



## BHAVNAGAR MUNICIPAL CORPORATION

Bhavnagar

Tender Notice No: **BMC/Trans/Depo/01/2024**

### ONLINE E-TENDERING

Bhavnagar Municipal Corporation (BMC), invites Item rate Tender on line in single stage two bid system from interested qualified bidders for the work shown in the schedule given below respectively :-

1.0	Tender Notice No.	<b>BMC/Trans/Depo/01/2024</b>
2.0	Work Description	Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.
3.0	Estimated Cost	Rs. 15,86,27,070.49
4.0	EMD	Rs. 15,86,271.00
5.0	Tender Fee	Rs.18000/-(Non-refundable)
6.0	Qualification of Bidder	Duly registered with State/Central Govt. / Municipal Corporation/PSUdepts in Class 'AA' or above.

The detail tender notice & Bid Documents will be available for downloading & submission on the website: <https://bmc.nprocure.com> and notice/details can be seen on <https://www.bmcgujarat.com> from date: **13/03/2024 to 12/04/2024 upto 18:00hrs.** The Municipal Commissioner reserves the right to reject any or all offers received without assigning any reasons there of . Further details required if any, may be obtained from Executive Engineer (Transport Department), BMC. Email:transport.bmcgujarat@gmail.com in person.

Date:12/03/2024

Place:Bhavnagar

Executive Engineer (Transport Dept.)

Bhavnagar Municipal Corporation

**BHAVANAGARMUNICIPALCORPORA  
TION,BHAVNAGAR**

**VOLUME – I (Part-2)&(Part-3)**

**Name of Work:-Construction of City e-Bus Depot And  
Workshop On F.P. No.- 39, TPS-11, Adhevada,  
Bhavnagar.**

<b>Sr.No.</b>	<b>CONTENTS</b>
<b>Voll(Part2)</b>	<b>ItemwiseSpecificationsforConstruction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar. (Civil+Electrical)</b>
<b>Voli(Part3)</b>	<b>Tender Drawings</b>

## Technical Specifications (Civil)

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

### **Item No:-4**

**Box cutting the road surface to proper slope & camber for making a base for road work including removing the excavated stuff, and depositing on the road side slopes as directed up to 50 Mt. Lead**

1. Cutting shall be done in proper grade & camber as per measurements given. Care must be taken the tall slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (without extra cost) Box cutting for soling and metalling in required width the depth shall be done.
2. The stuff received from the cutting shall be utilized for filling cuts and correcting side slopes of bank with all lead and lift directed. Useful Stuff shall be carefully stacked separately as directed,
3. The measurement shall be taken as per cross section measurement of the cutting based on length. breadth, depth measured with tape at every 25 metres interval.
4. The payment shall be made on Cmt. basis.

### **Item No.20**

**Rolling and Consolidating of soling including filling in depression which occurs during the process with power roller 8 tonne to 12 tonne. and compacting the bed as per specifications to core test 97% compacting complete in all respects to the entire satisfaction of the Engineer-in - charge.**

#### 1.0 Rolling

Rolling shall be done with a 8-12 tonne power roller. Rolling is continued till the required density achieved is at least 98 % of MDD the material determined by Proctor density as per IS 2720 Pt.VII) and a smooth surface obtained without leaving any roller marks on the surface. During rolling surface should be checked for grade and camber and irregularities corrected.

#### 1.1 Curing

The compacted surface shall be cured for a minimum period of 7 days before the next layer is placed.

Curing is done by sprinkling water over the surface five or six times a day. The surface shall not be allowed to dry during the curing period. Curing by ponding shall not be adopted.

#### 1.2 Surface Irregularities

The finish surface should be checked for line, level and grade and surface finish. The maximum

permissible undulation in longitudinal profile shall not exceed 15 mm when checked with 3 meter straight edge and in cross profile the variation from specified profile shall not exceed 12 mm.

## 2.0 Measurements and Payment: -

2.1 The length and breadth shall be taken to the nearest centimetre. The consolidated net plane area shall be calculated in square metres, correct to two places of decimals.

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

2.3 The contract unit rate includes cost of mechanical roller required for consolidation including all labour equipments fuel, hire charges, tolls, and incidentals necessary.

### **Item No :-42,43,44**

**Providing TMT Bar FE 500/500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto plinth level,above floor two level.**

#### 1.0 Materials

1.1. High yield Strength Steel Deformed Bars: 1.1.1 High yield strength steel deformed bars are either cold twisted or hot rolled, shall conform to I.S. 1739-1966 and I.S.1139-1966 respectively.

1.2. Mild Steel Binding Wire: 1.2.1 The mild steel wire shall be of 1.63 mm or 1.22 mm. (16 or 18 gauge) diameter and shall conform to I.S. 280-197.

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

#### 2.0. WORKMANSHIP:

2.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shows as on the drawings or as directed.

2.2. Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

2.3. Reinforcing steel shall conform 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.

2.4. 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 not 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.

2.5. 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.

2.6. 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 mm 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.

2.7. 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 transit 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

2.8. 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 arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, 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.

2.9. The above specifications 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 however comply with relevant anchorage requirements.

3.0 Mode of Measurement:

3.1 For the purpose of calculation consumption, wastage shall both be permitted beyond 5 percent. Excess consumption over 5 % will be charged at penal rate

3.2 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the works. Where welding or coupling is resorted to in place of lap joints such joints shall be measured for a pimento as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basic of as per M-18 even though steel is supplied to the contractor by the department on actual weight Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.

3.3 The rate shall be for a unit of One Kg.

#### **Item No.50**

**Providing and Fixing of Mild Steel Hollow Profile Section of 1.25 mm thick for Door Frames of size 125 mm x 65 mm with Heay Stainless Steel 4' Long Hinges (4 no Each Side). The Frame Should be of Approved Shape, Single Rabate or double rebate as per site Requirement and as per instruction of Engineer incharge he Frame Sections of Doors shold be fixed with heavy hold fasts and with Necessary Cement Mortar (1:3;6) Filling inside holow portion and also include two coat of Oil paint including red lead primer etc complete After Fixing of Frame .**

Item shall be carried out as per item description, and as per detail drawing and as directed by Engineer- in-charge.

The rate shall be for a unit of one Sq.metre.

#### **Item No.51**

**Providing & fixing in position partly fixed and partly openable standard extruded Aluminium door with color anodized hollow section frame of approved shade & pivoted double shutter fabricated from alluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt) and door styles and toprial of alluminium section size 47.5mm x 44.5 mm (of app. Wt. 1.05 kg/ Rmt) Bottom rail & lockrail for door of size 114mm x 44.5mm (of app. Wt Kg./Rmt) and providing rubber gasket and glazing chips around the glass allover including providing heavy handle, heavy lock, bracket, stoppers,Aldrop (Color anodised) 5 mm th. transparent float glass of copper tint (Structural Glass) fixed with rubber gasket and 19 x 17 mm size Glasing Clip same in Bottom Portion with providing 9 mm thick decorative water**

**proof Both side prelaminaed pressed wood based board with fixing Glasing clips 19 X 17 mm including all required materials labours and equipments as per detailed drwg. as directed.**

Item shall be carried out as per item description, and as per detail drawing and as directed by Engineer- in-charge.

The rate shall be for a unit of one Sq.metre.

### **Item No.52**

**Providing & fixing in position standard extruded Aluminium Partition with Colour anodized hollow section frame of approved shade & pivoted without shutter fabricated from alluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt.) and using Glasing Clips of weight of 0.15 kg per running meter and providing rubber gasket around the glass allover including providing 5 mm th. transparent float glass of copper/ gray tint (Structural Glass) fixed with transparent silicon gasket and in bottom panel 12 mm thick prelaminated bothside partical board including all required materials labours and equipments as per detailed drwg. as directed..**

Item shall be carried out as per item description, and as per detail drawing and as directed by Engineer- in-charge.

The rate shall be for a unit of one Sq.metre.

### **Item No :-53**

**Providing and fixing 35 mm thick solid core flush door shutter of approved make both side lamination using 1mm thick approved laminate sheets with 6mm thk Lipping/border patti around flush hutter including fixing SS hinges, , wedges, keys, nails, catch screw, lever latches , handle(10 cm), aldop(20 cms), stoppers(20 cms), etc and cutting/ drilling of necessary holes in masonry/ concrete and all as per drawing, specification and direction of the Engineer, all materials, tools,plant and labour complete c. (All fixtures & fittings shall be stainless steel of approved quality).approved by architect/Engineer Incharge.At all Floors**

#### **1.0. Materials**

Flush door shall conform to M-30. Plywood shall conform to M-37.

#### **2.0. Workmanship**

2.1. The item covers the requirement of preparation of shutters for doors, windows, clerestory windows, their supply and fixing.

#### **2.2. Shutters:**

2.2.1. Paneled shutters shall be constructed in the form of timber frame work of styles and rails with panel inserted of type as specified in the detailed drawings. Panel shall be fixed by providing grooves in the style and rails. The styles and rails shall be joined to each other by mortise and tenon joints at right angles.

2.2.2. All members of the shutters shall be straight without any warp or bow and shall have smooth, well planed faces at right angles to each other.



2.2.3. The size of styles and rails shall be as per drawings or as directed. Styles and rails of shutters shall be made of one piece only.

2.2.4 Door shall be finished with 1.0mm laminated sheet of approved brand on both side and with 6mm thk moulding patti around flush shutter.

2.2.5 Including painting with two coats of synthetic enamel paint over one coat of primer and putty to the door frame including fixing SS hinges, 6 no. - hold fast of size 40 x 6mm flat 300 mm long, wedges, keys, nails, catch screw, lever latches, handle, aldrops, stoppers, etc and cutting/drilling of necessary holes in masonry/ concrete and grouting of holdfasts with (1:2:4) cement concrete all as per drawing, specification and direction of the Engineer, all materials, tools, plant and labour complete c. (All fixtures & fittings shall be stainless steel of approved quality). approved by architect/Engineer Incharge.

### **2.3. Timber paneling:**

2.3.1. Thickness of the panel shall be as specified in the item as shown in the drawing or as directed. If the panel is made from more than one piece the pieces shall be finished as shown in the detailed drawings and shall be joined with continuous groove with specified size. The end pieces of the panel and the top and bottom of the panel shall be provided with continuous tongue to frame into groove of the frame shutter. An air space of 1.5 mm. shall be left in the groove of frame of shutter while framing the panels in it.

2.3.2. The faces of the panel as well as various pieces of the panel shall be- closely fitted to the sizes of the grooves.

2.3.3. Finishing of the corners of raised panel edges shall be done as shown in drawings or as directed.

2.3.4. The thickness specified shall be finished thickness and no tolerance will be permitted.

### **3.0. Mode of measurement & payment**

3.1. The rate for shutter includes cost of teak wood frame including painting with two coats of synthetic enamel paint over one coat of primer and putty, All fixtures & fittings shall be stainless steel of approved quality as directed.

3.2. The dimension of the shutter shall be measured clear size of the shutter in close position between the grooves of the frame.

3.3. The rate shall be for a unit of one sq. meter.

### **Item No :-54**

**Providing and fixing FRP FRAME size 100 x 50mm and 28mm thick FRP Degree panel shutter having extra reinforcement on sides and edges and in Gel coat finish. The core of the shutter is to be filled up with injected fire retardant grade polyurethane foam done in situ along with embedded wooden pieces for stiffening and also for taking hinges and fixtures. The whole FRP frame and shutter is to be water proof, weather proof, termite proof and resistance to mild acid/Alkali, Rates are to be inclusive of S.S. hinges with necessary screws and aluminium fixtures and fastening product should have 3 years performance guarantee and company have ISO 9001-2000 certificate.**

Refer GTS Booklet Item no.10.12, Page.68 & Item no.10.1, Page.67 Except Frame & shutter FRP material instead of wood frame and paneled shutter.

The rate shall be consolidated for all above item.

The rate includes providing door frame, handles, stoppers and locking arrangements etc. complete Rate shall be for a unit of one Square Meter

### **ITEM NO:-55**

**'Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 95mm x 24mm x 1.17mm (of Jindal Section no:2459 @ wt.of 0.738 Kg/mt), horizontal Three track member size 92mm x 31.75mm x 1.30mm (of Jindal Section no:8688,@ Wt.1.07 Kg/mt), vertical member of size 92mm x 31.75mm x 1.50mm (of Jindal Section no:8933,@ Wt.**

**1.06 Kg/mt) with sliding shutters of horizontal member size 40 mmx18mm x1.29mm (of Jindal Section no:8947@ wt.of 0.456 Kg/mt), vertical member of size 40mm x 18mm x 1.29 mm (of Jindal Section no:8949 @ wt.of 0.456Kg/mt/ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc**

Matt anodized alluminium sliding windows shall be made of extruded alluminium sections having thickness not less than 1.5 mm and matt finished colour anodized not less than 20 micron.

The glass 5 mm thick float Saint/Gobain glass white or colour as directed.

All the section for main frame and shutter frame shall be as specified in the item description above.

All the fixture, fastener bearing, locks, handle, gaskets shall be used after getting approved from Engineer-in-charge and architect. The handle section shall be weighing not less than 0.417 Kg/meter. The interlock section shall be weighing not less than 0.464 Kg/mt. and having thickness of 1.5 mm. The glass panel shall be fixed in frame work using EPDM gaskets.

The whole assembly of window shall be fixed in best workman like manner to have smooth operations. All the windows shall be sealed to the R.C.C. or brick work with silicon sealants of dow corning or Wacker Germany as approved by Engineer-in-charge or his consultant.

#### **Item No :-56**

**Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 63.50 x 38.10 x 1.95 mm(of Jindal Section no:4605,@ Wt 1.094 Kg / Rmt), horizontal two track member size 61.85 mm x 31.75 mm x 1.20mm (of Jindal Section no: 8687 @ wt.of 0.695 Kg/mt), vertical member of size 61.85 mm x 31.75mm x 1.30 mm (of Jindal Section no:8758 @ wt.of 0.0.659 Kg/mt) with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm (of Jindal Section no:8949 @ wt.of 0.456Kg/mt), vertical member of size 40mm x 18mm x 1.29mm (of Jindal Section no:8947 @ wt.of 0.456Kg/mt/ Section 8948, @ Wt. 0.457 Kg/mt) with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window.**

Matt anodized alluminium sliding windows shall be made of extruded alluminium sections having thickness not less than 1.5 mm and matt finished colour anodized not less than 20 micron.

The glass 5 mm thick float Saint/Gobain glass white or colour as directed.

At bottom drain section shall be used to drain out rain water. The draina track shall be three track 92 mm x 31.55 weighing not less than 1.070 Kg/mt. The and side track s shall not be weighing less than 0.933 Kg/meter and thickness shall not be less than 1.5 mm. The work shall be carried out as directed by Engineer-in-charge or consultants.

Shutter Frame Work :- The fully glazed shutter frame shall be made from top and bottom section weighing not less than 0.464 Kg/meter. having bearing of Durlin or Nylon 66. All the fixture, fastener bearing, locks, handle, gaskets shall be used after getting approved from Engineer-in-charge and architect. The handle section shall be weighing not less than 0.417 Kg/meter. The interlock section shall be weighing not less than 0.464 Kg/mt. and

having thickness of 1.5 mm. The glass panel shall be fixed in frame work using EPDM gaskets.

The whole assembly of window shall be fixed in best workman like manner to have smooth operations. All the windows shall be sealed to the R.C.C. or brick work with silicon sealents of dow corning or Wacker Germany as approved by Engineer-in-charge or his consultant.

The rate shall be for a unit of one square metre

**Item No :-57**

**Providing and fixing standard extruded of aluminium section of size 63mm x 38.10mm x 1.2mm (Jindal Section :2434, @ Wt. 0.643 Kg/mt) with colour anodized aluminium frame for ventilation with 5 mm thick frosted glass as details etc complete for Ventilation**

**General**

The item shall consist of preparing and fixing of aluminum ventilators using square aluminum tubes of specified size having 5 mm thick frosted glass louvers as specified and fixing the same in structure at required places in accordance with the details shown on the drawings or as approved by the engineer in charge.

**1.0 MATERIAL**

**1.1 Main outer frame of rectangular tube**

Main frame shall be of standard coloured anodized Aluminum hollow sections as described in details in item of schedule B

Aluminum alloy used in the manufacture of extruded Window section shall conform to I S designation HEA-WP of I S 733-1975 and also Designation WVG –WP of I S 1285-1975 section shall be as specified in the drawing and design

All sections shall be Free from any scratches or holes or any damages on surface. All section shall have finished luster surface on all sides

**1.2 5mm thick frosted glass :-** The **5mm. thick frosted glass** shall be of approved colour and quality The thickness of glass shall be as per item description The Glass shall conform to M-38.2 Page No. 18 of General technical specification book for building works

**1.3. Rubber Gasket**

Rubber gasket shall be of approved make and shall be free from any scratches or holes or any damages on surface. and shall have finished luster surface on all sides

**2.0 WORKMANSHIP**

The Ventilators shall be fabricated as shown in detail architectural drawing and as per instruction of engineer in charge, Only approved material shall be used in Ventilators colour of anodizing shall be approved and shall be anodized up to the satisfaction of engineer in charge. Completed Ventilators shall be fixed in position in true line and level.

**3.0 Mode of Measurement & Payment :**

4.1. The unit rate of aluminum Ventilator shall include the cost of all materials, cost of anodizing, cost of all necessary fixtures and fastenings, Glass sheet for louvers labour charges for fixing frames and ventilator and fixing the same in wall at the place shown in drawing and as instructed by Engineer in charge.

4.2. The Ventilator shall be measured in square meter

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

**Item No :-58,96**

**Providing and fixing M.S. grills of required pattern to marble/granite frames of window etc. with M.s. flats at required spacing and frames around, square or round bars fixed with round headed bolts and nuts or by screws, including oil painting with one coat of primer of approved quality and brand & two coats of synthetic enamel oil paint etc. complete as per detail drawing and as directed by Engineer in charge.**

### **1.0. Materials**

The structural steel shall conform to M-22

### **2.0. Workmanship**

**2.1.** The M.S. Grill shall be prepared as per the drawing or as directed for fixing to wooden frames of windows etc.

**2.2.** The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be reverted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts or screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to minimum of 2 Nos. on each side of the frame or as indicated in the drawing or as directed.

**2.3.** The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of the frame strips.

### **3.0. Mode of measurements & payment**

**3.1.** No payment shall be made for weight of screws, bolts nuts etc. only weight of grill shall be paid.

**3.2.** The rate shall be for a unit of one kg.

### **Item No :-59**

**Providing and fixing 600mm wide sandwiched kota as Kitchen platform, pantry, Basin counter etc. 20mm thick granite of approved colour + 30mm Cm in 1:4 + 20mm kota stone one side polished in one piece for kitchen / platform. The joint shall be filled with white cement with pigments to match the colour of the stone. The cutouts for Kitchen sink if required shall be provided as per drawing. The stone shall be of one shade only and different shades if found will be rejected, finished shall be measured & paid for. ( For all floors )**

Item shall be carried out as per item description.. The work shall be carried out as per standard engineering practice.

#### **Mode of Measurement :**

The work shall be measured in Running.meter.

### **Item No :-60**

**P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for light shade At All floors**

### **Item No :-61**

**P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for antiskit**

### **VITRIFIED TILE**

The tiles shall be of approved make and shall generally conform to IS 15622. They shall be flat, and true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance. The tiles shall be tested as per IS 13630. Classification and Characteristics of VITRIFIED TILE shall be as per IS 13712.

The tiles shall be square or rectangular of nominal size. Table 1,3,5, and 7 of IS 15622 give the modular preferred sizes and table 2,4,6 and 8 give the most common non modular sizes. Thickness shall be specified by the manufacturer. It includes the profiles on the visible face and on the rear side. Manufacturer/supplier and party shall choose the work size of tiles in order to allow a nominal joint width upto 2mm for unrectified floor tiles and upto 1mm for rectified floor tiles. The joint in case of spacer lug tile shall be as per spacer. The tiles shall conform to table10 of IS 15622 with water absorption 3 to 6% (Group BII).

The top surface of the tiles shall be double charged. Glaze shall be either glossy or matt as specified. The underside of the tiles shall not have glaze on more than 5% of the area in order that the tile may adhere properly to the base. The edges of the tiles shall be preferably free from glaze. However, any glaze if unavoidable, shall be permissible on only upto 50 per cent of the surface area of the edges.

## **2 Coloured Tiles**

Only the glaze shall be coloured as specified. The sizes and specifications shall be the same as for the

## **3 Decorative Tiles**

The type and size of the decorative tiles shall be as follows :

### **(i) Decorated white back ground tiles**

The size of these tiles shall be as per IS 15622.

### **(ii) Decorated and having coloured back-ground**

The sizes of the tiles shall be as per IS 15622.

## **4 Preparation of Surface and Laying**

**4.1** Base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tile shall be with cement mortar 1:4 (1 cement : 4 coarse sand) or as specified. The average thickness of the bedding shall be 20 mm or as specified while the thickness under any portion of the tiles shall not be less than 10 mm.

**4.2** Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it.

**4.3** Over this mortar bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square metre over an area upto one square metre. Tiles shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

**4.4** The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope. In bath, toilet W.C. kitchen and balcony/verandah flooring, suitable tile drop or as shown in drawing will be given in addition to required slope to avoid spread of water. Further tile drop will also be provided near floor trap.

**4.5** Where full size tiles cannot be fixed these shall be cut (sawn) to the required size, and their edge rubbed smooth to ensure straight and true joints. Tiles which are fixed in the floor adjoining the wall shall enter not less than 10 mm under the plaster, skirting or dado.

**4.6** After tiles have been laid surplus cement slurry shall be cleaned off.

## **5 Pointing and Finishing**

The joints shall be cleaned off the grey cement slurry with wire/coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigment if required to match the colour of tiles. Where spacer lug tiles are provided, the half the depth of joint shall be filled with polysulphide or as specified on top with under filling with cement grout without the lugs remaining exposed. The floor shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished floor shall not sound hollow when tapped with a wooden mallet.

## **5 Double charge layer**

In all double charge tiles the top layer will be coated two times that is top 2 layer of color coated.

