(બાંધકામ શાખા) ભાવનગર

નકલ રવાના:-

- ૧) નગર વિકાસ અધિકારીશ્રી, ભાવનગર મ્યુનિસિપલ કોર્પોરેશન
- ૨) સિટી ઈન્જનેરશ્રી, ભાવનગર મ્યુનિસિપલ કોર્પોરેશન

Annexure 4

Acceptance of Bank
Guarantee as Security Deposit
and Earnest Money Deposit.

Government of Gujarat

Finance Department

GR. No.: EMD/10/2018/18/DMO

Date: 16/04/2018

Read: FD GR. No.: EMD/10/2016/328/DMO Dt. 01/05/2017

Preamble:

Tendering authorities of the State Government and its Boards/Corporations/Societies/PSUs frequently take Bank Guarantee from the bidders towards Security Deposit (SD) and Earnest Money Deposit (EMD). State Government had issued the list of eligible banks for the financial year 2017-18 vide above mentioned resolution of this department Dt. 01-05-2017.

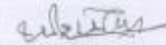
After careful consideration, the Government has decided to approve the list of Banks whose Bank Guarantees would be accepted in the Financial Year 2018-19 and it has now been decided to resolve as follows:

Resolution:

Government Departments and its Boards/Corporations/Societies/PSUs would accept Bank Guarantee [towards Security Deposit (SD) and Earnest Money Deposit (EMD)] issued by any of the bank included in the Annexure I, attached to this Resolution.

The tendering authority will be required to ascertain the authenticity of the Bank Guarantee and set up necessary internal control procedures.

By order and in the name of the Governor of Gujarat



(J G Shelat)
Section Officer
Finance Department

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To,

- > The Secretary to the Governor of Gujarat, Raj Bhavan, Gandhinagar.
- > The Principal Secretary to Hon. Chief Minister.
- > PS to Hon. Deputy Chief Minister.
- > PS to all Hon. Ministers, State Ministers and Deputy Ministers.
- > PS to Leader of Opposition Party.
- > Secretary, Legislative Assembly Secretariat, Gandhinagar.
- > PS to Chief Secretary.
- > PS to Additional Chief Secretary Finance Department.
- > PS to Secretary (Economic Affairs), Finance Department
- > PS to Secretary (Expenditure), Finance Department.
- > PS to Deputy Secretary (Budget).
- > All Administrative Departments, Sachivalaya, Gandhinagar.
- > All Heads of Department.
- > All Public Sector Enterprises of the State.
- > All State's Boards/Corporations/Societies.
- > Accountant General-I (Audit) Gujarat, Ahmedabad.
- > Accountant General (A&E) Gujarat, Ahmedabad.
- > Accountant General-II (Audit) Gujarat, Rajkot.
- > Accountant General (A&E) Gujarat, Rajkot.
- > Pay & Accounts Office, Gandhinagar / Ahmedabad.
- > Chief Information Officer, Finance Department.
- > All Joint Secretary / Deputy Secretary / Under Secretary of Finance Department.
- > All Branches, Finance Department (Including Finance Branches).
- > System Manager, Finance Department for put up on GSWAN website.
- > Select File DMO-Finance Department.

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Annexure I.

Finance Department, GR. No.: EMD/10/2018/18/DMO

Date: 16/04/2018


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

- ❖ All Nationalized Banks including the Public Sector Bank- IDBI Ltd.

(B) Guarantees issued by following Banks will be accepted as SD/EMD for period up to March 31, 2019. The validity cut-off date in GR is with respect to date of issue of Bank Guarantee irrespective of date of termination of Bank Guarantee.