## **6 Measurements**

Length and breadth shall be measured correct to a cm after laying flooring and the area calculated in square metre correct to two places of decimal. Where coves are used at the junctions, the length and breadth shall be measured between the lower edges of the coves. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Areas, where glazed tiles or different types of decorative tiles are used will be measured separately.

#### **7 Rate**

The rate for flooring shall include the cost of all materials and labour involved in all the operations described above, For tiles of sizes upto 0.16 sqm. unless otherwise specified in the description of the item. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

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

#### **Item No :-62**

**Providing and laying light shade vitrified tiles 8 mm to 10 mm thick in skirting , risers of steps and dado on 10 mm thick cement plaster 1:3 (1 Cement : 3 Coarse Sand) & jointed with white cement Slurry.At All floors**

Detail specification same as Item no.39 above.

#### **Measurements**

Length and breadth shall be measured correct to a cm after laying skirting, dado or wall plaster and the area calculated in square metre correct to two places of decimal. Where coves are used at the junctions, the length and breadth shall be measured between the lower edges of the coves. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Areas, where glazed tiles or different types of decorative tiles are used will be measured separately.

#### **Rate**

The rate for skirting, dado shall include the cost of all materials and labour involved in all the operations described above, For tiles of sizes upto 0.16 sqm. unless otherwise specified in the description of the item. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

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

#### **Item No :-63**

**Providing and laying Granite slab (18 mm thick) one side polished flooring over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M 1:1.5 laid and jointed with grey cement slurry including rubbing and polishing complete At all Floorsbase of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M 1:1.5 laid and jointed with grey cement slurry including rubbing and polishing complete**

##### **1.0. Materials**

Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 Granite river stone shall conform to M-52.

##### **2.0. Workmanship**

**2.1.** Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides trust dressed shall have a full contract if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free from chippings and giving a plane surface. The thickness shall be 25 mm. (Average) as specified in the item but not less than 20 mm. at any place of the slab. **2.2.**

Bedding for the Granite stone slabs shall be of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M. 1:1.5 of average thickness 20 mm given in the description of the item. Sub grade shall be cleaned, wetted and mopped Mortar of the specified mix and thickness shall then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. If shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining, the walls shall enter not less than 10 mm. under the plaster, skirting or dedo. The junction between the wan and floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

**2.3.** The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set properly.

**2.4.** Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with carborundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 to 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water when directed by the Engineer-in-charge, wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polishing machine fitted with bobs shall be run over it.

**2.5.** The holes required for Nahni traps, pipes and any other fittings shall be made, without any extra cost.

**3.0. Measurement & payment:**

**3.1.** The rate shall include the cost of all materials and labor involved in all the operations described above. The Granite stone flooring shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimetre and between the finished face of skirting dedo plaster and no deduction shall be made nor extra paid for any opening in floor of areas up to 0.1 sq. meter.

**3.2.** The rate shall be for a unit of one sq. meter.

**Item No :-64**

**Providing and laying polished granite stone slab 18 mm thick in risers of steps, dedo and pillars laid on 10 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with gray cement slurry including rubbing & polishing etc. Complete At all Floors**

Detail specification of materials same as Item no.45 above.

**Measurements**

Length and breadth shall be measured correct to a cm after laying skirting, dado or wall plaster and the area calculated in square metre correct to two places of decimal. Where coves are used at the junctions, the length and breadth shall be measured between the lower edges of the coves. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Areas, where glazed tiles or different types of decorative tiles are used will be measured separately

**Rate**

The rate for skirting, dado shall include the cost of all materials and labour involved in all the operations described above, For tiles of sizes upto 0.16 sqm. unless otherwise specified in the description of the item. Nothing extra shall be paid for the use of cut (sawn) tiles in the work.

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

**Item No :-76**

**Prov.20mm deep finished groove etc. comp.**

In general the work shall be carried out as per the standard practice in the industry.

20mm deep finished groove shall be made as per Relevant drawings and as per the instructions of Engineer in Charge.

The work shall be carried including necessary scaffolding ,tools and labour required.

The rate shall be for a unit of one Running Meter

**Item No :-77**

**Providing and fixing chicken wiremesh jali at R.C.C. masonry joints at any height with all labour & material etc. complete.**

**Material , Workmanship and Fixtures & Fastening etc. :**

The chicken wire mesh shall be provided to prevent cracks appearing between junctions of column /beams and walls, 150 mm wide chicken wire mesh fixed with U nails, 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go.

**Mode of measurement & payment :**

The rates includes all materials, labor, tools and plants in satisfactory completion of work as specified above.

The rates shall be for unit of one Sq.mt. for actual work done.

**Item No :-78**

**Applying two coats of Birla or Asian acrylic lapy (putty) & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.At all Floors**

**General :**

Scope of work includes cleaning off the entire surface , remove all loose particles, dust, scale, smoke, grease from the surface, sand the surface with Emery paper 180 and wipe clean, applying 2 coats of white birla putty.

**Material:**

manufacturer's standard guide line Putty Make.

**Workmanship:**

The Putty shall be of approved brand. Plaster filler to be used for filling up uneven surfaces , small cracks and holes etc and it should be done as per the manufacturer's standard guide line. The whole process of paint required 2 times sand with 180 emery paper wipe off and 1 time sand with 320 emery paper wipe off.

**Mode of measurement:**

All the measurement shall be taken on net surface area actually painted, deduction will be made from the area for fixtures, grills, ventilation, elect boxes and such obstructions not painted , if they are individually more than 0.05 sq.m.

**Rate :**

Rate is to include for All materials of puttys, sand paper, etc with labour required for scaffolding, cleaning off the surfaces, cleaning the site after completion of job, etc as directed by engineer in charge. Rate is for the net surface area of Painted surfaces in Square metre.

**Item No :-79**



**Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.(A) for wall and similar surfaces At all Floors**

**1.0. Materials**

Water shall be conform M-1. The plastic emulsion shall conform to I.S.: 5411-1969 (part-I).

**2.0. Workmanship**

**2.1. Scaffolding :** The relevant specifications of item-No. 18.11 Para 2.1 shall be followed.

**2.2. Preparation of surface :** The relevant specification of item No. 18.44 Para 2.2 shall be followed.

**2.3. Preparation of Mix :**

This shall be done as per manufacturer's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

**2.4. Application :**

**2.4.1.** Before pouring into small containers for use, the paint shall be stirred thoroughly in item container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

**2.4.2.** The paint shall be laid on evenly and smoothly by means of crossing and laying off the crossing and consist of covering the area over with paint, brushing the surface hard for the first time over and then, brushing alternately in opposite direction two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush Marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.

**2.4.3.** The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum two coats of cement water proofing paint. The second or subsequent coat shall not be started until the proceeding coat as become sufficiently hard to resist marking by brushing being used.

**2.4.4.** The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

**2.5. Precautions :**

(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and kept immersed in water fusing break periods to prevent the paint from hardening on the brush.

(b) In the preparation of wall for plastic emulsion painting, no oil base petals shall be sued in filling cracks, holes etc.

(c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

(d) Washing or surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application

**3.0. Mode of measurements and payment**

**3.1.** The rate shall be for a unit of One sq. meter.

**Item No :-80**

**Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.(B) for ceilings and soffits At all Floors**

Same as item no.-78 above

**3.0. Mode of measurements and payment**

**3.1.** The rate shall be for a unit of One sq. meter.

**Item No :-81,82**

**Finishing wall with weather proof exterior emulsion paint like Asian apex ultima ,ICI weather shield ,Neroleck , or equivalent on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etccomplete All floors**

Material :

The paint shall be (Textured exterior paint/Acrylic smooth exterior paint/ premium acrylic smooth exterior paint) of approved brand and manufacture. This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the

Engineer-in-Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface :

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc., should be repaired using white cement. The prepared surface shall have received the approval of the Engineer-in-Charge after inspection before painting is commenced.

Application :

Base coat of water proofing cement paint.

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application of cement paint shall be as per manufacturer's specification. The completed surface shall be watered after the day's work.

The second coat shall be applied after the first coat has been set for at least 24 hours. Before application of the second or subsequent coats, the surface of the previous coat shall not be wetted.

For new work, the surface shall be treated with three or more coats of water proof cement paint as found necessary to get a uniform shade.

For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade.

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ration of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions and directions of the Engineer-in-Charge shall be followed meticulously.

The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.

Paint shall be applied with a brush on the cleaned 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.

The specifications in respect of scaffolding, protective measures, measurements and rate shall include all material and labour involved in all the operations described above.

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

**Item No :-83**

**Providing & applying single coat of textured at external surface at all floor levels with three coats of weather proof cement exterior paint of approved standard brands make (Asian/Dulux/Narolac) at outer side of the building on RCC or Masonary walls. Rate to include for all labour, materials, staging, scaffolding, cleaing, curing etc. application of texture after throughly brushing th`e surface to give an even shade free from mortar dropping/other foreign matter etc. complete. application of textures & paints must be as per company's standard instructions. Texture and colour selection as per approved by engineer in charge.(It is recommended to use low voc paints rated by IGBC)**

Specification as per item description, manufacturer's details instruction and as directed by Engineer-in-charge.

The rate shall be for a unit of one Sq.metre.

**Item No :-84**

**Providing and laying China Mosaic type water proofing treatment on terrace including (a) Applying neat cement slurry 2.75 Kg./Smt. of cement admix with water proofing compound after cleaning the surface (b) 50 mm thk. Cement Concrete flooring 1:2:4 (1-Cement : 2-Coarse sand : 4-graded stone aggregate 20 mm nominal size) laid in admixed with water proofing compound including rounding of junctions of walls and slabs (c) after two days of proper curing applying a second coat of cement slurry (d) finishing the surface with 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand) and china mosaic tilling & finally finishing the surface with trowel with white cement slurry (e) after finishing the whole terrace shall be flooded with water for a period of two weeks.**

**Item No :-86**

**Supply & Fixing of Broken Glazed (China Mosaic) tiles size 5-6 mm thick of different size and shade (approved crazy patern) in Cement:Mortar 1:2 and joint filling with White Cement / Coloured Cement with water proofing component including Ramping, Watering, Curing etc. complete (FOR ALL FLOOR)**

Immediately on applying the cement slurry over the surface of the brick bat coba and when the slurry applied is still green, Provide in position 6 mm. thick broken Glazed tiles in size 12 mm to 20 mm, of odd sizes and shapes laid in approved crazy pattern (with one or more color in pattern, as directed) for floor/ dado having plain or curved surfaces, in cement mortar 1:3 proportion with cement, floating, joints finished with white or approved colour cement including tamping, watering, curing, cleaning with oxalic acid, etc. complete as per the Engineer's instructions.

#### **Curing and Testing the Treatment**

The entire surface thus treated shall be flooded with water by making ponding arrangement with weak cement mortar, for a minimum period of two weeks.

#### **MODE OF MEASUREMENT AND PAYMENT :**

The measurement shall be taken along the finished surface of treatment including the rounded and tapered portion at junction of parapet wall. Length and breadth shall be measured correct to a cm and area shall be worked out to nearest 0.01 sqm. No deduction in measurement shall be made for openings or recesses or chimney stacks, roof lights or khurras of area upto 0.40 sqm., nor anything extra shall be paid for making such openings, recesses etc. For areas exceeding 0.40 sqm., deduction will be made in the measurements for the full openings and nothing extra shall be paid for making such openings.

The rate shall include the cost of all labour and materials involved in all the operations described above.

The rate shall be for a unit of one sq. mt.

#### **Item No :-88,95**

**Steel work, riveted in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. (A) In beams and joists, channels angles Tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins conneted to common rafters and the like. (upto 10 ton).including applying a priming coat of red lead paint and two coats of oil painting etc complete**

#### **LAYING OUT :**

The steel structures, as shown in the drawings or as per directions of the Engineer-in-charge, shall be laid out on a level platform to full scale and to full size in parts. A steel type shall be used for measurements to ensure maximum accuracy.

Wooden templates 12 mm to 19 mm thick or steel templates shall be made to correspond to each connecting gusset plate and rivet holes shall be accurately marked on them and drilled. The templates shall be laid on the steel members and holes for rivetting and bolting marked on them. The ends 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.

#### **FABRICATION :**

The steel sections as specified shall be straightened and cut square and accurately to correct lengths. The cut ends exposed to view shall be finished smooth. No. two pieces shall be welded or otherwise jointed to make up required length of a member except as indicated in the drawing or otherwise specifically permitted by the Engineer - in - charge. All straightening and shping to form shall be done by application of pressure and not by marning. Any bending or cutting shall be

carried out in cold condition (unless otherwise directed) in such a manner as not to impair the strength of the metal.

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 the locating, type, size, length and details of rivets, bolts or welds shall be prepared in advance of the actual fabrication and approved by the Engineer-in-charge. The drawing shall indicate the shop and filed rivets, bolts and welds. The steel members shall be distinctly marked or stencilled with paint with the identification marks as given in the shop drawings.

The bars shall be thickened at the ends so as to provide for screwed threads and gradually tapered off to meet their normal section.

Great accuracy shall be observed in the fabrication of various members. Do that these can be assembled without being unduly packed strained or forced into position and when built-up shall be true and free from twists, bracks buckles or open joints.

Before making holes in individual members, for fabrication the steel work intended to be riveted or bolted to girders shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping of the surface of the different members. All stiffeners shall be tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut of dressed true and straight and fitted close together,

We splice plates and fillers under stiffeners shall be cut to fit within 3 mm of flange angles. We plated or girders which have no cover plates shall have their ends flush with the top of angles forming the flanges unless otherwise required. The we plates, when spliced shall have clearance of not more than 6 mm.

The erection clearance for cleated ends of members connecting steel to steel preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm. at each end but where for practical reasons, 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 flaws. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it, from lateral displacement.

Expansion bed plates shall be planed true and smooth. The planing of bed plates shall be done in the direction of the movement of the girder or truss resting on it.

Column splices and but joints of struts and impression members depending on contract for trees transmission shall be accurately machined and closebutted over the whole section. In column caps and bases, the ends of shafts together with the attached gussets, angles, channels etc. after riveting together shall be accurately machined so that the parts connected but against each other over the entire surface of contract. Connecting angles or channels shall be fabricated and placed in position with great accuracy so that they are not unduly reduced in thickness by machining.

The ends of all bearing stiffeners shall be machined 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 position. Sub-punching shall be permitted, provided it is done 3 mm. less in diameter and reamed thereafter to the required size.

Holes for rivets and black bolts shall be large by 0.4 to 6 mm. as shown in appendix-I under column "Coarse" than the nominal diameter of the rivets or black bolts depending upon the dia of rivets.

Holes for turned and fitted bolts shall be drilled or reamed large by 0.2 to 3 mm. depending upon the dia of bolts as shown in Appendix under column "Medium".

When the number of plates or sections to be riveted together exceeds three or when their total thickness is 90 mm or more, holes shall be drilled or reamed in position, after the members are assembled and the parts firmly hold together by clamps. Before riveting or bolting up or welding finally. The members shall be taken part and all burns removed.

Holes shall have their exist perpendicular to the surface bore through. The drilling or remering shall be free form burrs and the holes shall be clean and accurate.

The work or fabrication shall be completed in the work shop as far as it is practicable to do so. Site jointing shall be done with rivets or turned and fitted bolts, or black bolts or welding as shown in drawings or as directed by the Engineer-in- charge. Generally, the following principles shall govern the use of rivents, turned and fitted bolts and back bolts :-

[ i] Rivets of turned and fitted bolts shall be used where the connection is such that slip under load has or be avoided.

[ii] Black bolts may be used very sparingly where a force is carried through a connecting without impact, vibration or reversal of stresses (unless such reversal is due to wind forces.)

In the case of welding, holes shall only be made for the bolts used for temporary fasting as shown in drawings.

**WELDING :**

Welding shall be generally be done by electric process. The electric are method being economical, is usually adopted. Where public electricity is not available, a suitable generator shall be arranged Gas welding shall be resorted to using exyac etylene flame with specific period approval of the Engineer-in- charge.

Gas welding shall not be permitted for structural steel work. Gas welding required heating of the members to be welded along with the welding road and is likely to creat temprature stresses in the welded members. Precautious shall therefore be taken tol avoid distortion of the members due to these temprature stresses.

The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded, type of welds, shop and site welds, as well as the types of electrodes to be used symbol for welding on plans and shop drawings shall be according to IS : 813-1061. As far as possible, every effect shall be made to limit the welding that must be done after the structure is erected so as to avoid the improper welding that is likely to be done due to heights and difficult positions of scaffolding etc. a part from the aspect of economy.

**PREPARATION OF SURFACE :**

Surfaces which are to be welded together, shall be free form loose mild-scale, rust, paint, grease or other foreign matter. A Coating of boiled linseed oil shall be permitted.

**PRECAUTIONS :**

All operations connected with welding and cutting equipment shall confirm to the safety requirement given in IS : 818-1968 for "Safety and Health requirements in Electric and Gas welding and Cutting Operations".

The following points shall be borne in mind during the process of welding :-

[a] Welds shall be made in the flat position. Whereever practicable.

[b] Are length, voltage and amperage shall be suited to the thickness of materials, type of groove and other circumstance of the work.

[c] The sequence of welding shall be such that where possible, the members which after the greatest resistance to compression are welded first.

All defective welds which shall be considered, harmful to the structural strength shall be cut out and rewelded.

Finishged welds and adjacent parts shall be proected with clean boiled linseed oil and after all slag has been removed. Welds and adjacent apart shall be painted after the same are approved by the Engineer-in-charge.

All the members shall be throughly cleaned of rust, scales dust etc. and given a priming coat of lead painting before fixing then in position.

**RATE :**

The rate shall be for a unit of one Kg.

**Item No:-89**

**Fabricating, supplying and fixing in position SS railing for staircase and balcony with brush finish and 304 grade as per Indian Standrd and detailed drawing including grinding, cleaning**

**and filling the welded spots with SS finish (Only Length will be paid for payment height max.1.0 mt.). The Work to be executed as per consultant drawing .**

The relevant specification shall be followed as per General Technical specification for Building work booklet It.No.10.100 (A) except the materials used is of ASIS 304 grade. And as per item descriptions.

The consolidated item shall be measured and paid on Rmt.

### **Item No.90**

**The providing & fixing of Fix louvered work. The main frames both verticals and horizontals have to be Aluminium pipes of 100 mm x 50 x 3.0 mm with colour anodized 20 micron (silver) thick all colour anodized of 15 microns. including All hardware, labour,scaffolding,fixtures,fastners transport and all other taxes included etc. complete as per architect's details at all floor levels. General**

The item shall consist of preparing and fixing of aluminum ventilators using square aluminum tubes of specified size having 5 mm thick frosted glass louvers as specified and fixing the same in structure at required places in accordance with the details shown on the drawings or as approved by the engineer in charge.

#### 1.0 MATERIAL

##### 1.1 Main outer frame of rectangular tube

Main frame shall be of standard coloured anodized Aluminum hollow sections as described in details in item of schedule B

Aluminum alloy used in the manufacture of extruded Window section shall confirm to I S designation HEA-WP of I S 733-1975 and also Designation WVG –WP of I S 1285-1975 section shall be as specified in the drawing and design

All sections shall be Free from any scratches or holes or any damages on surface. All section shall have finished luster surface on all sides

1.2 5mm thick frosted glass :- The 5mm. thick frosted glass shall be of approved colour and quality The thickness of glass shall be as per item description The Glass shall conform to M-38.2 Page No. 18 of General technical specification book for building works

##### 1.3. Rubber Gasket

Rubber gasket shall be of approved make and shall be free from any scratches or holes or any damages on surface. and shall have finished luster surface on all sides.

#### 2.0 WORKMANSHIP

The Ventilators shall be fabricated as shown in detail architectural drawing and as per instruction of engineer in charge, Only approved material shall be used in Ventilators colour of anodizing shall be approved and shall be anodized up to the satisfaction of engineer in charge. Completed Ventilators shall be fixed in position in true line and level.

### 3.0 Mode of Measurement & Payment :

4.1. The unit rate of aluminum Ventilator shall include the cost of all materials, cost of anodizing, cost of all necessary fixtures and fastenings, Glass sheet for louvers labour charges for fixing frames and ventilator and fixing the same in wall at the place shown in drawing and as instructed by Engineer in charge.

4.2. The Ventilator shall be measured in square meter

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

### **Item No.93**

**Providing, laying and jointing in true line and level 110 diametre U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diametre x 149 mm length x 145 mm heigh at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials.**

#### 1.0 Materials:

UPVC SWR type B pipe confirming to IS 13592-1992 with one end plain and other end socketed with rubbering & fitting conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant.

#### 2.0 Workmanship:

Make sure the spigot end and inside of sockets clean and the sealing ring is placed evenly in the socket. When cutting pipes, make sure they are cut square. Cut end of pipe should be debarred and chamfered to an angle of 150 with a medium file. This is important to avoid displacement of the rubber ring. A correct depth of entry of the spigot into the socket is required to allow thermal movement. To achieve this, push spigot fully into the socket (remove sealing ring at this time) and make a mark on the spigot. Withdraw the spigot by 10mm and mark the spigot with a bold line. This bold mark indicates the correct depth of entry to allow the necessary expansion gap. Apply Tulsi rubber lubricant evenly on the pipe or fitting spigot end and the sealing ring. Then insert the spigot into the socket with light twisting motion. Pull out the pipe to allow for 10mm expansion gap. The joint is now complete and required no additional mastics, tape or cement or any other jointing sealants.

#### Important Information

Only UV stabilized UPVC SWR pipes with rubber ring / click ring or pasted type only should be used. The regular UPVC pressure pipes with solvent cement jointing when exposed to sun-rays / weather get brittle and brownish and joint get opened due to thermal expansion. ÿ Use only rubber lubricant for joining SWR pipes and fittings where rubber ring is used. ÿ Avoid over tightening of door caps. Proper placement of rubber ring should be confirmed before tightening. ÿ Avoid misalignment of vertical SWR pipe stacks and incorrect spacing



of pipe clips. Use of rubber ring type joint for horizontal installation requires proper supports and alignment and hence pasted type joint should be preferred. Cutting of pipes should be straight, as diagonal cutting may lead to leakage. All entry to main stacks should be protected with water seal trap, wherever there is mixing of Soil and Waste lines. Keep a gap of 10 mm between all pipes and fittings to accommodate thermal expansion and contraction of pipes for longer life of the system. Smoke test should be avoided and test plug/socket plug should be used for testing the lines. Horizontal lines within bathrooms should be cement encased and tested before compacting of sunken floor to avoid any accidental damages. For further technical information/assistance, the manufacturer to be contacted for required clarification.

### 3.0 Mode of Measurements and Payment:

The description of each item shall, unless otherwise stated held to include where necessary conveyance, and delivery, handling, unloading, storing, fabrication, hoisting, all labour for finishing to required shape and size setting, fitting in position, straight, cutting and waste, return of packings etc. The length shall be measured on running meter basis of finishing work. The length shall be taken along the center line of the pipe and fittings. The pipes fixed to walls, ceilings, floors etc. shall be measured and paid under this item. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated.

The rate shall be for a unit of one running meter including fitting & clamps as per detail. The rate shall be for a unit of one running meter

#### **Item No :-94**

**Providing and fixing hot dip Concertina Coil of 610 mm. dia made out of 2.59 mm. (12SWG) hot dip galvanized ( G.I. coating not less than 200 gm / s.m. )th. Wire having 80 nos. of spies and 200 nos. of clips made out of stainless steel (AISI 304) 1.5 mm thick. Dia, G.I. Strips 0.5 mm. ht. (G.I coating not less than 120 gm / s.m. ) weight of one coil should not be less than 15 kg etc. complete, at the top of compound wall fixed with S.S clips and binding wires wherever necessary etc. complete. (Note : Stretching length of one coil should not be more than 9 m.)**

Detailed specification same as per item description and as directed by Engineer-in-charge

The rate shall be for a unit of running metre.

**3.2** The rate shall be for a unit of one sq. meter.

#### **ITEM NO.:-97**

**Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths interlocked together through their entire length and jointed together at the ends by end locks mounted on specially designed pipe shaft with bracket plates, guide channels and arrangements for inside and outside locking with push-pull operation including the cost of hood cover and spring etc. complete.(A) Shutters having width below 3.5 M.**

#### **1.0. Materials**

The rolling shutters shall conform to I.S.6248-1979

#### **2.0. Workmanship**

Rolling shutters shall be supplied of specified type with accessories. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide for shutters up to 3.5 m .width not less than 1.25 mm. thick and 80 mm wide for shutters 3.5 m. in width and above unless otherwise specified.

Guide channels shall be of mild steel deep channel section and of rolled pressed or built up ( fabricated ) joint less construction The thickness of sheet used shall not be less than 3 15 mm.

Hood covers shall be made of M S. Sheets not less than 0.90 mm. thick. For shutters having width 3.5 Meter and above, the thickness of M.S. sheet for the hood cover shall be not less than 1 25 mm.

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

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

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

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

### **3.0 Mode of Measurement:**

**3.1** The length and breadth shall be measured correct to cm. The rate shall include the cost of all labour materials required for the operation involved for satisfactory completion of this item.

**3.2** The rate shall be for a unit of one sq. meter.

### **Item No:-98,99,100**

**Providing laying and jointing in true line and level 15mm dia. U.P.V.C. Pipe ( SCH- 40) for cold water including fittings as approved by Engineer In Charge. Pipe shall be fixed on the wall with the help of clamp at every two metre C/C or shall be cancelled as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.(A) 15mm. dia.,(c) 25mm. dia.,(e) 40mm. dia.**

#### **1.0 Materials:**

1.1 The pipe (schedule 40) of specified diameter with working pressure shall conform to ASTM –D 1785 (non-threaded). The specials and fittings required shall be of best quality and UV stabilized so as to facilitate open fixation, conforming to ASTM–D-2466 and relevant specifications of plumbing materials.

#### **2.0 Workmanship:**

2.1 The uPVC pipes of specified diameter shall be fixed as directed. Due to thermal expansion of uPVC pipes, due allowances, about 10 mm. of thermal gap, shall be made particularly in over the ground pipe lines for any change in length of pipe line which may occur during installation or when pipe line is in serve.

2.2 Above the ground installation of uPVC pipe should be undertaken after precautions are observed for their protection against dirt, sunrays and mechanical damage. uPVC pipes are UV stabilized and shall be adopted.

2.3 The uPVC pipelines should not be kept exposed above the ground when it passes through public place, railway lines, roads, roadside and footpaths.

2.4 Generally, in horizontal runs, uPVC pipes shall be supported at an interval of not more than ten times the outside diameter of the pipe. In vertical lines, uPVC pipes shall be supported at an interval of 1 m. to a maximum of 2 m. Closer support spacing shall be provided, if recommended by the manufacture.

2.5 The guide line indicated by the manufacture regarding handling, transporting, storing, laying and jointing of pipes shall be kept in view, during execution. Provision for expansion joints, air vents and proper anchorage shall be made.

2.6 uPVC pipes shall be fixed on wall with wooden plugs and suitable clamps.

### **2.7 Jointing the pipes:**

2.7.1 The pipes and sockets shall be accurately cut. Care shall be taken to cut the pipe square. The shortened pipe end shall be chamfered to an angle of 15 with a medium file. The ends of the pipes and fittings should be absolutely free from dirt and dust. The outside surface of the pipes and the inside of the fittings shall then be roughened with emery paper, and then solvent cement shall be applied to the matching surface i.e. to the spigot end and the sealing ring and then pass the spigot end in to the socket containing the sealing ring until pushed home fully and joined. Mark the position of the socket edge on the pipe and then withdraw the pipe from the socket for the necessary thermal gap. Since solvent cement is aggressive to uPVC, 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. Very old, hard, semi fluid solvent cement shall not be used. Empty solvent cement tins, brushes, rags of paper unpregnated with cement should not be buried in the trenches. They should be gathered, not left scattered about, as they can prove to be a hazard to animals, which may chew them.

2.7.2 Threaded uPVC pipe fittings shall not be over tightened, as the threads may get damaged. The pipes shall never be threaded but suitable threaded fittings shall be used.

2.7.3 If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge or Architect.

### **2.8 Laying the pipes in trenches:**

2.8.1 The pipes shall be laid over uniform relatively soft fine-grained soil, found to be free from presence of hard objects such as large flints, rocky projections, large tree roots etc. While laying the pipes underground, care shall be taken so that the trench shall be as narrow as possible as required for working and its bottom shall be free of stones, sharp objects etc.

2.8.2 The pipes laid underground shall not be less than 1 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.

### **3.0 Mode of Measurements and payment:**

3.1 The relevant specifications of item No. 1.01.a of water supply installations shall be followed except that the uPVC pipes of specified dia. shall be paid under this item.

3.2 The rate shall be for a unit of one rmt.

**Item No :-108**

**Providing erecting and fixing double coated Syntex or equivalent PVC (ISI) mark water tank of reqd capacity each with all necessary fitting and connection etc. comp on terrace.**

1.1 Approved PVC water tank of specified manufacturer

**2.0 WORKMANSHIP:**

2.1 The Syntex water tank shall be supplied in Size As per Decided By Engineer In charge and fixed, and fitted on basis of the drawings furnished by the manufacturer, on purchase of the water tank. Whenever, staging is required for installations, designs and drawings for the same up to 2.0 mt. height shall be furnished again placement of order. Installation can also be done through the trained personnel of the dealer. The work shall be carried out in best workman like manner as directed by Engineer-in-charge.

**3.0 MODE OF MEASUREMENT AND PAYMENT:**

3.1 The rate includes for all labour, materials, tools and equipment required to complete the working satisfactory manner.

3.2 The rate shall be for a unit of liter basis

3.4 The Payment shall be for a unit of liter basis.

**Item No.112**

**Providing and constructing B.B. masonry in C.M. 1: 6 ( 1. Cement, 6 coarse sand ) and cement concrete 1: 2: 4 ( 1 Cement, 2 sand, 4 graded stone agg. Of 20 mm nominal size B.T. kapachi ) SEPTIC TANK of 3 M X 0.9 M X 1.5 M internal dimension with necessary compartment of grit chamber and septic tank with necessary inlet and outlet connection with cement plaster ( 15 mm thick ) in C.M. 1: 4 (1 cement, 4 sand) with water proofing materials 1: 5: 10 ( 1 Cement, 5 Sand, 10 Brick bats aggregate 40 mm nominal size ) brick bats concrete bedding R.C.C.1:2:4 top cover slab 12 cm. thick with C.I. Cover of 60cm. X 45 cm. size (light duty ) 75 mm. dia PVC SWR ventilating pipe 2 mtr. Long with cowl vent, 40 mm thick I.P.S. flooring 10 cm. thick cement vata mild steel for slab and finishing to exposed faces in C.M. 1:3 ( 1 Cement, 3 Sand ) curing etc comp. as directed by E.I.C.**

Details specification same as per Item description and as instruction by Engineer-in-charge.

The rate shall be for a unit of one No.

**Item No.113**

**Providing and construction SOAK WELL OF 2.50 M. dia. & 5.00 M. depth clear dimension incl. B. K. masonry solid and honey comb masonry in C.M. 1:6 ( 1 cement, 6 sand ), R.C.C.1:2:4 ( 1 cement, 2 sand, 4 graded stone agg. 20 mm nominal size of B.T. kapachi ) top slab thick with C.I. manhole cover 60 cm. X 45 cm. size ( medium ) 75 mm C.I. ventilating pipe 2 M. long with 75 mm dia. Cowl vent and incl. filling brick bats of required size and depth incl. cost of reinforcement excavation refilling finished top of slab with C.M. 1:3 ( 1 Cement, 3 sand ) curing etc. comp. as directed by E.I.C.**

Details specification same as per Item description and as instruction by Engineer-in-charge.

The rate shall be for a unit of one No.

**Item No.118**

**Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concret as per approved design and including excavation for fixing in proper line and level,filling the joint with C:M 1:3 (1cement:3fine sand) etc complete. (upto 10 ton).**

**1.0 Material:**

Water shall confirm to M-1, sand shall confirm to M-6, Cement shall confirm to M-3. Pre-cast concrete kerb stone of gray cement based concrete block 35cm length,30cm height and 15cm thick of M250 grade concreteapproved shape.

**2.0 Workmanship:**

Subgrade shall be cleaned, leveled, wetted and rammed as directed. kerb stone of approved colour, shape and size, shall be laid in different pattern/design as shown in the drawing or as directed by Consulting Architect/Engineer in charge as directed on top, pressed, tapped gently to bring it in line and level and inter lock with others. The joint shall be as fine as possible. The finished surface shall be true to levels and slopes as directed. Necessary testing of blocks is to be carried out.

**3.0 Mode of Measurement and Payments :**

The rate shall include the cost of all materials and labour involved in all the operations described above.

The rate shall be for a unit of running meter.

**Item No :-119**

**Providing and fixing to wall ceiling and floor 10.0 Kg. F/Cm2 working pressure polythene pipes of the following outside Dia. Low density, complete with special falnge compression type fittings, wall clipsetc. including making good the wall ceiling and floor.(F) (A) 75 mm dia**

Specification for this item shall conform to item no. **Ch.23-it no 23.80 it code 23004A**General Technical Specifications for building work. Except that the pipe shall be of **10 kg/Sqcm. And Dia. Of 75mm.**

Rate shall be for a unit of one Running Meter.

**Item No :-120**

**Providing and fixing to wall ceiling and floor 10.0 Kg. F/Cm2 working pressure polythene pipes of the following outside Dia. Low density, complete with special falnge compression type fittings, wall clipsetc. including making good the wall ceiling and floor.(F)(B) 110 mm dia.**

Specification for this item shall conform to item no. **Ch.23-it no 23.80 it code 23004A**General Technical Specifications for building work. Except that the pipe shall be of **10 kg/Sqcm. And Dia. Of 100mm.**

Rate shall be for a unit of one Running Meter.

**Item No :-121**

**Providing and fixing P V C SWR pipes (IS 13592) spigot and socket soil waste and ventilating pipe of the following nominal size 160 mm dia**

Rate shall be for a unit of one Running Meter.

**Item No :-128,129**

**Providing and fixing in position P.V.C. cowl vent to pipes of prince, suprim, jain make etc. comp. (B) 75 mm Dia., (C) 100 mm Dia**

**1.0 MATERIALS:**

1.1 The cowl vent shall be of 1st quality and make as approved By the Engineer-in-charge & As per Manufacturer's Specifications.

**2.0 MODE OF MEASUREMENTS & PAYMENT:**

2.1 The rate includes cost of all labour, materials; tools and plant etc. required for satisfactory completion of this item as specified in workmanship.

2.2 The rate shall be for a unit of one number.

**ITEM NO.136:**

**Providing and fixing pre- cast concrete kerb stone of gray cement based concrete block 30 cm length, 30 cm height and 15cm thick of M 250 grade concrete as per approved design and including excavation for fixing in proper line and level, fillig the joint with C: M 1:3 ( 1 Cement : 3 Fine Sand) etc. complete**

**1.0 Material:**

Water shall confirm to M-1, sand shall confirm to M-6, Cement shall confirm to M-3. Pre-cast concrete kerb stone of gray cement based concrete block 35cm length,30cm height and 15cm thick of M250 grade concrete approved shape.

**2.0 Workmanship:**

Sub grade shall be cleaned, levelled, wetted and rammmed as directed. kerb stone of approved colour, shape and size, shall be laid in different pattern/design as shown in the drawing or as directed by Consulting Architect/Engineer in charge as directed on top, pressed, tapped gently to bring it in line and level and inter lock with others. The joint shall be as fine as possible. The finished surface shall be true to levels and slopes as directed. Necessary testing of blocks is to be carried out.

**3.0 Mode of Measurement and Payments:**

The rate shall include the cost of all materials and labour involved in all the operations described above. The rate shall be for a unit of running meter.

**Item No :-137**

**Providing, laying, spreading and consolidation graded stone aggregate to wet mix macadam 150mm compacted thick as per MORT & H specifications including premixing the material with water at OMC in mechanical plant carriage of mixed material by tippers to site, laying in uniform layers with paver in sub base/ base course on well prepared surface and compacting with vibratory roller to achieve the desired density**

1 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 75mm. 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 20cm upon approval of the Engineer.

## 2 MATERIALS

### 2.1 AGGREGATES

#### 2.1.1 PHYSICAL REQUIREMENTS :

Course aggregates shall be crushed stone. If crushed gravel / shingle is used, not less than 90 percent 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 400-10 below.

TABLE 40-10 PHYSICAL REQUIREMENT OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE / BASE COURSES

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

\* Aggregates 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 be 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.

If the water absorption value of the coarse aggregate greater than 2 percent, the soundness test shall carried out on the material delivered to site as per 2386 (Part – 5).

#### 2.1.2 Grading requirements :

The aggregates shall conform to the grading given in Table 400-11

TABLE 400-11. 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	8-12
75.00 micron	0-8

Materials finer than 425 micron shall have plasticity index (P.I ) 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.

### 3 Construction Operation :

3.1 Preparation of base : Clause 3.1 as below shall apply.

3.1 Preparation of base: The surface of the subgrade/sub-base/base to receive the water bound macadam course shall be prepared to the specification lines and cross fall(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 unit 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 specification.

As far as possible, laying water bound macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two course. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it. However, where the intensity of rain is low and the interface drainage facility is efficient, water bound macadam can be laid over the existing thin bituminous surface by cutting 50 mm x 50 mm furrows at an angle of 45 degrees to the centre line of the pavement at one metre intervals in the existing road. The directions and depth of furrows shall be such that they provide adequate bondage and also serve to drain water to the existing granular base course beneath the existing thin bituminous surface.

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 4.1 as below.

### 4 Construction Operations:

4.1 Shoulder: The sequence of operations shall be such that the construction of paved shoulder is done in layers each matching the thickness of adjoining pavement layer . Only after a layer of pavement and corresponding layers in paved and earth shoulder portion have been laid and compacted, the construction of next layer of pavement and shoulder shall be taken up.

Where the materials in adjacent layers are different ,these shall be laid together and the pavement layer shall be compacted first. The corresponding layer in paved shoulder portion shall be compacted thereafter, which shall be followed by compaction of earth shoulder layer. The adjacent layers having same material shall be laid and compacted together.

In all cases where paved shoulders have to be provided along side of existing carriageway, the existing shoulders shall be excavated in full width and to the required depth as per clause 3.7 under no circumstances, box cutting shall be done for construction of shoulders.

Compaction requirement of earthen shoulder shall be as per table 300-2 in the case of bituminous courses, work on shoulder(earthen/hard/paved), shall start only after the pavement course has been laid and compacted.

During all stages of shoulder (earth/hard/paved) construction, the required cross fall shall be maintained to drain off surface water

Regardless of the method of laying, all shoulder construction material shall be placed directly on the shoulder. Any spilled material dragged on to the pavement surface shall be



immediately removed, without damage to the pavement, and the area so affected thoroughly cleaned.

#### 3.4 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-mil or pan type mixer of concrete batching plant.

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 micron to 22.4 mm size. While adding water, due 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 so segregation should be permitted.

#### 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 paver finisher shall be self – propelled, having the following features :

- (i) Loading hoppers and suitable distribution mechanism
- (ii) The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
- (iii) 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 tested by depth blocks during construction.

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

#### 3.5 Compaction :-

After the mix has been laid to the required thickness, grade and camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100mm, a smooth wheel roller of 80 to 100 KN weight may be used. For a compacted single layer up to 200mm, 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 center line of the road. Uniformly over-lapping each preceding track by at least one fourth 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 be at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall progress gradually

towards the center parallel to the center line of the road uniformly overlapping each of the preceding track by at least one-fourth 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 sub grade is soft or yielding or when it caused a wave-like motion in the sub – base/ base course or sub grade. If irregularities develop during rolling which exceed 12mm when tested with a 3 meter straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a 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 of the material as determined by the method outlined in IS : 2720 ( Part-8 )

After completion, the surface of any finished layer shall be well-graded, 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 re-compacted.

#### 3.6 Setting and drying :

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

#### 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 laid.

#### 5 Surface Finish and Quality control of work

##### 5.1 Surface evenness :

The surface finish of construction shall conform to the requirements of Clause 902 of MORT & H specifications.

##### 5.2 Quality Control :

Control on the quality of materials and works shall be exercised by the Engineer in accordance with section 901 of MORT & H specifications

#### 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 subgrade 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 of this item . The area treated in the aforesaid manner shall not be less than 5m long and 2m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

#### 6.7 Arrangement for Traffic :

During the period of construction, arrangement of traffic shall be done as per Clause 112 of MORT & H specifications

#### 6.8 Measurements for Payment :

Wet mix macadam shall be paid as finished work in position on cross sectional measurements and computing the volume of WMM work in cubic meters by average area method.

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

- i) Making arrangement for traffic to Clause 112 as above Except for initial treatment to verges, shoulders and Construction of diversions :
- ii) Furnishing wet materials to be incorporated in the work including all royalties, fees, rents where necessary and 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.

The payment shall be made on Cum basis.

### **Item No :-138**

**Providing & laying of specified compacted thickness Granular sub base (GSB) in specified grading in table 400-1 of the specification MORT&H and compactor to the required density with 8 - 10 tonne vibratory roller with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement .( fully saturated having CBR value greater or equal to 30) compacted thickness of 150 mm consisting of Machine crust stone aggregate as per grading 1 in table 400-1 of the specification MORT&H fifth Revision**

**SCOPE** This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of 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.

### **2 MATERIALS**

**2.1** The material to be used for the work shall be natural sand, gravel, crushed stone, or combinations thereof depending upon the grading required. The material shall be free from organic or other deleterious constituents and conform to grading (given below). While the gradings in Table -1 are in respect of close-graded granular sub-base materials, one each for maximum particle size of 75 mm, 53 mm and 26.5 mm, the corresponding gradings for the coarse-graded materials for each of the three maximum particle sizes are given at Table -2. The grading to be adopted for a project shall be as specified in the Contract.

**2.2** Physical requirements The material shall have a 10 per cent fines value of 50 kN or more (for sample in soaked condition) when tested in compliance with BS : 812 (Part 111). The water absorption value of the coarse aggregate shall be determined as per IS :2386 (Part 3); if this value is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS : 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 per cent.

S. No.	Item	Ref. Code	Frequency
1	<b>Granular Sub Base</b>		
1.1	Gradation	IS:2720 (Part 4)	1 Tests/400 m <sup>3</sup>
1.2	Atterberg's limits	IS:2720 (Part 5)	1 Tests/400 m <sup>3</sup>
1.3	Moisture Content prior to compaction	IS:2720 (Part 2)	1 Tests/400 m <sup>3</sup>
1.4	Field Density of compacted layer	IS:2720 (Part 28)	1 Tests/1000 m <sup>2</sup>
1.5	Deleterious content test	IS:2720 (Part 27)	As required
1.6	CBR	IS:2720 (Part 16)	Minimum 30%, as required.

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

IS Sieve Designation	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

### 3 STRENGTH OF SUBBASE

3.1 It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished

3.2 When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the "quality" of materials, as may be necessary.

### 4 CONSTRUCTION OPERATIONS

4.1 Preparation of sub grade Immediately prior to the laying of sub-base, the subgrade already finished 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 8 -10 Ton smooth wheeled roller.

**4.2 Spreading and compacting** The sub-base material of grading specified in the Contract shall be spread on the prepared sub grade 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.

When the sub-base material consists of combination of materials mentioned above, mixing shall be done mechanically by the mix-in-place method.

Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations. The equipment used for mix-in-place construction shall be a rotator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out 9 of 9 to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS : 2720 (Part II) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS : 2720 (Part VIII). While adding water, due allowance shall be made for evaporation losses. After water, has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotators until the layer is uniformly wet.

Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 8 to 10 Ton weight may be used. For a compacted single layer upto 225 mm the compaction shall be done with the help of a vibratory roller of minimum 8 to 10 Ton static weight with plain drum or pad foot drum or heavy pneumatic tired roller of minimum 200 to 300 kN weight having a minimum tyre pressure of 0.7 MN/m<sup>2</sup> or equivalent capacity roller 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 and super elevation and shall commence at the edges and progress towards the center for portions having cross fall on the both sides.

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 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% of the maximum dry density for the material determined as per IS : 2720 (Part 7). 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.