- ❖ Rajkot Nagarik Sahakari Bank Ltd.
- ❖ The Mehsana Urban Co-Operative Bank Ltd.
- ❖ The Surat District Co-Op. Bank Ltd.
- ❖ The Ahmedabad Mercantile Co-Op. Bank Ltd.
- ❖ Nutan Nagarik Sahakari Bank Ltd.
- ❖ The Kalupur Commercial Co-operative Bank Ltd.
- ❖ Saurashtra Gramin Bank
- ❖ Baroda Gujarat Gramin Bank
- ❖ RBL Bank
- ❖ Karur Vysya Bank
- ❖ AXIS Bank
- ❖ ICICI Bank
- ❖ HDFC Bank
- ❖ Kotak Mahindra Bank
- ❖ Indusind Bank
- ❖ DCB Bank
- ❖ FEDERAL Bank
- ❖ YES Bank

All the eligible banks are instructed to collect the original documents/papers of guarantee from the concerned tendering authority.



(J G Shelat)
Section Officer
Finance Department

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Annexure-5

૧૩૧

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 ક્ર. પરચ/૧૦૨૦૦૮/(૬૧)/સ

તા. ૨૭-૧૧-૨૦૦૮.

પરિપત્ર :

ટેન્ડરમાં અસામાન્ય ઉંચા કે નીચા ભાવો ડિજિટાઇઝેશન 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 વહેલાં 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 મૂકેલ અંદાજ ભાવ કરતાં ટેન્ડરમાં મૂકેલ અંદાજ રકમથી સમગ્ર ટેન્ડર જેટલા ટકા ઉંચું કે નીચું મંજૂર થયું હોય તે ટકાવારીથી ૧૦% થી વધુ ઉંચો રહેતો હોય તેવી આઈટમનું ચૂકવણું રેનીંગ બીલ વખતે જે તે આઈટમના અંદાજ ભાવ +/- મંજૂર ટેન્ડરની ટકાવારી + તે આઈટમના અંદાજ ભાવની ૫% ની મર્યાદામાં કરવામાં આવશે. આ રીતે વીથહેલ રાખેલ કામ સંતોષકારક રીતે પૂર્ણ થયે ફાઇનલ બિલ મંજૂર કરતી વખતે વ્યાજભારણ વગર છૂટી કરવામાં આવશે.

ઉક્ત જોગવાઈની સ્પષ્ટ સમજણ માટે આ સાથે આપેલ ઉદાહરણ ધ્યાને લેવું.

અનુ.....૨

(આર.કે.ચૌહાણ)

ખાસ ફરજ પરના અધિકારી(વિ.યો.)

માર્ગ અને મકાન વિભાગ.

પ્રતિ,

સર્વે અધિક્ષક ઈજનેરશ્રીઓ, મા.મ. વિભાગ (પાટનગર યોજના 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. અગ્રસચિવશ્રીના અંગત મદદનીશશ્રી, મા.મ. વિભાગ, સચિવાલય, ગાંધીનગર
૨. સર્વે મુખ્ય ઈજનેરી અને અ.સ. શ્રીઓ, મા.મ.વિભાગ.
૩. સર્વે તાંત્રિક ઉપસચિવશ્રીઓ, 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 ફાઈલ.
૭. શાખા સિલેક્ટ ફાઈલ ૨૦૧૩.

ટેન્ડરમાં ભરેલ અસામાન્ય ઉંચા ભાવોના સંદર્ભે કામ પર પડતા ખર્ચ પર નિયંત્રણ રાખવા તથા કામની નાણાકીય પ્રગતિ ભૌતિક પ્રગતિ સાથે સુમેળમાં રહે તે માટે જરૂરી જોગવાઈ કરવા બાબત.

ગુજરાત સરકાર
માર્ગ અને મકાન વિભાગ
પરિપત્ર ક્રં. પરચ/૧૦૨૦૦૮/(૬૧)/સ
તા. ૨૭-૧૧-૨૦૦૮.