#### **4.3 Surface Finish and quality Control of Work**

The finished surface shall be checked for lines, levels and regularity. The surface evenness of completed surface in longitudinal and transverse direction shall be within the tolerances specified.

## **5 MODE OF MEASUREMENTS:**

The surface finish of construction shall conform to the requirements. Granular sub-base shall be measured as finished work in position in cubic meters.

### **Item No. :-139**

**Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.**

#### **1.0 Material:**

The concrete pavers should have perpendicularities after release from the mould and the same should be retained until laying.

The surface should be anti skid and anti flare type.

The pavers should have uniform special chamfers to facilitate easy drainage of surface run off.

The pavers should have uniform interlocking space of 2 to 3mm. to ensure compacted sand filling after vibration of the paver surface.

The pavers should have the following Engineering properties when tested as per IS 2185.

Crushing strength - minimum 250 kg. per sq.cm.

% of water absorption - 3% max.

Abrasion resistance - As per relevant IS codes.

The ingredients of pavers shall meet the specifications of relevant IS code (IS 15658-2006).

#### **2.0 Workmanship:**

Subgrade shall be cleaned, leveled, wetted and rammed as directed. 75mm thick layer of dry sand shall be spread over it. paver block of approved color, shape and size, shall be laid in different pattern/design as shown in the drawing or as directed by Consulting Architect/Engineer-in-charge as directed on top, pressed, tapped gently to bring it in line and level and inter lock with others. The joint shall be as fine as possible. The finished surface shall be true to levels and slopes as directed. Necessary testing of blocks is to be carried out.

#### **3.0 Mode of Measurement and Payments:**

The rate shall include the cost of all materials and labour involved in all the operations described above. The Paver block flooring shall be measured in square meters correct to two places of decimal, length and breadth shall be measured correct to a centimeter.

The rate shall be for a unit of one square meter

### **Item no: 140**

**Dry Lean Cement Concrete Sub- base (Construction of dry lean cement concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.**

**Scope-**

DLC acts as a sub-base for the cement concrete pavements or pavement quality concrete (PQC) DLC material has no slump i.e. zero slump

**Material**

**Cement**

Any of the following type of cement may be used with **prior approval of the Engineer in charge.**

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

If the subgrade soil contains soluble sulphates in a concentration more than 0.5%, sulphate resistant cement conforming to IS:6909 shall be used.

**Aggregate**

Aggregate for lean concrete shall be natural material complying with IS:383. Aggregate shall not be alkali reactive. In case engineer consider that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hours before batching, or as directed by the engineer.

**Coarse aggregate**

Coarse aggregate shall consist of clean, hard, dense, strong, durable and non-porous pieces of crushed stone and crushed gravel and shall be devoid of pieces of disintegrated stone, soft flaky, elongated, very angular, splintery pieces. The Max. size of aggregate is 26.5 for pavement concrete. No aggregate which has water absorption more than 2% shall be used in concrete mix. The aggregate shall be tested for soundness in accordance with IS:2386(part-5). After 5 cycle of testing, the loss shall not be more than 12%, If sodium sulphate solution is used, 18% If magnesium sulphate solution is used. The combined flakiness index and elongation index of aggregate shall not be more than 35% and the Los Angeles abrasion value shall also not be exceed 35.

The aggregate gradation shall comply with Table 600-1 given below..

Table 600-1 aggregate gradation for Dry Lean concrete (DLC)	
Sieve Designation	Percentage by weight passing the sieve
26.5 mm	100
19.0 mm	75-95
9.50 mm	50-70
4.75 mm	30-55
2.36 mm	17-42
600 micron	08-22
300 micron	07-17
150 micron	02-12
75 micron	0-10

### **Fine aggregate**

The fine aggregate shall consist of clean natural sand and 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 aggregate shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (part 37).

### **Water**

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. Water found satisfactory for mixing is also suitable for curing of concrete.

### **Moisture Content**

The optimum water content shall be determined and demonstrated by rolling during trail length construction and the optimum moisture content and degree of compaction shall be got approved by the engineer. While laying in main work, the lean concrete shall have a moisture content between the optimum and optimum +2 percent, keeping in view the compaction and compensate evaporation losses.

### **Cement Content**

Cement content in DLC shall be such that the strength specified in concrete strength( Next point) is achieved. The minimum cement content shall be 150 kg/cu.m of concrete. In case fly ash is blended at site as part replacement of cement, the quantity of fly ash shall not be more than 20% by weight of cementitious material and the content of OPC( Ordinary Portland Cement) shall not be less than 120 kg/cu.m.

### **Concrete Strength**

The average compressive strength of each consecutive group of 5 cubes shall not be less than 10 MPa at 7 days. In addition, the minimum compressive strength of each cube shall not be less than 7.5 MPa at 7 days. The design mix shall be got approved from the engineer and demonstrated in the trail length construction.

### **Construction of DLC Layer ( Construction Procedure)**

The DLC shall be laid on the prepared granular drainage layer. The dry lean concrete (DLC) sub-base shall be over laid with concrete pavement (viz. Pavement quality Concrete (PQC)) only after 7 days of sub base construction.

### **Batching and Mixing & Transporting**

Plant mix lean concrete shall be transported in tipping trucks at the required point and discharged immediately. Protection from weather is done by covering the tipping trucks with



tarpaulin during transit. Each tipping truck shall be washed with water jet before next loading.

### **Placing**

Lean concrete shall be placed by a paver with electronic sensor on the drainage layer or as specified in the contract. DLC material shall be laid in one layer in even manner without segregation with suitable equipments. The paver machine shall have high amplitude tamping bars to give good initial compaction to the sub-base. One day before placing of the DLC sub base, the surface of the granular sub base /drainage layer shall be given a fine spray of water and rolled with smooth wheeled roller. Preferably the lean concrete shall be placed and compacted across the full width of the two lane carriage way by constructing it one go. In roads with carriage way more than 2 lanes a longitudinal joint shall be provided. Transverse butt type joint shall be provided at the end of the construction in a day. The DLC shall be laid in such way that it is at least 750 mm wider on each side than the proposed width including paved shoulder of the concrete pavement.

### **Compaction**

The shall be carried out immediate after the material is laid and levelled. Rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is well closed.

The minimum dry density obtained shall not be less than 98% of that achieved during the trail length construction (of max dry density). The density achieved at the edge i.e. 0.5 meter from the edge shall not be less than 96% of the that achieved during the trail length construction (of max dry density).

The spreading, compacting and finishing of the lean concrete shall be carried out as soon as possible and time between the mixing of first batch of concrete in any transverse section of the layer and the final finishing of the same shall not exceed 90 minutes when the temperature of concrete is between 25°C and 30°C, and 120 minutes if less than 25°C. This period may be reviewed by the Engineer in the light of the results of the trial run but in no case shall it exceed 120 minutes. Work shall not proceed when the temperature of the concrete exceeds 30°C. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35°C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

Double drum smooth-wheeled vibratory rollers of minimum 80 to 100 kN static weight are suitable for rolling dry lean concrete.

The number of passes required to obtain maximum compaction depends on the thickness of the dry lean concrete.

Except on super elevated portions where rolling shall proceed from the inner edge to the outer, rolling shall begin from the edges gradually progressing towards the centre. First, the edge/edges shall be compacted with a roller running forward and backward. The roller shall then move inward parallel to the centerline of the road, in successive passes uniformly lapping preceding tracks by at least one half width. A preliminary pass without vibration to bed the Dry Lean Concrete down shall be given followed by the required number of passes to achieve the desired density and, a final pass without vibration to remove roller with vibration marks and to smoothen the surface.

For repairing honeycombed/hungry surface, concrete with aggregates of size 10 mm and below shall be spread and compacted as per Specifications. Any level/thickness deficiency shall be corrected after applying concrete with aggregates of size 10 mm and below after roughening the surface. Surface regularity also shall be checked with 3 m straight edge.

### **Joints**

Transverse butt type joint shall be provided at the end of the construction in a day. Longitudinal construction joint shall be provided only when full width paving is not possible. Transverse joints in Dry Lean concrete shall be staggered from the construction butt type joint in Concrete pavement by 800-1000 mm. Longitudinal joint in Dry Lean Concrete shall be staggered by 300-400 mm from the longitudinal joint of concrete pavement

### **Curing**

As soon as the lean concrete surface is compacted, curing shall commence.

Curing may be done by covering the surface by gunny bags/hessian, which shall be kept wet continuously for 7 days by sprinkling water.

### **Measurement for Payment**

The unit of measurement for dry lean concrete pavement shall be in cubic metre of concrete placed, based on the net plan area for the accepted thickness shown on the drawings or as directed by the Engineer.

### **Item No. : -141**

**Cement Concrete Pavement: Providing and Laying of un-reinforced, dowel jointed, M40 pavement cement concrete pavement over a prepared sub base with 53 grade cement with coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing Compound, finishing to lines.**

### **Scope of Work:**

This methodology shall be applicable for construction of dowel jointed or plain cement concrete pavement in accordance with the lines, grades, camber and thickness as shown in the drawings using fixed forms.

### **1.0 Material:**

#### **Cement:**

These shall consist of Ordinary Portland Cement from approved source. The minimum cement content shall be 440 Kg/cum. However, optimum cement content shall be determined by carrying out concrete mix design in accordance with IRC: 44-2008 and establishing a job mix formula, approval of which shall be obtained from EIC

#### **Admixtures:**

The admixtures shall conform to IS 6925 and IS 9103 shall improve the workability of concrete or extension of time and they will not have any effect on the properties of concrete. The performance of these admixtures will be proved both on laboratory trials and in trial paving works. The admixtures containing calcium chloride shall not be used.

#### **Aggregates:**

The aggregates shall be of crushed stone or Crushed gravel, conforming to IS 383. The coarse aggregate shall be clean, hard, strong, dense and durable of crushed stone. The Los Angeles Abrasion value shall not be more than 35%. The fine aggregate shall be of clean natural sand or crushed stone sand or combination of both. These shall be free from clay, shale, loam, mica and other organic matter. The limit of deleterious material content shall not exceed the requirements set out in IS:383. Coarse aggregates and fine aggregates shall satisfy all the requirements specified in Sections 602.2.4.2 and 602.2.4.3 of MORTH (3rd Rev.)

#### **Water:**

Water used for mixing and curing of concrete shall be free from oil, salt, acid and other substances, which are harmful to concrete. It shall meet the requirements stipulated in IS: 456.

**Mild steel bars for dowel and tie bars:**

Dowel bars shall conform to S 240 (with yield strength 840 Mpa) and tie bars (deformed or plain) to grade Fe500 deformed steel bars as per IS: 1786/IS: 432

**Pre-Molded joint filler:**

This shall be used for expansion joints abutting structures like bridges, culverts and at end of the day work. These shall be of 20-25mm thickness or as shown in drawings, complying to IS 1838. It shall be 25mm less in depth than the thickness of slab provided in suitable lengths, which shall not be less than lane width. Holes shall be made to accommodate dowel bars.

**Joint sealing compound:**

While carrying out joint sealing, the provision made under codes viz. IRC: 57-2006, IRC: 15-2011 and IRC: 58-2011 shall be taken into consideration. This shall be hot poured Elastomeric type as per AASHTO M282 or cold poured Polysulphide type as per BS 5212-part2 having flexibility, resistance to age hardening and durability.

**Separation membrane:**

A separation membrane of impermeable plastic sheeting 125 microns thick shall lay between the concrete slab and sub-base by nailing with concrete nails to the lower layer. Where overlap is necessary the same shall be laid by at least 300mm.

## **2.0 Workmanship:**

**Mix: M400**

The mix shall be designed as per IRC: 44-2008. And the design shall be based on the flexural strength of concrete. The water content shall be minimum required to provide workability for full compaction of the concrete to the required density. The maximum free water cement ratio shall be 0.5. The mix shall be proportioned to give an average strength at 28 days exceeding the specified strength (4.8Mpa) by 1.65 times the standard deviation calculated from the flexural strength of the first 30 beams first during the trial length and then the job control test beams (during the actual execution). The workability requirements at the batching plant and at site shall be established by slump tests while doing trial length. A slump value of  $30 \pm 15$ mm is reasonable for slip form paving and  $50 \pm 15$ mm for fixed form paving.

Avg. strength Ratio ® of 7days and 28 days compressive strength of cubes prepared from each batch shall be determined periodically during construction. If R value so obtained is found less than those determined as the time of mix design, 5% extra cement shall be added to the mix.

**Mixing:**

The materials shall be mixed in a mechanized batching plant consisting air-conditioned centralized control cabin, minimum 4bins, weigh hoppers, separate scales for cement, fine and coarse aggregate with weighing balances calibrated, aggregates being proportioned by automatic weighing devices using load cells. The concrete ingredients shall be mixed thoroughly by a mixer with automatic timing/alarm device to mix and discharge (in case of failure of timing/alarm device concrete shall be mixed as per Manufacturer's recommendations) capable of mixing to get a homogenous mix without being segregated while discharge.

**Joints, dowel and tie bars:**

The location and type of joint shall be as shown in the drawings.

**Contraction Joints**

Transverse joints shall be contraction and expansion joints, cut with mechanical saw, could start as early as 6-8 hours, i.e. initial hardening of concrete, after paving. The contraction joints shall consist of mechanical sawn joint groove, 3 to 5mm wide and 1/4 to 1/3 depth of the slab. The expansion joints shall consist of a joint filler board positioned vertically with the prefabricated assemblies along the line of joint.

The dowel bars shall mild steel with details and dimensions as indicated in the drawings. Unless otherwise shown in the drawings the dowel bars shall be positioned at the mid depths of the slab with suitable tools/means within +/-20mm tolerances. The dowel bars shall be covered with plastic sheath for at least 2/3rd from one end for contraction joint, and 1/2 length +50mm for expansion joint. For expansion joints, a closely fitting cap of 100mm long shall be provided at the sheath end. To block the entry of cement slurry between dowel and cap a compressible sponge may be used.

The dowel bars shall be supported on cradles / chairs in pre-fabricated joint assemblies positioned prior to the construction of slab 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.

#### **Longitudinal Joints:**

The longitudinal joints shall be saw cut as shown in the drawings. A groove of 1/3rd the depth of the slab may be cut after the final set of the concrete. The tie bars shall be deformed steel bars of 415 Mpa complying to IS 1786. Tie bars shall be painted with bituminous paint for 75mm at the both ends and positioned with suitable tools/means. Tie bars shall be placed within the middle third of the slab depth.

Tie bars in the longitudinal joints shall be made up into rigid assemblies with adequate supports to remain firmly in position during the construction of slab.

#### **Construction Joints:**

Transverse construction joints shall be place whenever concreting is completed for the day's work on is suspended for more than 30 minutes. These shall be provided at regular location of contraction joints using dowel bars as stated above.

Using sealants, not before 14days after construction of slab shall seal all transverse and longitudinal joints, but prior to allowing the traffic ply on the new construction.

#### **Separation membrane:**

A separation membrane of impermeable plastic sheeting 125 microns thick shall lay between the concrete slab and the sub base by nailing with concrete nails to the lower layer. Wherever overlap is necessary, the same shall be laid by at least 300mm. Before placing the separation membrane the sub-base shall be swept clean of all extraneous materials using high pressure water jetting or compressed air.

#### **Construction by fixed form:**

This shall consist of straight side forms made of steel of thickness not less than 5mm and of minimum 3000mm length. These shall have a depth equal to the prescribed thickness of the pavement. These forms shall be straight and free from bends and warps. Side forms shall be of sufficient rigidity in the form and in the interlocking connection with adjoining form such that springing will not occur under the weight of the sub grade and paving equipment or from pressure of concrete.

The vibrators for concreting shall be either surface pan type or internal type with immersed tube or multiple spuds. The surface vibrators shall a frequency not less than 3500 impulse per minute and the internal type vibrators shall have frequency more than 5000 impulse per minute.

#### **Curing:**

Curing shall be done manually by sprinkling water on PQC surface. Wet Jute bags shall be used to cover whole surface. Curing shall be start day after concreting and shall be done everyday up to 14th day.

After the side forms are removed, edges of slabs shall be corrected wherever irregularities have occurred by using fine concrete consisting 1:3 ratio of cement to fine chips and aggregate.

After the final regulation of the slab and before the application of curing membrane, the surface of the concrete shall be brush-textured at right angles to the longitudinal axis. The wire brush used for this purpose shall be made of 32 gauge type wired grouped together in tufts at 10mm centers and of width not less than 450mm.

**Joints sealing:**

When saw cuts joints are adopted in construction, they are not made to provide the minimum width specified in the drawings, they shall be widened subsequently by sawing before sealing, and the width and depth are controlled by gauges. 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 requirements. The sealant shall be applied within the minimum and maximum drying time of the primer recommended by the manufacturer. Before sealing, the temporary seal provided for blocking the ingress of dirt, soil, etc. should be removed. A highly compressible heat resistant paper-backed de-bonding strip as shown in 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.

**Machinery Requirement:**

Batching plant, Transit Miller, Fixed form concrete paver machine with Vibrating screed roller, Water Tanker, Vibrator, Shovels, Broom, Wire brush, Straight edge.  
Setting out will be done prior to work demarking the area of execution.

**Measurement for Payment**

The unit of measurement for M400 pavement cement concrete pavement shall be in cubic metre of concrete placed, based on the net plan area for the accepted thickness shown on the drawings or as directed by the Engineer.

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

**Item No.143**

**Providing and laying 20 mm thick water proof cement plaster using water proofing powder 1Kg/1bag of cement for all floors on brick / concrete wall work using water proofing materials in C M 1: 4 ( 1 cement 4 coarse sand) including finishing with a floating coat of neat cement slurry etc complete for all floor.**

Mode Of Measurement And Payment :

Rate including cost of all materials labours, tools, plants etc.required to complete the item. Horizontal plan area of horizontal surfaces with side adjoining walls upto 300 mm height including of junctions of walls and slabs Vertical surface area shall be actual work carried out at site. The rate shall be for a unit of one sq. mtsured & paid in number of waste bin supplied and fixed in position.

**Item No :-144**

**Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and oraganic mater and grading as per I.R.C. Code.(iii) 25mm**

**Materials**

Coarse aggregate shall be of machine crushed stone of black trap (B.T.Metal) or equivalent hard stone and be hard, strong, dense, 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 or equivalent hard stones as approved.

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

**Workmanship**

As soon as the work of bed concrete of Percolation Well chamber has been completed the **stone aggregate (40mm. size)** layer 600mm. in thickness shall be laid. Care shall be taken to avoid any major voids being left in the layer while filling filter media, around PVC slotted pipe in the Percolation Well chamber. Above this layer **stone aggregate (25mm. size)** layer of 300mm. in thickness shall be laid.

**Mode of Measurements & Payment**

The payment shall be made for filling in filter media in the Percolation Well chamber. No deduction shall be made for shrinkage or voids, if filled as instructed above.

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

**Item No :-145**

**Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and oraganic mater and grading as per I.R.C. Code.(ii) 40mm**

Same as Item no. 140 but done for 40mm.

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

**Item No :-146**

**Spreading the stone aggregate including filling the interstices to required camber and gradient (excluding spreading of Blindage)(iii) 25mm to 50mm size crushed stone**

Same as Item no. 142 but done for 25mm to 50mm size crushed stone.

The rate shall be for a unit of one cubic meter of actual work done

**Item No :-147 to 158 Tube Well Specification (separate sheet attached)**

**Item No :-159**

**Providing, laying and jointing in true line and level 160 diametre U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings**

**conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant.**

Pipes shall conform to IS 13592 : 1992 (Type B). The internal and external surfaces of the pipes shall be smooth and clean and free from grooving and other defects. The end shall be clearly cut and shall be square with the axis of the pipe. The end may be chamfered on the plain sides. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible provided the wall thickness remain within the permissible limit.

**Colour of Pipe :**

Surface colour of the pipes shall be as specified.

**Marking :**

Each pipe shall be clearly and indelibly marked with the following information at intervals not more than 3 metre.

- (a) Manufacturer's name or trade mark.
- (b) Nominal outside dia of pipe.
- (c) Type 'A'
- (d) Batch number.

The pipe may also be marked with standard mark.

**Dimensions :**

UPVC water pipes shall be of the dia, as specified and shall be in nominal lengths of 2,3,4 or 6 metres either plain or with sliding / grooved socket, unless shorter lengths are required at junctions with fittings. Tolerance on specified length shall be + 0.10mm.

**Laying:**

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 Chambers 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 Chambers by means of curved tapered channels formed in Cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for its entire length, on a even level bed grips being made or left on the bed to receive the sockets of the pipes. The pipes shall be fitted to fittings with seal ring conforming to IS : 5382 allowing 10mm gap for thermal expansion.

**Installation in Wall/Concrete:**

The walls/concrete slots should allow for a stress free installation. Pipes and fittings to be inserted into the slots without a cement base, have to be applied first with a thin coat of PVC solvent cement followed by sprinkling of dry sand (medium size) and then allowed to dry. The process gives a sound base for cement fixation. This process is repeated while joining PVC material to CI/AC materials.

**Testing of Joints:**

If nay leakage is visible the defective part of the work shall be made good at no extra cost. The pipe line shall be tested as directed. 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.

**Fittings :**

Fittings used shall be of the same make as that of the PVC pipes and shall have a minimum wall thickness of 3.2mm. The fittings shall be supplied with proved socketted ends with square groves and provided with Rubber Gasket conforming to IS : 5382. The plain ends of the fittings should be chamfered. The fittings shall be joined with the help of Rubber lubricant.

**Method of Measurement And Payment**

The measurement shall be recorded in running meter of pipe length laid along the centerline of axis of pipeline including tees, enlarges, reducers and bends, correct up to 0.01 m length. No payment shall be made for overlaps etc. The payment shall be made after completion of whole made item as mentioned in price bid on Running Meter basis and 15% shall be withheld for satisfactory hydraulic testing.

The rate includes cost of all materials, tools, plants and labour involved in satisfactory completion of work as specified above.

The rate shall be for a unit of One running meter of actual work done.

**ITEM NO.:-164**

**Providing and laying white glazed tiles 6mm thick in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand ) finishing with flush pointing in white cement.**

Item will be executed as per item no 86 specification except that item include dismantling of old tiles and laying of new tiles with approved coated materials.

**ITEM NO.:-166**

**Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35- 2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide liminance coefficinet on cemend road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.**

Detailed specification same as per item description and as directed by Engineer-in-charge

The rate shall be for a unit of running metre.



# **Technical Specifications (Electrical)**

## **01 - TECHNICAL SPECIFICATIONS FOR INSTALLATION OF INTERNAL WIRING**

## TECHNICAL SPECIFICATIONS FOR INSTALLATION OF INTERNAL WIRING

### 1.0 SCOPE OF WORK

1.1 This section covers, definition of point wiring, system of wiring and, installation, connection, testing and commissioning of point wiring for light points, ceiling fan points, exhaust fan points, convenience socket outlet points, power socket outlet points, bell outlet points etc. including fixing of light fixtures, ceiling fan, exhaust fan, wall fan, bell etc.

### 2.0 CODES & STANDARDS

2.1 The following standards and rules shall be applicable :

IS:732	Code of practice for electrical wiring installation (System voltage not exceeding 650V)
IS:1646	Code of practice for fire safety of buildings (General) Electrical installation.
IS:9537(Part-2)	Rigid steel conduits for electrical wiring.
IS:2667	Fittings for rigid steel conduits for electrical wiring.
IS:3480	Flexible steel conduits for electrical wiring.
IS:3837	Accessories for rigid steel conduit for electrical wiring.
IS:694	PVC insulated cables.
IS:9537(Part-3)	Rigid non-metallic conduits for electrical wiring.
IS:6946	Flexible (Pliable) non-metallic conduits for electrical installation.
IS:1293	3 pin plugs and sockets.
IS:8130	Specifications of conduits for electrical installation.
IS:3854	Switches for domestic purpose.
IS:3419	Fittings for rigid non-metallic conduits.
IS:4648	Guide for electrical layout in residential buildings and Indian electricity act and rules

All standard and codes mean the latest.

### 3.0 MATERIALS REQUIRED

### 3.1 REFERSUPPLYSPECS

## 4.0 INSTALLATIONOFTHESYSTEM

### 4.1 CONCEALED INSTALLATION WITH RIGID PVC CONDUIT

4.1.1 All the rigid PVC conduit used for concealed installation shall be as per IS ; 9537 and its accessories shall be as per IS: 3419 (Small Wire Ropes).

4.1.2 Whenever necessary bends or diversion may be achieved by bending the conduits with the help of bending spring. No other method of bending is allowed

4.1.3 Conduit pipes shall be joined with the help of plain coupler fixed at the end with the help of vinyl solvent cement. No other method of joining is permissible

4.1.4 All other methods, no wires through conduit, bunching, etc. Shall be as specified in the concealed installation

4.1.5 Prior to fixing the conduits, the complete route shall be marked on site for the approval of consultant

### 4.2 CONCEALED WIRING SYSTEM WITH RIGID PVC CONDUIT

4.2.1 The rigid PVC conduits shall be used for concealed wiring system. The conduits shall be concealed in the concrete slab, floor, walls, beams, columns etc

#### 4.2.2 FIXING OF CONDUIT

1. Conduits embedded in concrete shall be installed in the frame work before pouring concrete. The conduits shall be installed above the bottom reinforcing bars, and shall provide positive wire fastening of the conduit to the reinforcing rods at an interval of not more than one meter, but on either side of couplers or bends or putlet/pull/junction boxes or similar fittings, proper hold fast shall be fixed at a distance of 30 cm from the center of such fittings. Conduits embedded in the wall shall be fixed inside the chase . The chase in the wall shall be neatly made and be fixed in the manner desired. In the case of building under construction, chase shall be provided in the wall at the time of their construction and shall be filled up neatly with cement mortar 1:4 after erection of conduit and brought to the original finish of the wall. Cutting of horizontal chases in walls is prohibited. The conduits shall be fixed inside the chase by means of staples or by means of saddles not more than 60 cm apart.

2. Conduits shall be so arranged as to facilitate easy drawing of wires through them. Entire conduit layout shall be done in such a way as to avoid additional junction boxes other than light points. The wiring shall be done in a looping manner. All the looping shall be done in either switch boxes or outlet boxes. Looping in junction or pull boxes are strictly not allowed. Where conduits cross building expansion joints, adequate expansion fittings or other approved devices shall be used to take care of any relative movement

3. All conduits shall be installed so as to avoid steam and hot water pipes
  4. Conduits shall be installed in such a way that the junction, derivation and pull boxes shall always be accessible for repairs and maintenance work. The location of junction/pull boxes shall be marked on the shop drawings and approved by the client
  5. A separation of 200 mm shall be maintained between electrical conduits and hot water lines in the building
  6. No run of conduit shall exceed ten mtr. between adjacent draw in points nor shall it contain more than two right angle bends, or other derivation from the straightline
  7. Caution shall be exercised in using the PVC conduits in location where ambient temperature is 50 degree cel. or above. Use of PVC conduits in places where ambient temperature is mote than 60 deg. cel. Is prohibited. The entire conduit system including boxes shall be thoroughly cleaned after completion of installations and before drawing of wires. Conduit system shall be erect and straight as far as possible. Traps where water may accumulate from condensation are to be avoided and if unavoidable, suitable provision for draining the water shall be made
  8. All jointing method shall be subject to the approval of the client
  9. Separate conduits shall be provided for the following system.
    - 15 A power outlets.
    - 5 A outlets and lighting system.
    - Low voltage system.
    - Telephone/intercom system.
    - C.C.T.V. system
    - Sound system
    - Computer data cabling system
    - Equipment wiring
- 4.3 CONDUIT JOINT

- 4.3.1 1. Conduits shall be joined by means of plain couplers vinyl and/or solvent cement. Where there are long runs of straight conduit, inspection type couplers shall be provided at intervals , as approved by the client
2. The conduits shall be thoroughly cleaned before making the joints
  3. In case of plain coupler joints, proper jointing material like a vinyl solvent cement (gray in color) or any material as recommended by the manufacturer shall be used.

#### 4.4 BENDS IN CONDUIT

- 4.4.1 Wherever necessary, bends or diversions may be achieved by bending the conduits or by employing normal bends. No bends shall have radius less than 2.5 times outside dia. of the conduit
- 4.4.2 Heat may be used to soften the PVC conduit for bending, but while applying heat to conduit, the conduit shall be filled with sand to avoid any damage to the conduit

#### 4.3 OUTLETS

- 4.3.1 All the outlets for fittings, switches etc. shall be boxes of substantial construction

4.3.2 In order to minimize condensation or sweating inside the conduits, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects , etc.

4.3.3 Fixing between conduit and boxes, outlet boxes, switch boxes and the like must be provided with entry spouts and smooth PVC bushes.

4.3.4 Joints between conduit and any type of boxes shall be affected by means of conduit couplers in to each of which shall be coupled smooth PVC bush from inside the box. In any case all the joints shall be fully water tight.

#### 4.4 BUNCHING OF CABLES

4.4.1 Cables of AC supply of different phase shall be bunched in separate conduits

4.4.2 The number of insulated wires/ cables that may be drawn into the conduits shall be as per the following table. In this table, the space factor does not exceed 40%. However, in any case conduits having lesser than 19 mm dia. shall not be used.

MAXIMUM PERMISSIBLE NUMBER OF 650 VOLT GRADE SINGLE CORE CABLES THAT MAY BE DRAWN IN TO RIGID PVC CONDUITS.

CABLE SIZE IN MMSQ.	SIZE OF CONDUITS (MM)			
	MAXIMUM NO. OF CABLES			
	25	32	38/40	51/50
1.5	8	15	---	---
2.5	6	10	---	---
4.0	4	8	12	---

#### 4.5 WIRING WITH RIGID STEEL CONDUIT

4.5.1 All conduits and it's accessories shall be of threaded type and under no circumstances pin grip type or clamp type accessories be used

#### 4.6 FIXING OF CONDUIT

4.6.1 Conduit pipes shall be fixed by heavy gauge spacer bar saddles. The saddles shall be of 3 mm x 19 mm galvanized mild steel flat, properly treated and securely fixed to support by means of nuts and bolts raw bolts, brass machine screws, as mentioned, at an interval of not more than one meter but on either side of couplers, or bends, or junction/pull/outlet boxes or similar fittings, saddles shall be fixed at a distance of 30 cm from the centre of such fittings.

4.6.2 Draw boxes shall be located at convenient location for easy drawing of wires

4.6.3 Every mains and sub mains shall run in independent conduits with an independent earth wire of specified capacity along the entire length of conduit

4.6.4 The conduits to be installed shall be of ample cross section area to facilitate the drawing of wires. The diameter of the conduit shall be selected as per table specified in these specifications. But in no case it shall be less than 25 mm diameter

4.6.5 Entire conduit layout shall be done such as to avoid additional junction boxes other than for outlet points. Conduits shall be free from sharp edge and burrs. Conduits shall be laid in a neat and organized manner as directed and approved by the client. Conduit runs shall be planned so as not to conflict with any other services pipe, lines/duct

4.6.6 The entire conduit system shall be electrically and mechanically continuous and shall be bonded, together by means of approved type earthing clamp and earthed through a bare copper conductor of 14 SWG to the earthing terminals on the nearest distribution board

4.6.7 If required, connection between PVC and steel conduits shall be through a junction box. Direct connection between PVC and steel conduits are not allowed

4.6.8 Where exposed conduits are suspended from the structure, they shall be clamped firmly and rigidly to hangers of design to be approved by client. Where hangers are to be anchored to reinforced concrete, appropriate inserts and necessary devices for their fixing shall be left in position at the time of concreting, making holes and opening in the concrete will generally not be allowed. In case, it is unavoidable, prior permission of the client shall be obtained

#### 4.7 CONDUIT JOINTS

4.7.1 Conduit pipes shall be joined by means of screwed couplers and screwed accessories, as per IS: 2667

4.7.2 The threads shall be free from grease or oil

4.7.3 In long distanced straight runs of conduit, inspection type couplers two way junction boxes at reasonable intervals shall be provided or running threads with couplers and lock nuts shall be provided. The bare threaded portion shall be treated with anti-corrosive paints. Threads on conduit pipes in all cases shall be between 11mm to 27mm long, sufficient to accommodate pipes to full threaded portion of couplers or accessories. Cut ends of conduit pipes shall have no sharp edges nor any burrs left, to avoid damage to the insulation of conductors while pulling them through such pipes

4.7.4 Brass female bushes shall be used in each conduit termination in a switch box, outlet box, electrical panel or any other box

4.7.5 Conduit shall be secured in each outlet box switch box, electrical panel or any other box by means of one brass hexagonal lock nut and bush, outside and inside the box

4.7.6 At each building, expansion joints approved oil tight double wire wound flexible steel conduit or any other approved method shall be used. This shall be united on both sides with the rigid conduits by suitable union

4.7.7 Conduits installed in the plant room for mechanical equipment shall be properly clamped with the mechanical supports, but in no case, it shall be fixed with the body of the equipment

4.7.8 The connection of conduit to the mechanical equipment shall be through oil tight double wire wound flexible steel conduit. In any case the length of the flexible conduit shall not exceed one meter. The flexible conduit shall be properly clamped with the body of the equipment. They shall not in any case be clamped with any cover or any removable parts of the equipment

#### 4.8 BENDS IN CONDUIT

4.8.1 All necessary bends in the system including diversion shall be done by bending pipes or by inserting suitable solid or circular inspection type normal box or similar fittings.

Conduit fittings shall be avoided as far as possible on conduit system exposed to weather, where necessary, solid type fittings shall be used. Radius of such bends in conduit pipes shall be not less than 75 mm. No length of conduit shall have more than the equivalent of four quarter bends from outlet, the bends at the outlets not being counted

#### 4.9 PROTECTION AGAINST DAMPNESS

4.9.1 In order to minimize condensation or sweating inside the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, as far as possible

#### 4.10 PROTECTION OF CONDUIT AGAINST RUST

4.10.1 The outer surface of the conduits including bends, junction boxes, etc., forming part of the conduit system shall be adequately protected against rust, particularly when such system is exposed to weather. In all cases, no bare/threaded portion of conduit pipe shall be allowed unless such bare threaded portion is treated with anti-corrosive coating or covered with approved plastic compound

#### 4.11 BUNCHING OF CABLES

4.11.1 Unless otherwise specified, insulated conductors of different phases shall be bunched in separate conduit.

Wires carrying current shall be so bunched in the conduit that the out going and return wires are drawn into the same conduit. Wires originating from two different phases shall not be run in the same conduit

4.11.2 The number of insulated wires/cables that be drawn into the conduits shall be as per the following table.

MAXIMUM PERMISSIBLE NUMBER OF 650/1100 VOLTS GRADE SINGLE CORE CABLE THAT CAN BE DRAWN INTO RIGID STEEL CONDUITS.

CABLE SIZE IN MMSQ.	SIZE OF CONDUITS (MM)			
	MAXIMUM NO. OF CABLES			
	25	32	38	51
1.5	10	14	---	---
2.5	8	12	---	---
4.0	6	10	---	---

4.12.1 Switches shall be installed at 900 mm above finished floor level unless otherwise indicated on the drawings

4.12.2 The switch controlling the light point or fan shall be connected on to the phase wire of the circuit and neutral shall be continuous, having no fuse or switch installed in the line except at the D.B. All fan regulators shall be fixed inside the switch boxes on adjustable flat M.S. strips/plates with tapped holes and brass machine screws, leaving

ample space at the back and side for accommodating wires

4.12.3 The cover plates to the switch box shall be fixed by means of sunk head brass cadmium screws

4.12.4 Where two or more switches and fan regulators are installed together, they shall be provided with one gang cover plate with knockouts to accommodate required number of switches, sockets and regulators

4.12.5 The switch controlling the socket outlet shall be on the phase wire of the circuit. The third pin of the socket shall be connected to the earth continuity conductor of the circuit

4.12.6 The switch boxes, installed back-to-back in the same wall shall be offset from each other, 150 mm horizontally, to preclude noise transmission

#### 4.13 DRAWING OF CONDUCTORS

4.13.1 The drawing and joining of copper conductor or wires shall be executed with due regard to the following precautions. While drawing insulated wires into the conduits, care shall be taken to avoid scratches and kinks which may cause breakage of conductors. There shall be no sharp bends

4.13.2 Insulation shall be shaved off for a length of 15 mm at the end of wire like sharpening of a pencil and it shall not be removed by cutting it square or ringing



4.13.3 FRLS insulated copper conductor wire ends before connection shall be properly soldered (at least 15 mm length) with soldering flux/copper solder, for copper conductor. Strands of wires shall not be cut for connecting to the terminals. All strands of wires shall be soldered at the terminals. All strands of wires shall be soldered at the end before connection. The connecting brass-screws shall have flat ends. All looped joints shall be soldered and connected through terminals block/connectors. The pressure applied to tighten terminal screws shall be just adequate, neither too much nor too less. Conductors having nominal cross section exceeding 4 sq. mm shall always be provided with crimping type cable sockets. At all bolted terminals, brass flat washer of large area and approved steel spring washers shall be used. Brass nuts and bolts shall be used for all connections

4.13.4 Only certified wire men and cable jointers shall be employed to do joining work

4.13.5 For all internal wiring FRLS insulated wires of 650/1100 volts grade shall be used. The sub-circuit wiring for point shall be carried out in looping system and no joint shall be allowed in the length of the conductors. No wire shall be drawn in to any conduit, until all work of any nature that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire. Before the wires are drawn into the conduits the conduits shall be thoroughly cleaned of moisture, dust, and dirt or any other obstruction by forcing compressed air through the conduits

#### 4.14 JOINTS

4.14.1 The wiring shall be by looping back system, and hence all joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switch boxes only. No joints shall be made inside conduits and junction boxes.

4.14.2 Contractors shall be continuous from outlet to outlet. For joints where unavoidable, due to any specified reasons, prior permission in writing shall be obtained from the client before making such connections. Joints by twisting conductors are prohibited.

#### 4.15 LOAD BALANCING

4.15.1 Balancing of circuit in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to

#### 4.16 EARTHING

4.16.1 All earthing systems shall be in accordance with IS: 3043 - 1985 code of practice for earthing

**02 - TECHNICAL  
SPECIFICATIONS FOR  
INSTALLATION OF  
LIGHTING DB's**

## TECHNICAL SPECIFICATIONS FOR INSTALLATION OF LIGHTING DBs

### 1.0 SCOPE

1.1 This section relates to specifications for installation, connection, testing and commissioning of lighting distribution board (LDB) using TPN/FP/DP/SP MCB isolator & ELMCB, Earthing terminal, connector strip for phase neutral and earth for each circuit, CRCA sheet steel housing and complete the item installation. Common banking of neutral and earth conductor is not allowed.

### 2.0 CODES & STANDARDS

2.1 Refer Supply specs

### 3.0 MATERIALS REQUIRED

3.1 Refer Supply specs

### 4.0 INSTALLATION OF SYSTEM

4.1 The DB's shall be assembled and aligned together and be installed at site as per installation manual/instruction of the DB manufacturer.

4.2 The DB shall be installed in surface manner at the various location.

4.3 All minor electrical and mechanical work required to be attended to on the DB shall be completed in an approved manner after installation but before energizing the DB's.

4.4 The M.S. angle/channel iron frame used for installation of D.B. shall be hot dip galvanized (816 g/m<sup>2</sup>).

4.5 The DB shall be mounted on angle/channel frame with Anchor fastening only. Civil grouting is not acceptable.

### 5.0 EARTHING INSTALLATION

5.1 Refer Earthing Specs

### 6.0 INSPECTION & TESTING

6.1 Prior to commissioning of the DB's following tests shall be carried out.

6.1.1 Mechanical endurance test shall be carried out by closing and opening of all the MCB's, switches etc.

6.1.2 Insulation resistance test shall be carried out between phases and between phase to earth bus, keeping the isolating switch in open position. Similar test shall be carried out keeping the isolating switch in closed position.

All the interlocks, controls and tripping mechanism of the switch gears shall be tested for their proper functioning.

**03- TECHNICAL SPECIFICATIONS  
FOR ERECTION, TESTING &  
COMMISSIONING OF  
ELECTRICAL INSTALLATIONS**

## ERECTION, TESTING & COMMISSIONING OF ELECTRICAL INSTALLATIONS

### 1.0 SCOPE OF WORK

1.1 The intent of this specification is to define the requirements for the installation, testing and commissioning of the electrical system like H.T VCB panel, transformer,

L.T. panels, Cables, earthing network, Internal and External lighting, Light fixtures etc.. Requirement of this project shall be as specified in bill of quantities / approved drawings / general specifications or as per the battery limits fixed by the owner / consultant.

### 2.0 STANDARDS

2.1 1. The work shall be carried out in the best workman like manner in conformity with this specification, the relevant specification / codes of practice of the Indian Standards Institution, approved drawings and the instructions issued by the authorised representative, from time to time. Some of the relevant Indian Standards are listed elsewhere in this tender document.

2. In addition to the standards mentioned in 2.1, all works shall also conform to the requirement of the following :

3. Indian Electricity Act and Rules framed there under.
4. Fire Insurance Regulations.
5. Regulations laid down by the Chief Electrical Inspector of the State / State Electricity Board / Union Territory.
6. Regulations laid down by the Factory Inspector of the State / Union Territory.
7. Any other regulations laid down by the local authorities.
8. Installation & operation manuals of original manufacturers of equipment.

### 3.0 ERECTION

3.1 The contractor shall make his own arrangement for safe transportation of all the items to the erection site and also carry out complete loading / unloading during transportation. Equipment shall not be removed from packing cases unless the floor has been made ready for installing them. The cases shall be opened in presence of the client / consultant or his authorised representative. The empty packing cases shall be returned to the stores and any document if found with the equipment shall be handed over to the client's representative. Any damage or shortage noticed shall be reported to the client / consultant in writing immediately after opening of packing cases.

### 3.2 ONAN TYPE TRANSFORMER

1. Erection

Transformer complete with radiators, bushings, conservator and miscellaneous accessories shall be thoroughly inspected and any damage noticed shall be reported to the client / consultant. Before erection of transformer, the level of rails on foundation shall be checked and minor corrections if necessary shall be carried out. After the completion of erection, necessary stoppers shall be provided at the wheels. All loosely supplied fittings / accessories shall be cleaned and mounted on the transformer and connections made. After completely assembling & installation, the transformer shall be cleaned and touched up with a paint supplied by the manufacturer applied wherever necessary. All cover bolts shall be checked for proper tightness. (The foundation of transformer and rail fixing will be made by some other agency).

## 2. Testing

Winding insulation resistance shall be measured from primary and secondary to ground and between primary and secondary.

Test the operation of thermister type sensor relay in accordance with the manufacturer's instructions.

Check the polarity of terminals and the phase sequence. Proforma for transformer tests :

### 3. Proforma for transformer tests :

- Transformer name plate.
- Insulation resistance test with 1000 V meagre.
  - a) between primary to earth
  - b) between secondary to earth
  - c) between primary and secondary
- Operation of the tap changer. Operation of the tap at tap No. 1 Operation of the tap at tap No. 2 Operation of the tap at tap No. 3 Operation of the tap at tap No. 4 Operation of the tap at tap No. 5
- Polarity marking and phase sequence.
- Earth resistance: Body & Neutral tank.

[This proforma shall be jointly signed by the CLIENT/ CONSULTANT and the contractor in duplicate].

## 3.3 POWER CONTROL CENTER / MOTOR CONTROL CENTER, DISTRIBUTION BOARDS

### 1. Erection

Electrical panels and bus duct shall be delivered in convenient shipping section by the manufacturer. The contractor shall make his own arrangement for safe transportation of all the items to the erection site and also carry out complete loading / unloading during transportation. The contractor shall be responsible for final assembly and interconnection of busbars / wiring. Foundation channel shall

be grouted in the flooring by the contractor. Switchgear shall be aligned and levelled on their base channels and bolted to them as per the instructions of the client / consultant. The earth bus shall be made continuous throughout the length. Loosely supplied relays and instruments shall be mounted and connected on the switchgear. The contacts of the drawout circuit breaker shall be checked for proper alignment and interchangeability.

After erection, the switchboard shall be inspected for dust and vermin proof. Any hole which might allow dust or vermin etc. to enter the panel shall be plugged suitably at no extra cost. If the instrument transformers are supplied separately, they shall be erected as per the direction of the client / consultant. The contractor shall fix the cable glands after drilling the bottom / top plates of all switchboards with suitable holes at no extra cost.