પરિપત્ર :

ટેન્ડરમાં અસામાન્ય ઉંચા કે નીચા ભાવો ઈજારદારશ્રીઓ દ્વારા ઘણી વારે ભરાતા હોવાનું સરકારશ્રીના ધ્યાન પર આવેલ છે. આવા કિસ્સાઓમાં કામની નાણાકીય પ્રગતિ અને ભૌતિક પ્રગતિનો સુમેળ ન રહેવાની સંભાવના રહેલી છે. આથી કામની ભૌતિક પ્રગતિ પ્રમાણે નાણાકીય પ્રગતિ રહે કે જેથી સરકારશ્રી પર સમય વહેલાં અયોગ્ય નાણાકીય 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 મૂકેલ અંદાજ ભાવ કરતાં ટેન્ડરમાં મૂકેલ અંદાજ રકમથી સમગ્ર ટેન્ડર જેટલા ટકા ઉંચુ કે નીચું મંજૂર થયું હોય તે ટકાવારીથી ૧૦% થી વધુ ઉંચો રહેતો હોય તેવી આઈટમનું ચૂકવણું રેનીંગ બીલ વખતે જે તે આઈટમના અંદાજ ભાવ +/- મંજૂર ટેન્ડરની ટકાવારી + તે આઈટમના અંદાજ ભાવની ૫% ની મર્યાદામાં કરવામાં આવશે. આ રીતે વીથહેલ્ડ રાખેલ કામ સંતોષકારક રીતે પૂર્ણ થયે ફાઈનલ બિલ મંજૂર કરતી વખતે વ્યાજભારણ વગર છૂટી કરવામાં આવશે.

ઉક્ત જોગવાઈની સ્પષ્ટ સમજણ માટે આ સાથે આપેલ ઉદાહરણ ધ્યાને લેવું.

અનું.....૨

(૨)

૧.	ટેન્ડરમાં મૂકેલ અંદાજી રકમ	રૂ. ૧૦૦/-
૨.	મંજૂર થયેલ ટેન્ડરની રકમ	રૂ. ૧૧૦/-
૩.	ટેન્ડરમાં મૂકેલ અંદાજી રકમ સામે ખરેખર મંજૂર થયેલ ટેન્ડરની ટકાવારી	રૂ. ૧૦%
૪.	ટેન્ડરની એક આઈટમનો ટેન્ડરમાં મૂકેલ અંદાજી ભાવ	રૂ. ૧૦/-
૫.	તે આઈટમનો ભરેલ ભાવ	રૂ. ૧૪/-
૬.	તે આઈટમમાં ભરેલ ઊંચા ભાવની ટકાવારી	૪૦%
૭.	તે આઈટમ માટે રનિંગ બીલ વખતે ચૂકવવાપાત્ર ભાવ	રૂ. ૧૦ + કોલમ-૩ પ્રમાણે ૧૦% ઊંચા + અંદાજી ભાવના ૫% = રૂ. ૧૧.૫૦
૮.	ફાઈનલ બિલ વખતે વ્યાજ ભારણા વગર ચૂકવવાપાત્ર થતો વીશ હેલ રાખેલ ભાવ.	રૂ. ૧૪.૦૦ - રૂ. ૧૧.૫૦ રૂ. ૨.૫૦

જો સદર આઈટમના ભાવ રૂ. ૧૨/- કે તેથી નીચે ભરેલ હોત તો રનિંગ બિલમાં ભાવ કપાત આ જોગવાઈ મુજબ કરવાની રહેતી નથી.

સત્તી/-

(આર.કે. ચૌહાણ)
ખાસ ફરજ પરના અધિકારી
માર્ગ અને મકાન વિભાગ

પ્રતિ,
તમામ અધિકારક ઈજનેરશ્રીઓ, માર્ગ અને મકાન વિભાગ,
તમામ કાર્યપાલક ઈજનેરશ્રીઓ, મા.મ. વિભાગ

નકલ રવાના :

૧. સચિવશ્રીના અંગત મદદનીશશ્રી, મા.મ. વિભાગ.
૨. તમામ મુખ્ય ઈજનેરશ્રી અને અ.સે.શ્રી મા.મ. વિભાગ.
૩. તમામ તાંત્રિક ઉપસચિવશ્રીઓ, મા.મ. વિભાગ
૪. ના.કા.ઈ.શ્રીઓ, મા.મ. વિભાગ પ્રે.પર
૫. નાણા શાખા, મા.મ. વિભાગ
૬. ના.સે.અ. સિલેક્ટ ફાઈલ
૭. શાખા સિલેક્ટ ફાઈલ.