Range of overload relays / timers etc. shall be checked with requirement of motor actually to be connected at site and if the same is undersized / oversized, it shall be brought to the notice of the client / consultant, who shall arrange procurement of corrected components. However, the contractor shall not charge anything extra for

labour for such replacements.

The busduct shall be suitably supported between switchgear and transformer. The opening in the wall where the duct enters, the switchgear room shall be sealed to avoid rain water entry. The foundation of the switchgear shall be raised suitably for minor adjustment to ensure proper alignment and connection of the busduct at no extra cost. Expansion joints, flexible connection, etc. supplied by the manufacturer / contractor of the busduct shall be properly connected.

## 2. Testing

Before electrical panel is energised, the insulation resistance of each bus shall be measured from phase to ground. Measurement shall be repeated with circuit breakers in operating positions and contacts open.

Before switchgear is energised, the insulation resistance of all control circuits shall be measured from line to ground.

The following tests shall be performed on all circuit breakers during erection.

- Contact alignment and wipe shall be checked and adjustment where necessary in accordance with the breaker manufacturer's instructions.
- Each circuit breaker shall be drawn out of its cubicles, closed manually and its insulation resistance measured from phase to phase and phase to ground.
- All adjustable direct acting trip devices shall be set using values given by the consultant/ manufacturer.
- The dielectric strength of insulating oil wherever applicable, shall be checked.
- Before switchgear is energised, the following tests shall be performed on each circuit breaker in its test position.

- Close and trip the circuit breaker from its local control switch push button or operating handle. Switchgear control bus may be energised to permit test operation of circuit breaker with A.C. closing with prior permission of the client

/ consultant.

- Test tripping of the electrically operated circuit breaker by operating mechanical trip device.
- Test proper operation of circuit breakers latch, check carriage limit switch if provided. Test proper operation of lockout device in the closing circuit. Wherever provided by simulating conditions which would cause a lockout to occur.
- Trip breaker either manually or by applying current or voltage to each of its associated protective release.
- Before switchgear is energised, the tests covered above shall be repeated with each breaker in its normal operating position.
- Capacitor banks shall be tested as per manufacturer's instructions. In addition, test for output and/or capacitance, insulation resistance test and test for efficiency of discharge device shall be carried out.
- All electrical equipment alarms shall be tested for proper operation by causing alarms to sound under simulated abnormal conditions.

### 3. Performa For PCC, MCC, DB, Control Panel Test

- Circuit breaker or contactor module designation / bus no.
- Insulation resistance test (contacts open, breaker racked in position)
  - a) between each phase of bus : Mega ohm
  - b) between each phase and earth : Mega ohm
  - c) DC and AC control and auxiliary circuits : Mega ohm
  - d) between each phase of CT / PT and between  
CT & PT circuit if any : Mega ohm
- CT checks
  - a) CT ratio
  - b) CT secondary resistance
  - c) CT polarity check
- Check for contact alignment and wipe.



- Check / test all releases / relays.
- Check mechanical interlocks.
- Check electrical interlocks.
- Check switchgear / control panel wiring.
- Check breaker / contactor circuit for :
  - a) Closing - local & remote (wherever applicable)
  - b) Tripping - local & remote (wherever applicable)
- Opening time of breaker / contactor.
- Closing time of breaker / contactor.

[This proforma shall be jointly signed by the CLIENT / CONSULTANT and the contractor in duplicate].

### 3.4 INSTALLATION OF CABLE NETWORK

Cable network shall include power, control and lighting cables which shall be laid in underground trenches, hume pipe open trenches, cable trays, G.I. pipes, or on building structures as detailed in the relevant drawings, cable schedules or as per the client / consultant's instructions. Supply & installation of cable trays, G.I. pipes / conduits, cable glands and sockets of both end isolators, junction boxes, remote push button stations, etc. shall be under the scope of the contractor.

#### 1. General requirements for handling cables :

- Before laying cables, this shall be tested for physical damage, continuity, absence of cross phasing, insulation resistance to earth and between conductors. Insulation resistance tests shall be carried out with 500 / 1000

V megger.

- The cables shall be supplied at site, wound on wooden drums as far as possible. For smaller length and sizes, cables in properly coiled form can be accepted. The cables shall be laid by mounting the drum of the cable on drum carriage. Where the carriage is not available, the drum shall be mounted on a properly supported axle, and the cable laid out from the top of the drum. In no case the cable will be rolled on as it produces kinks which may damage the conductor.
- Sharp bending of cable shall be avoided. The bending radius for PVC insulated and sheathed, armoured cable shall not be less than 10 D, where "D" is overall diameter of the cable.
- While drawing cables through G.I. pipes, conduits, RCC pipes, ensure that size of pipe is such that, after drawing cables, 40% area is free. After drawing cables, the end of pipe shall be sealed with cotton / bituminous compound.

- High voltage (11 KV and above), medium voltage (240 V and above) and other control cables shall be separated from each other by adequate spacing or running through independent pipes / trays.

- Armoured cables shall never be concealed in walls / floors / roads without

G.I. pipes, conduits or RCC pipes.

- Joints in the cable throughout its length of laying shall be avoided as far as possible and if unavoidable, prior approval of site engineer shall be taken. If allowed, proper straight through epoxy resin tight joint shall be made, without any additional cost.

- A minimum loop of 3 mtr. shall be provided on both ends of the cable, and on both ends of straight through cable joint. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying.

- Cable shall be neatly arranged in the trenches / trays in such manner so that criss-crossing is avoided and final take off to the motor / switchgear is facilitated. Arrangement of cable within the trenches / trays shall be the responsibility of the contractor.

- All cable routes shall be carefully measured and cable cut to the required lengths and undue wastage of cables to be avoided. The routes indicated in the drawings is indicative only and the same may be rechecked with the client / consultant before cutting of cables. While selecting cable routes interference with structures, foundations, pipelines, future expansion of buildings etc. should be avoided.

- All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of all PVC insulated cables shall be taped with an approved PVC or rubber insulating tapes. Use of friction type or other fabric type tape is not permitted. Lead sheathed cables shall be plumbed with lead alloy.

- Wherever cable rises from underground / concrete / masonry trenches to motors / switchgears / push buttons, these shall be taken in G.I. pipes of suitable size, for mechanical protection upto 300 mm. distance of concerned cable gland or as instructed by the client / consultant.

- The cable pass through foundation / walls of other underground structures, the necessary ducts for opening will be provided in advance for the same. However, should it become necessary to cut holes in existing foundation of structures the electrical contractor shall determine the location and obtain approval of the client / consultant before cutting is done.

## 2. LAYING OF CABLES (UNDERGROUND SYSTEM)

Cables shall be so laid in trench that this will not interfere with other underground structure. All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded / diverted as directed by the owner / consultant.

- Cable shall be laid at minimum depth of 750 mm. in case of L.T. and 1200 mm. in case of H.T. from ground level. Excavation will be generally in ordinary alluvial soil. The width of trench shall be sufficient for laying of required no. of cables.
- Sand bedding 75 mm. thick shall be made below and above the cables. Layer of bricks (full size) shall be laid above sand bedding on the sides and above the of cables to cover cable completely. More than one cable can be laid in the same trench by providing a brick on edge between two cables. However, the relative location of cables in trench shall be maintained till termination. The surface of the ground after back filling the earth shall be made good so as to conform in all respects to the surrounded ground and to the entire satisfaction of the client / consultant.
- For all underground cables, route markers should be used :
  - a) Separate route markers should be used for LT, HT and telephone cables.
  - b) Route markers should be grounded in ground with 1:2:4 cement concrete pedestal size 230 x 230 x 300 mm..
  - c) Cable markers should be installed at an interval not exceeding 30 mtr. along the straight routes of cables at a distance of 0.5 mtr. away from centre of cable with the arrow marked on the cable markers plate indicating the location of cable. Cable markers should also be used to identify change in direction of cable route and for location of every joint in underground cable.
- RCC hume pipe for crossing road in cable laying shall be provided by employer. No deduction shall be made for cable laying in hume pipe for not providing bricks, sand and excavation. RCC hump pipe at the ends shall be sealed by bituminous compound after laying and testing of cables by electrical contractor without any extra charge.

### 3. LAYING OF CABLE IN MASONRY TRENCHES

- Masonry / concrete trenches for laying of cables shall be provided by employer. However, steel members such as M.S. angles / flats etc. shall be provided and grouted by electrical contractor to support the cables without any extra charge. Cables shall be clamped to these supports with minimum saddles / clamps. More than one tier of cables can be provided in the same trench if the no. of cables are more.
- Entry of cables in trenches shall be sealed with bituminous MASTIC compound to stop entry of water in trenches.

### 4. LAYING OF CABLES IN CABLE TRAYS

- Cable trays and steel members such as M.S. angle / channel / flats etc. shall be provided and fixed by the erector.
- Cable shall be fixed in cable trays in single tier formation and cables shall be clamped with aluminium flat clamps and galvanised bolts / nuts.
- Earthing flat / wire can also be laid in cable tray alongwith cables.
- After laying of cables, minimum 20% area shall be spare.

5. TERMINATION AND JOINTING OF CABLES

- a) For HT cables suitable size of Reychem termination kit shall be used.
- b) Use of glands :

All PVC cables upto 1.1 KV grade, armoured or unarmoured shall be terminated at the equipment / junction box / isolators / push buttons / control accessories, etc. by means of suitable size double compression type cable glands. Armour of cable shall be connected to earth point. The contractor shall drill holes for fixing glands wherever necessary. Wherever threaded cable gland is to be screwed into threaded opening of different size, suitable galvanised threaded reducing bushing shall be used of approved type.

In case of termination of cables at the bottom of the panel over a cable trench having no access from the bottom, a close fit holes should be drilled in the bottom plate for all the cables in one line, then bottom plate should be split in two parts along the centre line of holes. After installation of bottom plate and cables with glands, it shall be sealed with cold sealing compound.

- USE OF LUGS / SOCKETS

All cable leads shall be terminated at the equipment terminals, by means of crimped type solderless connectors unless the terminals at the equipment ends are suitable for direct jointing without lugs / sockets.

The following is the recommended procedure for crimped joints and the same shall be followed :

- a) Strip off the insulation of the cable and with every precaution, not to sever or damage any strand. All insulation's to be removed from the stripped portion of the conductor and ends of the insulation should be clean and square.
- b) The cable should be kept clean as far as possible before assembling it with the terminal / socket. For preventing the ingress of moisture and possibility of re-oxidation after crimping of the aluminium conductors, the socket should be filled with corrosion inhibiting compound. This compound should also be applied over the stripped portion of the conductor and the palm surface of socket.
- c) Correct size and type of socket / ferrule / lug should be selected depending on size of conductor, and type of connection to be made.
- d) Make the crimped joint by suitable crimping tool.
- e) If after crimping the conductor in socket / lug, some portion of the conductor remains without insulation the same should be covered sufficiently with PVC tape.
- f) For HT cable upto 11 KV the manufacturer's recommendation should be followed.

- DRESSING OF CABLE INSIDE THE EQUIPMENT

After fixing of cable glands, the individual cores of cable shall be dressed and taken along the cable ways (if provided) or shall be fixed to the panels with polyethylene straps. Cable shall be dressed in such a manner that small loop of each core is available inside the panel.

For motors of 20 HP and above, terminal box if found not suitable for proper dressing of aluminium cables, the erector shall modify the same without any additional cost.

Cables inside the equipment shall be measured and paid for.

- IDENTIFICATION OF CABLES / WIRES / CORES

Power cables shall be identified with red, yellow and blue PVC tapes. For trip circuits identification, additional red ferrules shall be used only in the particular cores of control cable at the termination points in the switchgear / control panels and control switches.

In case of control cables all cores shall be identified at both ends by their wire numbers by mean of PVC ferrules or self sticking cable markers, wire numbers shall be as per schematic / connection drawing. For power circuit also, wire numbers shall be provided if required as per the drawings of switchgear manufacturer / supplier.

#### 6. TESTING OF CABLES

- Before energising, the insulation resistance of every circuit shall be measured from phase to ground. This requires 3 measurements if one side is grounded and 6 measurements for 3 phase circuits.

- Where splices or terminations are required in circuits rated above 650 volts, measure insulation resistance of each length of cable before splicing and/or terminating. Repeat measurements after splices and/or terminations are complete.

- DC high voltage test shall be made after installation on the following :

- a) All 1100 volts grade cables in which straight through joints have been made.
- b) All cables above 1100 V grade.

For record purpose test data shall include the measured values of leakage current versus time.

The DC high voltage test shall be performed as detailed below :

Cables shall be installed in final position with all the straight through joints complete. Terminations shall be kept unfinished so that motors, switchgear, transformer etc. are not subjected to test voltage.

The test voltage and duration shall be as per relevant codes and practices of Indian Standards Institution.



4. 20 mm. dia. Cu. pipe for watering, shall run from top edge of the plate / pipe electrode to the mid level of block masonry chamber.
5. Top of the pipe shall be provided with G.I. funnel and screen for watering the earth / ground through the pipe.
6. The masonry chamber shall be provided with a Cast Iron hinged cover resting over the Cast Iron frame which shall be embedded in the block masonry.
7. Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS : 3043, Code of Practice for Earthing Installation.
8. The earth conductors (Strips / Wires copper / Hot dip G.I.) Inside the building shall properly be clamped / supported on the wall with Galvanised Iron clamps and Mild Steel Zinc Passivated screws / bolts. The conductors outside the building shall be laid atleast 600 mm. below the finished ground level.
9. The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.
10. Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long.
11. The earth conductors shall be in one length between the earthing grid and the equipment to be earthed

#### 4.2 EARTH LEADS AND CONNECTIONS

1. Earth lead shall be bare copper or Galvanised steel as specified with sizes shown on drawings. Copper lead shall have a phosphor content of not over 0.15 %. G.I. strip buried in the ground shall be protected with bitumen and hessian wrap or polythene faced hessian and bitumen coating. At road crossing necessary hume pipes shall be laid. Earth lead run on surface of wall or ceiling shall be fixed on saddles so that strip is atleast 8 mm away from the wall surface.
2. The complete earthing system shall be mechanically and electrically bonded to provide an independent return path to the earth source.

#### 4.3 TEST

1. The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS : 3043.
2. The following earth resistance values shall be measured with an approved earth megger and recorded.
  - 1) Each earthing station

- 2) earthing system as a whole
- 3) Earth continuity conductors
3. Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 5 ohm in each case.
4. Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.

5. All tests shall be carried out in presence of the Pmc

## 5.0 CONCEALED / SURFACE CONDUIT WORKS

### 5.1 LAYING OF CONDUITS

1. Conduits shall be laid before casting in the upper portion of a slab / in PCC if below flooring or otherwise, as may be instructed in accordance with approved drawings, so as to conceal the entire run of conduits and ceiling outlet boxes. Conduits shall be so laid that they are interconnected. This is required to facilitate pulling of wires from different openings in case of any of the outlet is outlet is blocked during slab casting. Vertical drops shall be cut by the contractor to sufficient depth to allow full thickness of plaster over conduits. The width of the chases will be made to accommodate the required number of conduits. The chases will be filled with cement, coarse

2. When the conduit is to be embedded in a concrete member it shall be adequately

tied to the reinforcement to prevent displacement during casting. Tie wire to be supplied by the contractor.

3. Cutting of chases in any RCC member / finished floor / already finished surface is not allowed unless prior approval of Site Engineer is taken in site instruction book. If a chases is cut in an already finished surface, the contractor shall fill the chases and finish it to match the existing finish including painting at his cost to Site Engineer's satisfaction.

4. Contractor shall not cut any iron bars to fix the conduits. Puncher of wooden / steel shuttering for RCC slab / beams / column etc. for conduit work is also not allowed, unless Site Engineer permits in site instruction book under special conditions.

5. Run of conduit pipe through expansion joints in RCC members should be avoided as far as possible and if unavoidable, flexible conduit pipe should be used with ceiling outlet box on both sides of expansion joints.

6. Conduit on surface of RCC walls / RCC members shall be avoided as far as possible and if unavoidable prior approval of Site Engineer on sample saddles, clamps screws and a minimum 5 mtr. conduit laid on surface shall be taken, to achieve best possible workmanship. Distance between 2 consecutive clamps for fixing conduit on surface shall not exceed 900 mm. wooden patties for fixing saddles / clamps shall be used. Use of roll plug / steel fastener with hard setting / sealing compound is recommended.

7. In case of stone masonry, necessary conduits with M.S. boxes should be placed as the masonry is in progress, since after completing masonry, it is very difficult to cut chases in wells.



Special location of cement concrete shaft is also recommended to conceal conduit in stone masonry and the same shall be provided by client / consultant.

8. In ground floor conduiting below the flooring should be avoided. Wherever it is unavoidable G.I. pipe should be used with prior approval of Site Engineer.

## 5.2 CEILING / WALL OUTLET BOXES FOR LIGHTS / FANS

1. Outlet boxes shall be of steel with aluminium cover and so installed as to maintain continuity throughout. These shall be protected at the time of laying by filling with jute / earth / cotton etc. so that no cement mortar finds its way inside during concreting or plastering etc. Typical sketches for such outlet boxes shall be supplied alongwith other working draws. In beams conduit socket shall be provided in place of outlet boxes. The same shall be used for installation of luminaire.

2. For fixing light fixtures / brackets, outlet boxes complete with check nut for holding conduits shall be used. For lighting fixture suitable for 20 watts fluorescent tubes / incandescent lamps / mercury vapour lamps, only one outlet box is required. For fixing lighting suitable for 40 watts fluorescent lamps, two numbers outlet boxes should be provided at a distance of 300 mm. away from the centre in the longitudinal direction of the fixture, so that the use of patties / roll plug etc. may be avoided, as well as wiring from outlet box to the light fitting is to be installed in RCC beam and due to heavy reinforcement at the bottom of beam it is not possible to provide outlet boxes simple conduit should be provided. However alternative fixing arrangement shall be made in consultation with client / consultant.

3. For fixing ceiling fans, circular outlet boxes, 100 mm. diameter, complete with 12 mm. dia. Mild Steel rod 300 mm. long, for holding 12 mm. dia. Mild Steel cover

125 mm. dia. at bottom shall be used.

## 5.3 DRAW OUT JUNCTION BOXES

Steel drawout boxes at angle dimensions shall be provided at a convenient points on walls / ceilings to facilitate pulling of long runs of cables / wires. These shall be completely concealed with Anodised Aluminium, flush with plaster works. These draw boxes should be five sided. The location of these boxes is to be decided prior to fixing, as per site requirement and following should be treated as general

guidance for deciding the location of these :

1. These should be provided at a place where these are not in direct view. Recommended place is 400 / 450 mm. below ceiling, if conduits are running vertically.

2. Junction box in the offset of bottom of RCC beam and vertical wall should not be provided.

3. If junction boxes are coming side by side for two or more conduits, one common

M.S. box of proper size can be used to act as junction box.

4. If junction box is to be provided in ceiling, its position should be so located that it is in line with other light / fan points.
5. Junction boxes should never be used for splitting one conduit into two or more. Junction box for such functions is avoidable and for this, number of conduits to be connected to one switch board should be calculated correctly as per drawing before laying conduits in ceiling.
6. Locating junction boxes on outer surface of exterior walls of building should be avoided as these are in direct view and are also exposed to weather.
7. Junction boxes should never be closed permanently by plaster. Removable covering of aluminium should be provided for conduit junction boxes for M.S. junction boxes removable hylem plate should be provided. This cover may be painted with wall colour.
8. Junction boxes in important areas should be avoided and can be located in toilets / corridors / service shafts and stores etc.

#### 5.4 SWITCH BOXES

Steel boxes of required sizes, shall be provided to house speed regulators of fans, switches for lights, fans, plug sockets etc. as per requirement of drawings. These should be so designed that accessories on Anodised aluminium sheet could be mounted with tapped holes and brass machine screws, leaving ample space at the back and on the sides for accommodating wires and check nuts at conduit entries. These shall be attached to conduits by means of check nuts on all walls of the boxes through which the conduits are entering. These shall be completely connected leaving edges flush with finished wall surfaces. Anodised aluminium cover should be fixed to these switch boxes by means of brass chrome plated machine screws and cup washers. Utmost care shall be taken by contractor to ensure that all switch boxes are in line and level.

Inside each switch box, one bolt shall be welded to receive earthing wire.

#### 5.5 SWITCH AND SOCKET

Switches shall be installed at 900 mm above finished floor level unless otherwise indicated on the drawings.

The switch controlling the light point or fan shall be connect on to the phase wire of the circuit and neutral shall be continuous, having no fuse or switch installed in the line except at the D.B. All fan regulators shall be fixed inside the switch boxes on adjustable flat M.S. strips / plates with tapped holes and brass machine screws, leaving ample space at the back and side for accommodating wires.

The cover plates to the switch box shall be fixed by means of sunk head brass cadmium screws.

Where two or more switches and fan regulators are installed together, they shall be provided with one gang cover plate with knockouts to accommodate required number of switches, sockets and regulators.

The switch controlling the socket outlet shall be on the phase wire of the circuit. The third pin of the socket shall be connected to the earth continuity conductor of the circuit

The switch boxes, installed back-to-back in the same wall shall be offset from each other, 150 mm horizontally, to preclude noise transmission.

#### 5.6 CLEANING AND PROTECTION OF CONDUIT SYSTEM

The entire conduit system including outlet boxes, junction boxes and switch boxes shall be thoroughly cleaned after completion of erection and tested for not blockage by air / sound or steel wire prior to finishing of building by air / sound or steel wire prior to finishing of building and before drawing in of cables / wires to safeguard conduit system against filling up with the plaster / cement slurry / water etc. all the outlet and switch boxes will have to be provided with temporary jute / cotton filling, covers and plugs etc.. Within tendered cost which shall be replaced later on by hylem / sheet cover after wiring as required.

#### 5.7 TESTING OF INSTALLATION

Before a completed installation is put into service, the following tests shall be complied with:

##### 1. INSULATION RESISTANCE

The insulation resistance shall be measured by applying 500 volt megger with all fuses in places, circuit breaker and all switches closed.

The insulation resistance in gegohms of an installation, measured shall not be less than 50 megohms divided by the number of points on the circuit.

The insulation resistance shall be measured between EARTH TO PHASE

EARTH TO NEUTRAL PHASE TO NEURAL PHASE TO PHASE

##### 2. EARTH CONTINUITY PATH

The earth continuity conductors shall be tested for electrical continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit-breaker, measured from the connection, with the earth electrode to any point in the earth continuity conductor in the completed installation and shall not exceed one ohm.

##### 3. POLARITY OF SINGLE POLE SWITCHES

A test shall be made to verify that every no-linked, single pole switch is connected to one of the phase of the supply system.

##### 4. COMPLETION CERTIFICATES

All the above tests shall be carried out in presence of client and the results shall be recorded in prescribed forms. Any default during the testing shall be immediately rectified and that section of the installation shall be re tested. The completed test result from shall be submitted to the client for approval.

On completion of an electric installation a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in a prescribed form as required by the local electric supply authority.

## 6.0 INSTALLATION OF LIGHTING FIXTURES / FANS

### 6.1 INSTALLATION OF LIGHTING FIXTURES

Scope of work under this item shall start from light point, with a 5 A bakelite connector, 2 core 1.5 mm.<sup>2</sup> PVC insulated wires from this connector to the

connector inside the lighting fixture, connections, fixing of lighting fixture complete with all accessories, lamps on wall / roof / steel truss etc. testing the lighting fixture and commissioning. If wire length of light point is enough to reach connector of light fitting, connector in light point can be deleted.

### 6.2 INSTALLATION OF EXHAUST FANS

Scope of work under this system shall start from exhaust fan point, with a ceiling rose, 2 core 2.5 mm.<sup>2</sup> PVC insulated wire from ceiling rose to connector of exhaust fan, connections, making fan opening in walls including repair / finishing fixing of exhaust fan complete with accessories and louvers on walls with hold-fasts, testing the exhaust fans and commissioning.

## 7.0 INSTALLATION OF EXTERNAL LIGHT FIXTURES

### 7.1 BRACKET FOR STREET LIGHT FITTINGS

The brackets shall be made of 38 mm. NB MS class "B" pipe approx. 1.8 mtr. long bent at the centre at an angle 120° C. with necessary holding brackets, hold fasts etc. with special reducer at the end to accommodate type of street light fitting to be fixed. Bracket shall have 1 coat of anti-corrosion paint before despatch to site and 2 coats of approved make and shade of aluminium paint. This bracket shall also be provided with one M.S. water tight box complete with the connector, neutral link, rewirable fuse etc.. See enclosed drawings of street light poles.

### 7.2 INSTALLATION OF POLES

Installation of poles shall be done as per enclosed drawings of street light poles. The depth of pole to be buried in ground shall be 1/5th of the total pole length or as specified in drawing, whichever is more. Special care shall be taken in erecting poles so that these are not strained or damaged during erection and are firmly stayed till the foundation are secured. The pole shall be grouted inside ground pit (cross-section 600 x 600 mm.) with cement concrete 1:2:4. Before the placement of concrete around pole in the pit, necessary conduit pipes (not less than 25 mm. dia.) shall be placed for facilitating drawing of cables. Separate conduit shall be provided for incoming and outgoing cables. The cement concrete shall be protected from premature drying by curing for atleast 7 days after pouring. All concrete surface from 150 mm. below ground level to top shall be finished smooth with cement mortar 1:4.

### 7.3 INSTALLATION OF STREET LIGHT FIXTURES

This includes fixing of street light fittings complete with accessories and lamps at the end of the pole / bracket, connecting it with 3 x 2.5 mm.<sup>2</sup> aluminium conductor, PVC insulated cable from water tight M.S. box, testing, commissioning. Third core shall be connected with earthing point of light fitting at one end and earthing point of marshalling box at the other end.

#### 7.4 GENERAL NOTES FOR STREET LIGHTING

1. For supplying and laying of cables, technical specification (wiring) shall be applicable reference shall be made under heading Cable Work elsewhere in the tender.
2. For street light poles along roads, nearest finished road level shall be taken as ground level and for poles along compound wall / away from roads, existing ground / finished ground shall be taken as ground level.
3. Distance of 1 mtr. shall be maintained between centre of pole and centre of curb of road. For compound wall poles, distance between compound wall and poles shall be 3 mtrs.
4. A loop of 1.5 mtr. of cable shall be provided near each street light pole for all incoming and outgoing cable.

#### 8.0 COMPLETION TESTS

8.1 After supply and installation of complete project or a particular building / area, following tests shall be carried out by the contractor before switching on the power to installation and the results shall be recorded and submitted to the Site-Engineer. If results are not satisfactory / as per standards set herewith, the contractor shall identify the defects / short coming and shall rectify the same. Nothing extra shall be paid for carrying out these tests and contractor has to arrange all necessary instruments.

#### 8.2 INSULATION RESISTANCE TO EARTH

This is to be measured with all fuse links in place, all switches ON, all lamps and appliances in position by applying a voltage not less than twice the working voltage (subject to a limit of 500 V). Insulation resistance of the whole or any part of the installation to earth must not be less than 50 mega-ohms divided by the number of outlets (points and switch positions) except that it need not exceed one mega-ohm for the whole installation.

#### 8.3 INSULATION RESISTANCE BETWEEN CONDUCTORS

Tests to be made between all the conductors connected to one pole or phase conductor of the supply and all the conductors connected to the middle wire or neutral or the other pole or phase conductors of the supply. For this test, all lamps shall be removed and all switches put ON. The result of the test must be 50 mega- ohms divided by the number of outlets (points and switch positions) but need not exceed 1 mega-ohm for the whole installation.

#### 8.4 POLARITY OF SINGLE POLE SWITCHES

Tests shall be made to verify that all non-linked single pole switches are on phase conductor (live) and not on neutral or earth conductor. This can be done by connecting test lamps between two terminals of switch and earth. If the lamp lights up when switch is ON and either terminal is touched, the switch is correctly installed.

#### 8.5 RESISTANCE OF METAL CONDUITS / SHEETS (EARTH CONTINUITY TEST)

In case of cables encased in metal whether conduit of metallic sheathing, the total resistance of the conduit or sheathing from the earthing point any other position in the completed installation shall not exceed 2 ohms. This can be carried out by following circuit :

One end of the lead is connected to the ECC and its connection with the electrode and the other to the farthest point of the ECC. First, current through the circuit is measured with the resistance of 2 ohms short circuited by the link. Next, current is measured through the two ohms resistance by disconnecting the two leads from the ECC and joining them together. If current is more in the first case, the resistance of ECC is less than 2 ohms.

#### 9.0 HANDING OVER / TAKING OVER

9.1 After completion of works and tests specified above, the various building of the project can be taken over by the employer as and when these are ready in all respects. However, the defect liability period of 12 months would start from the date, when all the buildings of the project have been completed and handed over, unless employer agrees for defect liability period in phased due to non-completion of civil work of few buildings for which electrical contractor is not responsible.

#### 10.0 HANDING OVER / TAKING OVER

10.1 The Tenderer shall indicate the makes of tools, test equipment and other item listed below:

##### 1. TOOLS

A. Set of spanners of sizes 6 mm to 32 mm width across flat

- Adjustable wrench of 36 mm jaw width
- Adjustable wrench of 23 mm jaw width

B. Heavy duty screw driver with full size insulated handle and blade length of

- 100 mm
- 50 mm
- 200 mm

##### 2. TEST EQUIPMENT

A. 2500 V megger motor operated

B. 500 V megger hand operated

C. Multimeter (Battery operated) satisfying the following

- With 0-1 mA, 0-100 mA, 0-1A and 0-5A, AC & DC current ranges
- With 0-100 mV, 0-3V, 0-30 V, 0-300 V and 0-1000V AC & DC voltage ranges

- The resistance ranges shall be atleast five (0-100) m ohm, (0-1) Ohm, (0-10) Ohm, (0-100) Ohm, (0-100) mega ohm

- The Input impedance shall not be less than one mega Ohms for voltage ranges

### 3. LADDERS

Ladder shall be made out of light aluminium alloy of good strength. They shall be of step ladder, foldable, self supporting type with spreader of metallic angles or high strength nylon straps. The ladder shall be provided with shoes on bottom of legs. Rugs shall be flat type having thickness of 30 mm in case of 3 meters long ladders and 60 mm for 6 metres long ladder.

- 3 metres long

- 6 metres long

4. Tong tester - ammeter range 0 to 30, 150 & 300 Amps AC and voltmeter (0- 600) V, class 1.0 with leads and leather case.

## 04 - TECHNICAL SPECIFICATIONS FOR SUPPLY OF DG SET



TECHNICAL SPECIFICATIONS FOR SUPPLY OF D.G SET																																							
1.0		SCOPE OF WORK																																					
	1.1	This specification covers the design, construction features, manufacture and performance of emergency diesel generator. The scope includes supply, installation, testing and commissioning of D.G. set along with fuel pipeline, residence type exhaust pipe insulation and all the accessories required for trouble free operation.																																					
2.0		CODES & STANDARDS																																					
	2.1	The design, material, construction, manufacture, inspection, testing and performance of DG set shall comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable standards and codes of practice.																																					
		The DG set shall meet the requirements of the following standards and rules																																					
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3.0		DESIGN BASIS & SITE CONDITIONS																																					
		All the equipment and components provided in the transformer and accessories shall be																																					

		suitably designed for installation and satisfactory operation as specified below.	
		Site conditions	
		Location <b>India, Gujarat</b>	Site altitude <b>81M</b> above mean sea level
		Ambient temperature	Relative humidity
		Maximum <b>45°C</b>	Maximum <b>85%</b>
		Minimum <b>13°C</b>	Minimum <b>25%</b>
		Design <b>50°C</b>	Design <b>90% at 50°C</b>
		Seismic factor <b>Zone III</b> as per IS:1893	Rainfall <b>618mm/year</b>
		Environmental <b>Tropical/humid/corrosive conditions</b>	Location of Equipment <b>indoor</b>
		Electrical system data:	
		Power supply for Equipment	
		Voltage <b>415V ± 15%</b>	Frequency <b>50Hz ± 3%</b>
		Permissible combined voltage & frequency variation	±6% System design faults level (Symmetrical) <b>15kA for 1 sec. max.</b>
		System earthing <b>LV side neutral solidly earthed</b>	Wiring <b>3 phase, 4 wire on 415V system</b>
		Auxiliary power supply:	
		Power supply	<b>240VAC, 1-Ph, 50Hz</b>
		Control Supply	-----
		Space heater power supply	<b>240VAC, 1-Ph, 50Hz</b>
		Illumination power supply	<b>240VAC, 1-Ph, 50Hz</b>
		Plug-socket power supply	<b>240VAC, 1-Ph, 50Hz</b>
4.0		TECHNICAL REQUIREMENTS	
	4.1	GENERAL CONSTRUCTIONAL FEATURES	
	4.1.1	The diesel engine offered shall be of the regular production model of the manufacturer for industrial applications and already type tested either at the manufacturer's works or outside. The type test report shall be furnished to the purchaser for his review if so desired	

4.1.2	In case the proposed engine model has not been type tested, vendor shall furnish with the offer, a reference list of fit existing industrial installation and at least three of these engines, should have completed, 5000 hours of running at site
4.1.3	Unless otherwise specified in the equipment data sheets, the diesel engines shall be provided with class A1 governing as per the latest edition of B.S. 5514
4.1.4	The "Cyclic irregularity" of the diesel engine for direct coupling to an electric generator, "angular deviation of A.C. generators" given by diesel engine for parallel operation, and the "engine governor speed droop characteristics", shall be restricted to the values specified under the latest edition of B.S. 5514
4.1.5	The vendor shall be responsible for carrying out torsional analysis of the dynamic system as specified in the latest edition of British Standard-5514. The results in the form of a report shall be submitted to the purchaser for scrutiny and reference, if desired.
4.1.6	Vendor shall provide the flexible exhaust connection to connect the engine exhaust to the exhaust piping. The required size of the exhaust piping should be clearly specified by the vendor.
4.1.7	The common base plate for mounting the diesel engine and the driven equipment as well as the flexible couplings shall be supplied by the vendor.
4.1.8	Vendor shall indicate in the bid, the IS Noise Level rating of the diesel engine with the offered exhaust silencer, which should not exceed more than 75 db at 1 Mtr. Distance.
4.2	ENGINE COOLING
4.2.1	Vendor shall supply radiator based cooling system
4.3	ENGINE FUEL SYSTEM
4.3.1	The daily service fuel tank capacity 990 liters shall be equipped with shielded level gauge, strainer and a hand hole of not less than 150 mm diameter, besides the required fuel connections and a drain plug. One tank of suitable capacity to be provided
4.3.2	The inside surfaces of the fuel tank and the float tank shall be coated with Enamel Red or Black of I.C.I. or its equivalent and the outside surface to be given two coats of the oil resistant primer paint. The fuel tank shall be hydrostatically tested at a pressure not less than 0.35 Kg./Cm. <sup>2</sup>
4.3.3	Fuel oil transfer pump to transfer oil from barrel to day tank shall also be provided
4.3.4	All piping, valves, fittings and supports inside D.G. houses shall be part of supply
4.4	ALTERNATOR
4.4.1	This specification defines the requirements of design, manufacture, testing and supply of self excited emergency generator complete with automatic voltage regulator, control panel, isolator and other accessories as specified in the material requisition

4.4.2		<p>Unless otherwise specified the emergency generator shall be supplied complete with:</p> <ol style="list-style-type: none"> <li>1. Brushless excitations system complete with AVR.</li> <li>2. Electric panel including control cubicle and associated auxiliary devices, relay panel and generator breaker / isolator, battery and battery charger.</li> <li>3. Air inlet and outlet for generator cooling (inlet shall be oriented to suit total plant layout).</li> <li>4. Lifting arrangement for the machine.</li> <li>5. Foundation frame complete with foundation bolts to install along with engine on common base frame.</li> </ol>
		<ol style="list-style-type: none"> <li>6. Lub. oil system integral with the prime mover lub. oil system.</li> <li>7. Spares for commissioning.</li> <li>8. Spares for two years of operation and maintenance.</li> </ol> <p>Any other part / accessories not specifically mentioned above but considered necessary for safe and reliable operation.</p>
4.5		DESIGN & CONSTRUCTION
4.5.1		The alternator shall be mounted on a common base frame together with the prime mover unless otherwise agreed. The generator shall be provided with necessary lifting hooks and two earth terminals for connection to main earth grid.
4.5.2		The alternator windings shall be class "F" insulation with temperature limitation to Class "B"
4.5.3		The stator windings shall be brought out to six insulated terminals in two separate terminal boxes. The alternator shall, therefore, be provided with three separate terminal boxes, i.e. for the line and neutral stator connection and for control connection. The terminal box for the line terminal shall have 40% free space and each segregated for easy cable end connection of cable sizes specified in data sheet. The neutral box in addition to the space for neutral earthing cable shall have sufficient room for the current transformers used for the protection of the generator. Star connections shall be formed in the neutral side of terminal box. The terminal box for control cable shall contain properly marked terminals for all internal equipment, e.g. embedded temp. detector etc. All terminals shall be stud type. The terminal boxes shall be complete with lugs and double compression type cable glands. Current transformers shall be as specified in data sheet
4.5.4		All parts and accessories shall be suitable to withstand stresses due to overspeed / overload / short circuit conditions specified
4.5.5		Bearings shall be double shielded and pre-lubricated. Grease in the bearing enclosure shall provide additional lubrication to bearings as well as provide sealing against dust and moisture. On line greasing facility with excess grease expulsion system shall also be provided
4.5.6		The alternator shall be air cooled unless otherwise agreed, alternator enclosure shall be as specified in data sheet
4.5.7		The direction of rotation of the rotor of the machine shall be compatible with that of the prime mover. A clear indication of the direction of rotation shall be given on either end of the machine

	4.5.8	Field winding shall have class "H" insulation with excellent electrical and mechanical properties. The field windings shall be capable of operating at a field voltage with Excitation capacity $E_{max} / E_n = 1.6$ for at least two minutes to meet improved stability requirements
	4.5.9	A rating plate of S.S material shall be fixed on the generator frame and shall give the following information: <ol style="list-style-type: none"> <li>1. Manufacturer's name.</li> <li>2. Serial Number, Type and frame reference</li> <li>3. Rated output in KVA &amp; KW</li> </ol>
		<ol style="list-style-type: none"> <li>4. Rated power factor, frequency and voltage</li> <li>5. Rated stator current and speed in Rev./Min.</li> <li>6. Class of insulation</li> <li>7. Phase rotation (CW or CCW)</li> <li>8. Customer's indent no.</li> <li>9. Year of manufacture</li> <li>10. Weight of rotor and stator in Kg</li> </ol>
	4.6	EXCITATION SYSTEM
	4.6.1	The generator shall be provided with brushless type solid state excitation system. The field of the exciter shall be either permanent magnet type or externally excited through external power, transformer and AVR. AC voltage generated in the exciter shall be rectified by the rotary rectifier assembly and feed power to the main field circuits of the generator
	4.6.2	The exciter capacity shall be at least 20% more than the maximum requirement at any time
	4.6.3	The exciter windings shall be insulated with class "F" insulation
	4.6.4	Automatic solid state voltage shall be provided with the following features as a minimum. <ol style="list-style-type: none"> <li>1. Short circuit protection.</li> <li>2. Manual voltage control switches with adjuster.</li> <li>3. Cross current compensation for parallel operation.</li> <li>4. Voltage build up circuitry.</li> <li>5. Stator current limiter.</li> <li>6. Field current limiter</li> </ol>
	4.6.5	The current and potential transformers required to feed the AVR from the generator terminal shall be adequately rated
	4.7	ACOUSTIC ENCLOSURE

		The canopy should be soundproof, weatherproof & environment friendly, conforming to the latest environment (protection) act 1986 (29 of 1986) of ministry of Environment and forest notification No. dated 17 <sup>th</sup> May 2002 and 12 <sup>th</sup> July, 2004 and second amendment of 2002 and 2004 respectively. No set shall be accepted without the CPCB certificate of authorized agencies such as ARAI of Pune, NPL New Delhi, NSTL Visakapattanam, FCRI Palghat and NAL Bangalore.
		(i) The canopy shall be in modular construction with the provision of assembly at site. The acoustic panels shall be fabricated in 2mm thick CRC A sheet. The finished sheet metal components shall undergo seven tank treatment process for degreasing, derusting, phosphatising etc. for longer life and should be by Polly polyester based coated inside & outside. The nuts bolts and other hardware shall be Zinco coated. The door shall be provided with high quality EPDM gasket to avoid leakage of sound. The door handles and hinges shall be Zinco plated & lockable type.
		(ii) The Radiator fan of the water cooled Engines shall be used for ventilation. A pusher fan (for air cooled Engines) or in addition to Radiator fan, if required shall also be provided. The motor of this fan shall be of BSNL approved make.
		(iii) Adequate ventilation shall be provided to meet the air requirement for combustion & also to expel heat to maintain temperature inside the enclosure within 7 degree Celsius above ambient at 10% overload with tripping arrangement between (50-60) degree Celsius.
		(iv) An arrangement for adequate illumination inside the enclosure shall be provided
		(v) Separated door with locking arrangement for easy access to D.G. set during operation & maintenance should be provided.
		(vi) The enclosure shall be guaranteed for a period of 12 months from the date of completion of work against defective materials & rust, welding, painting, smooth functioning of doors, inspection window etc. minor civil work is to be carried out without any extra cost.
		(vii) Small see through window for reading meters etc. made of transparent polymer sheet of thickness not less than 5mm shall be provided.
		(viii) Proper sealing arrangement between radiator and radiator partitions shall be provided to avoid hot air returned to the canopy.
		Fuel Tank and Control Panel shall be incorporated inside the canopy
		(ix) Two point lifting arrangement.
		(x) Main base frame will be of size 100mm X 50mm X 5mm MS channel welded with 3mm thick MS sheet for bolting arrangement complete as required.
		(xi) Framework will be provided for floor made out of 2mm thick MS plate or welding, painting etc complete around foundation as required. Acoustic enclosure with the following thickness of CRC A sheet shall also be accepted : (a) 1.5mm for roof and 1.2mm for door and stay (b) 1.5mm for roof and 1.2mm for door (c) 1.6mm for all

		<p>(xii) Insulation on enclosure will be provided &amp; fixed of:</p> <p>a) Mineral rock wool Slabs of density not less than 96kg/M<sup>3</sup> of 75mm thickness, covered with 22 gauge GI sheet having 3mm perforation fitted with strips of AL by hydraulic riveting to support the whole insulation rigidly complete as required. (OR) Polyurethane foam/ PUF of minimum 26Kg/ m<sup>3</sup> density acoustic foam of dark grey/black colour, fire retardant and not less than 20 mm thickness.</p> <p>The following canopy insulation material is also acceptable to BSNL</p> <p>(i) PVC foam 1.5mm/2mm and density of 100-110kg/sq.m.</p>
		(xiii) Specially designed sound attenuator shall be provided to control sound at air entry & exit points / clouvers
		(xiv) The canopy shall be provided with emergency stop button easily approachable from outside.
		<p>(xv) The canopy shall be provided with following meters (visible from outside):-</p> <p>(a) Lub. Oil pressure gauge.</p> <p>(b) Water temperature gauge (for water cooled engines only).</p> <p>(c) Dial type fuel gauge with sensing arrangement.</p>
	4.8	AMF CONTROL PANEL
		<p>Control panel shall be cubical type made of 16 gauge CRCA sheet with hinged type openable covers mounted above base frame at suitable location of E/A set and supported on both sides on base frame. Rubber pads of 6mm thickness shall be provided between the base frame and control panel supports. All the control panel wiring should be easily accessible and shall have sufficient working space for making connections of cables etc. A manual bypass switch shall be provided on the control panel for total bypass of the AMF system. The changeover from Mains supply to EA set supply should be possible in manual mode with AMF relay totally bypassed. A tinned copper earth stud of adequate dimensions shall be provided. The panel shall be consisting of:-</p>
		a) 2 Nos. of 3 poles ___ A (with adjustable current setting) MCCB.
		b) Contactors:- 2 Nos. minimum, of A, 4 pole, AC-3 duty (or), 4 pole AC-1 duty power Contactors for Main / Diesel EA set (Mechanically interlocked & electrically interlocked) with contactor coil.
		c) The supply to the coil of the mains contactor is to be provided with the help of a static voltage regulator having wide input range from 90 Volts to 300 Volts and output within the operating range of contactor coil.
		d) Potential free contacts for extension of alarms- (6 Nos.) viz. lack of fuel, LLOP, Mains Fail, Engine Fail to start, Door opening, high cylinder / Water temp.