૭૫



ગુજરાત પાણી પુરવઠા અને ગટર વ્યવસ્થા બોર્ડ

તકેદારી એકમ, જલસેવા ભવન એરફોર્સ સ્ટેશન સામે,
સેક્ટર-૧૦ / એ, ગાંધીનગર ☎ : ૦૭૯- ૨૩૨૫૧૩૬૦ Fax: ૨૩૨- ૨૫૯૭૯
Email: vigilancecell@gmail.com

જા.નં. તકેદારી એકમ/ઇન્સ્પેક્શન નોંધ/૧૮૯

તારીખ:- ૧૯ /૦૩/૨૦૧૨

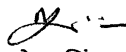
પરિપત્ર

ઇજારદાર મારફતે થતી કામગીરીના ટેન્ડરમાં જે જે બાબતો માટે ઇન્ચોરન્સ લેવાની જોગવાઈ કરાયેલ હોય તેના માટે નીચે જણાવ્યા મુજબની જોગવાઈઓ સ્પષ્ટ રુપે કરારખતમાં રાખવાની સૂચના ગુજરાત તકેદારી આયોગ દ્વારા આપવામાં આવેલ છે.

(૧) ઇજારદાર ધ્વારા ચોક્કસ સમયમાં ઇન્ચોરન્સ લઇને આધાર /પુરાવા સહિત જાણ ન કરાય તો આવા ઇન્ચોરન્સ નહી લેવાના કારણે જે કોઈ જવાબદારી ઉભી થશે તેની સંપૂર્ણ જવાબદારી ઇજારદારની રહેશે અને તે પટે જે કોઈ રકમની વસુલાત કરવાની જરૂર પડે તો ઇજારદારની લહેણી નીકળતી કોઈ પણ રકમમાંથી બોર્ડ વસુલ કરી શકશે.

(૨) ઇન્ચોરન્સ નહી લેવા બદલ ઇજારદાર પાસેથી બોર્ડ દંડનીય રકમ વસુલ કરી શકશે. દંડનીય રકમ વસુલ કરવા છતાં ઇજારદારની ઇન્ચોરન્સ લેવાની જવાબદારી ચાલુ રહેશે તથા આ જવાબદારીમાંથી તેઓ મુક્ત થતા નથી.

S. E. P. H. CIRCLE	
G. W. S. S. B.	
RAJKOT	
No :-	
Date	
S. E.	
D. E.	
O. S.	
SR.	


(મહેશ સિંહ)
સભ્ય સચિવ

નકલ સવિનય રવાના પ્રતિ,

- સેક્શન અધિકારીશ્રી, ગુજરાત તકેદારી આયોગ, ગાંધીનગરને તેમના પત્રાંક પીવીઆઇ/૧૯/૨૦૦૮/૧૭૯૫૮૩/ગ, તા.૯/૬/૨૦૧૧ અન્વયે બોર્ડ કરેલ કાર્યવાહી અર્થે જાણ સારુ.
- સર્વે મુખ્ય ઇજનેરશ્રી/ સર્વે અધિક્ષક ઇજનેરશ્રી/ સર્વે કાર્યપાલક ઇજનેરશ્રી
- માસ્ટર ફાઇલ.

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O & M CONDITIONS OF CONTRACT

SCOPE OF O & M (In Short):

DELETED

2.0 Special Conditions

1. The Agency shall have to submit all QAP (Quality assurance plan) of civil work (of all materials included in price bid), for approval to department within 3 months from the date of LOI and will resubmit within 15 days after incorporating queries if arise any. The procurement of items/material related to the project shall be procured within the 16 months from the date of LOI.
2. The Agency shall have inform by application named "Call Before dig" to BMC officials prior doing excavation or digging at anywhere within limit of Bhavnagar Municipal Corporation.
3. For the RCC pipeline supply, The Agency will liable maximum 5.0 km unlaidd length is payable for each diameter per each running bill.
4. The liaisoning (including all paper work, permission) of will be in scope of the Agency.
5. The scope of operation maintenance of Jetting machine, cleaning rod & suction machine is included in Schedule B3.
6. The liaisoning work (including all paper work, permission) of PGVCL/GETCO will be in scope of the Agency. The fees payment for the PGVCL/GETCO new connection shall be paid by the agency and shall be reimbursed by client after submission of necessary documents/challans for the same.
7. If any improper execution is done by contractor (i.e Poor pipe joint connection, leakage in manhole, pipe laid in incorrect gradient, fail in flow test, damage to the pipe material etc.), rectification will be done by the contractor at its own cost. No separate payment will be paid by BMC
8. At the time of handover of Overall project after completion of 5 years of O&M, check list prepared by BMC will be followed by contractor and all items to be checked in accordance with checklist. Failing of the same shall be complied within 15 day of time period from the time of checking. (If Applicable)
9. Penalty shall be implicated for the delayed days regarding the pumps & motor which have gone under maintenance/repair work. The time period for the maintenance/repair work for pump & motor shall be maximum one week. The penalty for delayed days will be Rs. 1000/- per day which will be deducted from the O & M bill.
10. Maintenance registers for Electro-Mechanical item shall be maintained by the agency during the entire O & M period.
11. Approved Checklist of each & every components of pumping station (i.e mechanical, instrumentation & electrical) shall be prepared by the agency & to be submitted quarterly to the client during O & M period.
12. The daily supervision (i.e 1/20 part of entire network of pipeline) shall be done by the lineman regarding the sewerage network executed by the agency even after no complains& for the same the monthly report shall be submitted to the client in the approved format of the client.

13. R.A. and final Bill shall be processed by the client once all the documents like QAP, work registers, NOC, as-built drawings (UTM Coordinate), measurement sheet, JMR report etc. as instructed by client shall be submitted prior to billing process.
14. Penalty of Rs. 500/- per day shall be imposed for the left-out materials of the agency occupied in the premises of pumping station not related to O & M purpose.
15. Prior permission shall be obtained from the client for the usage of sewerage cleaning machinery to resolve the sewerage complaint in the executed network. Registers for the sewerage cleaning machinery shall be maintained by the agency in the approved format of client. Moreover, for a period of time during the O & M period the client is liable to operate the sewerage cleaning machinery for the departmental work with the mutual understanding between the client & agency.
16. If the agency requires to operate the sewerage cleaning machinery of client during the execution of project, it would be available from the client on fixed charges approved by the client.
17. Agency must done trial pit before starting of excavation work. In case of damages to the utilities without doing trail pit, amount for the restoration mention in BOQ is not payable and agency shall pay amount to the respected department/service provider. Decision of EIC in such case is final.

Trial pit shall normally done at every of 30m distance, but the distance between trial pit may reduce depends upon situations such as cross road, junctions, alignment of utility already know, rail/canal/road crossing or when department said to agency for the same.
18. In future, if biometric attendance installed as extra item, then it shall be install by work agency at pumping station and monthly O&M Bill will process based on attendance of all staff.

ANNEXURE-I

The contractor shall employ the minimum staff for each package as under with qualification and experience stated below, Contractor may employ additional staff over and above minimum prescribed as per his requirement in order to run the system efficiently. The staff mentioned below is obligatory.

SR No	DESIGNATION	QUALIFICATION	EXPERIENCE
1	Supervisor cum Maintenance Engineer –M&E (As and when required)	BE or Diploma Mechanical & Electrical	5 years operation & maintenance exp. of all electro-mechanical equipment of sewerage projects.
2	Electrician (As and when required)	PWD supervisory certificate pass & having license of Govt. of Gujarat for HT Installations or ITI (Electrician) with NCTVT Certificate	5 years of operating Electrical Equipment.
3	Operators (3 nos per shift of 8 hrs)	ITI –Electrical Certificate Holder	2 years of operating Electrical Equipment.
4	Helper cum security guard (3 nos per shift of 8 hrs)	8 th Standard Pass. (unskilled)	Experience in pumping stations is preferable
5	Lineman-3 nos (per shift of 8 hrs for all components)	Physical fit person (unskilled)	Experience for patrolling of pipeline works

Note:

The above staff shall be required minimum as per mutual agreement between contractor & Bhavnagar Municipal Corporation. The arrangement of reliever for weekly off/all holiday setc. shall be made by the contractor separately.

The above mentioned requirement is Actual. However Contractor has to deploy adequate staff for normal operation & maintenance. The contractor has to call respective engineer for rectification of fault at any time of the day, during contract period. The contractor shall have to provide additional manpower for maintenance and repair on as and when required basis. No extra payment shall be made for hiring services of additional manpower.

However Senior Manager may give relaxation in qualification and experience for suitable cases and necessary recovery if any, will be made accordingly.

Contractor shall provide tools and equipments mentioned in Annexure III and furniture mentioned in Annexure IV for each Pumping Stations. Contractor should handover all the tools and furniture in good condition to BMC after completion of O & M period.

ANNEXURE- III

LIST OF THE TOOLS AND TACKLE TO BE PROVIDED AT EACH PUMPING STATION & PUMPING STATION FOR OPERATION AND MAINTENANCE.

Sr.No.	Item	Quantity
1.	For spanners set size 6mm to 22mm	1 set.
2.	Fix spanners set size 6 mm to 52mm	1 set
3.	Ring spanners set size 6mm to 22mm	1 set
4.	Ring spanners set size 7mm to 52mm	1 set
5.	Box spanners set size 6mm to 38mm	1 set
6.	Pipe wrench size 36"	1 No.
7.	Pipe wrench size 24"	2 Nos.
8.	Screw driver size 6", 9" and 12" (2 Nos. of each size)	6 Nos.
9.	Insulated pliers size 12"	6 Nos.
10.	Long nose pliers 8"	3 Nos.
11.	Adjustable screw spanner size 12"	3 Nos.
12.	Hammer 1Lb x 2Lb	2 Nos.
13.	Testers	6 Nos.
14.	Chisels 12" x 6" (2 Nos. of each size)	4 Nos.
15.	Hack saw frame	6 Nos.
16.	Hack saw blade	6 packets.
17.	Hand gloves suitable for 33KV	2 Pairs.
18.	Phawada	2 Nos.
19.	Ghamela	4 Nos.
20.	Tikam	2 Nos.
21.	Kaichin (For Gardening)	2 Nos.
22.	Vile (For Gardening)	3 Nos.
23.	Plastic bucket 10 Litres	2 Nos.
24.	Rope 1/2'	30 meter
25.	Torch/Battery	2 Nos.

ANNEXURE- IV

Item	Description	Unit	Number
1	2	3	4
A	Furniture and Fixtures and Office Equipments, Office furniture of Godrej / or similar approved quality		
1	Desk with 3 drawers with locks with a revolving chair for each plan dimension of desk 1500 mm x 900 mm approx.	No.	2
2	Chairs with Tapestry Cushion on seat, back & handle	No.	4
3	Filing Cabinets, steel with locks and drawers with suspended filling system	No.	2
4	Ceiling Fan 48" size Crompton Greaves or ORPAT	No.	2