		<p>e) Microprocessorbased AutomaticMains Failure Controller (suitable for 12VDC), with following functions:</p> <ul style="list-style-type: none"> <li>(i) As theoperating range of thepowerplant(90V to 300V) and AC Voltage stabilizer is quitewide,theAMFrelays shouldbeabletotriggerE/ASet for startingandstoppinginaccordancewith thisrange.</li> <li>(ii) Switchthe load to the enginesupply after suitable time delay, after starting the engineonmainsfailure/phase failure / low voltage/ highvoltage.</li> <li>(iii) Switchtheloadbacktothemainsupplyaftersuitabletimedelay,when healthymains supplyis restoredandstoppingtheEngine.</li> <li>(iv) AttempttostarttheEngineuptothreetimesonfailureofearlierattempts with suitabletime intervals.</li> <li>(v) AMF relays shouldhave facility for RS 232serialcommunicationinterface following <a href="#">TCP / IP Protocol</a>.</li> <li>(vi) OneGSMmodemshallbeprovidedalongwith necessarysoftwarefor transferringthedata to the basestationinExcelsheet.TheGSMmodemshall havetwoinputsoneachforAMF andACcontroller.The datafromboth AMF andAC controllers shouldbeaccessibleat remotestation.</li> </ul>
		<p>f) Connectionsofcontrolwiringshallbedonewithscrewlessconnectorstripsand ferrulesfor identificationonbothends.</p> <ul style="list-style-type: none"> <li>(i) ACandDCwiringshallbeseparateddistinctly.</li> <li>(ii) 1No.Multifunctionalmeter toindicateVoltage,Current,PF,Frequency&amp;kWh.</li> <li>(iii) Pushbuttonforstop,reset,test,andacknowledge.</li> <li>(iv) Recesstypehooter.</li> <li>(v) AudiovisualindicationforLLOP,HCT/HWT,Overspeed,Lackoffuel.</li> <li>(vi) RYBLEDindicationforindicatingMains/EASetsupply–2sets.</li> <li>(vii) DC.Ammeter[0-15A],DC.Voltmeter [0-30V] of size 96mmx 96mmwith selector switch for trickle /boost charging throughbattery charger andbattery charging unit.</li> <li>(viii) SelectorswitchforAuto/Manualoperation.</li> <li>(ix) BatteryCharger:Automatictrickle/boostbatterychargerofSCRorSMPStype</li> </ul>
		tocharge thestartingbatteryof DEA set.This chargingshallbedonethrough mainsupply for which a suitableincomershall be providedin the panel with suitable rangeofammeterandvoltmeterontheDCsidewith protectivefuses.
	4.9	NOTES
	4.9.1	TheengineH.P.shouldbeselectedso astoachieve requiredKWratingtobe generated atsite conditionandderatedconsideringtemperature insideacousticenclosure
	4.9.2	D.G.setshouldbeabletostartbypushbuttonAMFrelay,orremotecommand
	4.9.3	TheenginetestshallbewitnessedbytheOWNER'srepresentative
	4.9.4	Theengineshouldhaveautomaticbelttensioningarrangementforbatterycharging alternatorsystem
	4.9.5	Theengineshouldhavefacilityfortheindicationofoillevelinoilsumpduringrunning of theengine



	4.9.6	The noise level should not be more than 75 db at 1 Mtr. distance and engine exhaust smoke emission level should be less than 1 bosch
	4.9.7	Engines should be preferably from the engine manufacturers whom maintains quality-assurance to international standard of ISO 9001
	4.9.8	Engines should be fitted with the electronic governor only
	4.9.9	The engine water circular pump should be directly driven by engine gear system. V-belt driven systems should not be adopted / accepted
5.0		DRAWING & INFORMATION
	5.1	ALONG WITH OFFER
	5.1.1	The bidder shall submit completely filled data sheet as per the given format along with GA drawing indicating list of accessories. Submit list of spare parts required for safe operation of equipment for Two years.
	5.2	HANDING OVER DOCUMENTS
	5.2.1	The suppliers shall submit following: 1. GA drawing 2. Foundation layout 3. Rating and Diagram Plate 4. Data sheet indicating results of tests 5. Test reports 6. O&M manuals
6.0		METHOD OF MEASUREMENT
	6.1	Supply of the D.G Set including transport to site, loading and unloading etc. as specified will be treated as one unit for measurement and payment.
7.0		TRANSPORT, DELIVERY & STORAGE
	7.1	The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation upto the final location of DG SET or site store. The DG SET should be supplied with required storage arrangements suitable for placing in open storage yard. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.
		The transportation for any auxiliary item or detachable part of equipments should be simultaneous and carry necessary instructions for assembling and storage requirements.
		All metal surfaces shall be thoroughly cleaned of scale, rust and grease etc. Prior to painting. Cleaned surfaces shall be given two coats of primer and prepared for final painting. Final finish shall be free from all sort of blemishes

	7.2	The equipment shall be shipped to site suitably packed to prevent any damage. Each packages shall have labels to show purchaser's name, purchase order and equipment no. suitable lifting lug set etc. shall be provided and lifting points shall be clearly marked on the package. Packing shall be suitable for storage at site for a minimum period of 6 months
8.0		GUARANTEE & WARRANTY
	8.1	The Bidders shall stand guarantee for the performance of entire equipment and components for twelve (12) months from the date of commissioning or eighteen (18) months from the date of dispatch, whichever is earlier, as agreed upon and as reproduced in the purchase order within the tolerance specified or as permitted by the relevant standards for the equipment in his scope of supply. The Purchaser also reserves the right to use the rejected equipment or part thereof until the new equipment meeting the guaranteed performance is supplied by the Bidder.
9.0		SPARES
	9.1	The bidder shall quote for minimum spares required for two years safe operation of DG set along with the offer separately.
10.0		ATTACHMENTS
	10.1	DATASHEET

SR. NO.	PARTICULARS	REQUIRED DATA
1.0	Prime mover	Diesel Engine
2.0	Quantity required	One
3.0	Service	Prime mover for generating set
4.0	Rating	1 No. ___ KVA
5.0	RPM	
6.0	Voltage	415V TPN, ±5%
7.0	Voltage variation/regulation Steady state - slow variation In load (0.0% to 100% at P.F. 0.8)	1% or less
8.0	Voltage deep (sudden load application 0.0% to 100% at P.F. 0.8)	-5%, recovery time - 0.25 sec.
9.0	Frequency	50 Hz.
10.0	Frequency variation/regulation	0.5 Hz.
11.0	Temperature rise	Class 'F' used as Class 'B'
12.0	Alternator Insulation Material	VPI Insulation preferred
13.0	Flywheel	Required
14.0	Vibration damper	Required (fluid type only)
15.0	Fuel pump air cleaner	Required
16.0	Fuel pump	Required
17.0	Oil filter, fuel filter etc.	Required
18.0	Lubrication pump	Required
19.0	24V DC electrical system consisting of SMF lead acid battery set and suitable charger	Required
20.0	Safety controls	Required
21.0	Residential type Silencer	Required
22.0	Acoustic Hood	Required
23.0	AMF panel with MCCB	Required

24.0	Coupling	Required
25.0	Instrumentpanelconsistof a) Starterswitchwithkey b) Luboiltemp.gauge c) Watertemp.gauge d) Luboilpressuregauge e) TachocumHourmeter	Required  Require d Require d Require d Require d
26.0	Fuel tank	Required(Capacity- )
27.0	Battery charger	Required(Electronicsfloat&boosttype)
28.0	Enginetesting  a) Atshop b) Atsite	Required
29.0	Toolkits	Required
30.0	Literature(Twosetseach)  a) Operation&maintenancemanual b) Partscatalogue/list	Required Required

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TECHNICAL SPECIFICATIONS FOR LT XLPE CABLE

1.0 SCOPE OF WORK

This section shall cover supply, laying, testing and commissioning of medium voltage XLPE cables.

1.2 This specification gives the general requirement of cables. However, it is the responsibility of the vendor to take the joint measurement and obtain client's approval

before the placement of orders to the main supplier / manufacturer.

2.0 CODES & STANDARDS

2.1 The following standards and rules shall be applicable :

Sr .No	Item	RelevantIS	RelevantIEC
1	XLPEinsulatedelectric cables(heavyduty).	IS:7098PartI	
2	Recommendedcurrentratingsforcables.	IS:3961	
3	Aluminiumconductorsforinsulatedcables	IS:8130	IndianElectricityActandRules.

3.0 DESIGN BASIS & SITE CONDITIONS

3.1

Siteconditions			
Location:Gujarat		Sitealtitude81Mabovemeansealevel	
Ambienttemperature		Relativehumidity	
Maximum	45 <sup>0</sup> C	Maximum	85%
Minimum	13 <sup>0</sup> C	Minimum	25%
Design	50 <sup>0</sup> C	Design	90%at50 <sup>0</sup> C
Seismic factor IS:1893	Zone III as per	Rainfall	618mm/year
EnvironmentalTropicalconditions		LocationofEquipmentIndoor	
Electrical systemdata:			
PowersupplyforEquipment			
Voltage	415V±5%	Frequency	50Hz±3%
Permissiblecombined voltage&frequencyvariation	±6	Systemdesignfaultslevel(Symmetrical)	15kAfor1sec.max.
SystemearthingLVsideneutralsolidlyearth ed		Wiring	3phase,4wireon415Vsystem

All equipment and materials will be selected and rated for use at the following site conditions.

ply	
Powersupply	240VAC,1-Ph,50Hz
ControlSupply	-----
Spaceheaterpowersupply	240VAC,1-Ph,50Hz
Illuminationpowersupply	240VAC,1-Ph,50Hz
Plug-socketpowersupply	240VAC,1-Ph,50Hz

#### 4.0 TECHNICAL REQUIREMENTS

##### 4.1 GENERAL CONSTRUCTIONAL FEATURES

4.1.1 The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian

Standards specifications, manufacturer's instructions. The cables shall be delivered at site in original drums with manufacturer's name, size, and type, clearly written on the drums.

##### 4.2 MATERIAL :

Medium voltage cable shall be XLPE insulated. PVC sheathed, aluminium or copper conductor, armoured conforming to IS: 7098 Part I.

##### 4.2.1 Type:

The cables shall be circular, multi core, annealed copper or aluminium conductor, XLPE insulated and PVC sheathed, armoured or unarmoured.

##### 4.2.2 Conductor:

Uncoated, annealed copper / aluminium, of high conductivity upto 4 mm.<sup>2</sup> size, the conductor shall be solid and above 4 mm.<sup>2</sup>, conductors shall be concentrically stranded as per IEC : 228.

##### 4.2.3 Insulation:

XLPE rated 70° c. extruded insulation

#### 4.2.4 Core Identification:

- Two core : Red and Black  
Three cor : Red, Yellow and Blue  
Four core : Red, Yellow, Blue and Black  
Single core : Green, Yellow for earthing

Black shall always be used for neutral.

#### 4.2.5 Assembly:

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

#### 4.2.6 Armour:

Galvanised steel flat strip / round wires applied helicaly in single layers complete with covering the assembly of cores.

For cable size upto 25 Sq. mm. : Armour of 1.4 mm dia G.I. round wire

For cable size above 25 Sq. mm. : Armour of 4 mm wide 0.8 mm thick G.I strip

#### 4.2.7 Sheath:

XLPE 70 deg.c. rated extruded.

Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. 50 deg. C and operating temperature of cables. The sheath shall be resistant to water, ultraviolet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black.

Sequential length marking required at every 1.0 mtr. interval on outer sheath Vendor has to furnish resistance / reactance / capacitances of the cable

#### 4.2.8 Rating:

Up to and including 1100 Volts.

### 5.0 DRAWINGS & INFORMATION

5.1 Contractor shall submit the as built drawing of the cable laying drawing.

### 5.2 HANDINGOVER DOCUMENTS

The supplier shall submit following:

1. Data sheet indicating results of tests
2. Test reports

## 6.0 INSPECTION AND TESTING

6.1 All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.

The cable shall be supplied in single length i.e. Without any intermediate joint or cut unless specifically approved by the client.

The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practice.

### 6.2 Finished Cable Tests at Manufacturer's Works:

The finished cables shall be tested at manufacturer's works. Following routine tests for each and every length of cable and copy of test results shall be furnished for each length of cable alongwith supply. If specified, the cables shall be tested in presence of client's representative.

#### 6.2.1 Voltage Test:

Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for duration of 5 minutes.

#### 6.2.2 Conductor Resistance Test:

The D.C. Resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20° c. to check the compliance with the values specified in IS 8130 - 1976.

## 6.3 Cable Test Before and After Laying of Cables at Site

6.3.1 Insulation Resistance test between phases and phase to Neutral and phase to earth.

6.3.2 Continuity test of all the phases, neutral and earth continuity conductor.

6.3.3 Sheathing continuity test.

6.3.4 Earth resistance test of all the phases and neutral.

## 7.0 METHOD OF MEASUREMENT

7.1 The cables will be measured in meters. The unit rate shall include cutting the cable into required lengths, packing, loading, unloading, insurance, transportation, delivery to stores/site as per work order, stocking in stores, testing of cables at stores etc. of medium voltage cable. Total quantity in meters shall be measured lug to lug basis.

## 8.0 TRANSPORT, DELIVERY AND STORAGE

8.1 The cable shall be supplied in the actual length as per detailed purchase order

8.2 The cable shall be dispatched at client's stores or at site as per detailed instructions given by client at later stage.



8.3 The cable shall be loaded from the main vendor's store and properly stacked as per instruction of client's local representative. All such labour and transportation charges shall be clearly mentioned in the offer.

9.0 GUARANTEE OF PERFORMANCE

9.1 The quotes values of parameters shall be within given tolerance for given period of service life.

# 06 - LED LIGHT TECHNICAL SPECIFICATIONS

## LED LIGHT SPECIFICATIONS

### SUPPLY, LAYING, TESTING AND CONNECTING UNARMoured CABLE:

The item includes supply, laying, testing and commissioning of round 3 X 1.5 sq. mm for LED luminaries flexible unarmored single PVC insulated copper conductor cable 1100 V grade to be laid through the pole from luminaries to junction box by experienced technician without any damage. The cable joint shall not be allowed. Termination glands/lugs etc shall be included in the item.

### SITC OF LED LIGHT LUMINAIRES:-

### TECHNICAL SPECIFICATION FOR ENERGY EFFICIENT LED BASED LUMINAIRE UNIT FOR LED LIGHT: -

This specification is for technical and general requirements design, development, manufacturing, testing and supply of energy efficient LED luminary complete with all accessories, LED lamps with suitable current control driver circuit and required optics including mounting arrangement.

### CODES & STANDARDS: -

IEC 60529 Classification of degree of protections provided by enclosures (IP Codes) EN 55015, CISPR15 Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment.

IEC 62031 LED modules for general lighting-Safety requirements IEC 61547-EMC Immunity requirement

IEC 60598-2-1 Fixed general purpose luminaries

IEC 60598-1 Luminaries - General requirement and tests

IEC 61000-3-2 Electro Magnetic compatibility (EMC)- Limits for Harmonic current emission — (equipment input current  $\leq 16$  A per phase.

IEC 60068-2-38 Environmental Testing: Test Z- AD: composite temperature/ humidity cyclic test

IEC 61347-2-13 Lamp control gear: particular requirements for DC or AC supplied electronic control gear for LED modules.

IS 10322 Specification for the luminaries IS 4905 Method for random sampling

LM 79 LED luminary photometry measurement. LM 80 Lumen Maintenance

IEC 62384 DC or AC supplied electronic control gear for LED modules performance requirements

IEC/ PAS 62612 Self-ballasted LED lamps for general lighting services- Performance requirements

### CONSTRUCTIONAL FEATURES:

General:

- a) Luminaries shall be made of die cast aluminium/ extruded Aluminium body with powder coated finish having safety.
- b) Heat sink used should be aluminium extrusion having high conductivity. Heat sink should be integrated within luminaries and efforts shall be made to keep the overall outer dimensions
- c) optimum such that it permits sufficient heat dissipation through the body itself so as to prevent abnormal temperature inside the luminaries and consequential damage to cover, gasket material, LEDs, lenses and drivers.
- d) LED must be mounted on Metal core PCB with suitable large area surface by means of fins to dissipate the conduct heat. The fins must be exposed to ambient flowing air.
- e) All luminaries shall be provided with toughened glass of min. 0.8 mm thickness of sufficient strength. UV stabilized Poly carbonate material is also acceptable. High efficiency prismatic diffuser/Lens under the LED chamber to protect the LED and luminaries shall be provided.
- f) The minimum IK protection of optic cover shall be IK 05. The test material certificate shall be provided.
- g) Suitable number of LED lamps shall be used in the luminaries. The manufacturer shall submit the proof of procurement of LEDs from OEMs at the time of testing.
- h) Suitable reflector/ lenses may also be provided to increase the illumination uniformity and distribution.
- i) The electrical component of the LED and LED driver must be suitably enclosed in sealed unit to function in environment conditions mentioned earlier.
- j) The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side.
- k) Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.
- l) The equipment should be compliant to IEC 60598-1, IEC 62031 and IEC/PAS 62612 depending on the type of luminary.
- m) The LED Module(s), Driver gear, etc. shall be designed in such a way so that temperature of heat sink shall not exceed 70° C.
- n) All the material used in the luminaries shall be halogen free and fire retardant confirming to standard.
- o) The infrastructure for Quality Assurance facilities to verify/ test/ prove above specifications must be available at the manufacturing facility. The compliance shall be indicated clearly in the tender itself.
- p) All fasteners must be of stainless steel.
- q) All glands inside/ outside luminaries must be metallic
- r) Heat sink must be thermally connected to MCPCB/ LED light source.

High power and high lumen efficient LEDs suitable for following features shall be used:

- a) The working life of the lamp at junction temperature of 85° C (max) at operating current shall be more than 50,000 working hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day. These features shall be supported with datasheet.
- b) Adequate heat sink with proper thermal management shall be provided.
- c) Lumen maintenance report as per LM 80 guidelines shall be produced for the power LEDs used.
- d) Thermal management shall be in such a way that LED soldering point temperature shall not go beyond 75° C.
- e) The LED luminaries shall be free of glare.

LED DRIVER specification:

- a) Current waveform should meet relevant nation and international standard.
- b) LED Driver shall withstand, withstand voltage up to level mentioned elsewhere in tender and restore once normal working when normal voltage is applied.
- c) The life of the driver should more than 25000 Hrs.
- d) Maximum Temperature rise  $\leq 30^{\circ} \text{C}$  @  $45^{\circ} \text{C}$  Tamb. With safety margin of  $10^{\circ} \text{C}$ .
- e) The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements.
- f) The driver of the luminaries should have Short Circuit, Over Voltage, over current, over temperature, Under Voltage, String Open protections.

The electronic components used shall be as follows:-

- a) The protective cum adhesive coating used on PCBs should be cleared and transparent and should not affect colour code of electronic components or the product code of the company.
- b) The construction of PCBs and the assembly for components for PCBs should be as per IS standards.

Illumination Level:

The luminaries shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. The lux distribution curve/ graph/ spatial distribution shall be submitted.

GENERAL DATA SHEET:

Sr. No.	Parameter	Value/Detail
•	RatedSupply Voltage	230 V ~,50 Hz
•	Inputsupplyvoltage range	120-270V

•	ExpectedInputFrequency	50Hz +/-3%
•	WorkingTemperature	+5°to+50° C
•	WorkingHumidity	10%-90%RH
•	Usagehours	Dusktodawn
•	PowerFactor	≥0.90
•	Index ofProtectionLevel	IP 66 asperIEC60529.
•	SurgeProtection	4 KV
•	LEDChipefficacy	≥ 120 lm/W
•	DriverEfficiency	>85%
•	JunctionTemperatureofLED	< 85° C
•	Rated Life@ L70	50,000 burning hours at 35° C ambient
•	Nominal Correlated Colour Temperature	5000°K to 6000°K
•	DispersionAngle	Minimum120°
•	Tiltingangle	Adjustable
•	Maintenance factor of	0.85
•	ColourRenderingIndex	≥75
•	TotalHarmonicDistortion	<10%(EMI/EMCCertification)
•	LEDMAKE	Cree/Osram/Nichia/PhilipsLumileds

Particulars and Details to be submitted by the bidder:

In order to properly assess and due diligence on submissions, the Bidder should provide following information on the quality and photometric of proposed luminaries.

1. General Description

Following details of the proposed luminary shall be submitted

2. Electrical specifications

Electrical ratings of the proposed luminary product shall be submitted

3. LED chip and driver information

LED chip and driver information of the proposed luminary product shall be submitted

4. Photometric information to be submitted TESTS & CERTIFICATES:

Tests are classified as:-

Type test Acceptance test

• Routine test.

The luminaries' should be tested as per IEC 60598-2-3: 2002 standards and following test reports should be submitted: -

(i) Heat Resistance Test

- (ii) Thermal In SITU Test
- (iii) Ingress Protection Test
- (iv) Drop Test
- (v) Electrical/ Insulation Resistance Test,
- (vi) Endurance Test,
- (vii) Humidity Test,
- (viii) Electrical and Photometric Measurements Test Report (IES LM 79)
- (ix) LED Lumen Maintenance Test Report (IES LM 80)
- (x) Vibration test as per ANSI

Type Test: -

Type test certificates for both the luminaries' shall be provided with the technical-bid.

Acceptance Tests: -

These tests are carried out by an inspecting authority at the supplier's premises on sample taken from a lot for the purpose of acceptance of a lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below.

Sample size and criteria for conformity

The luminaries shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS 4905-1968 (Reaffirmed 2001) may be followed.

Routine Tests:

These tests shall be performed by the manufacturer on each complete unit of the same type and the results shall be submitted to the inspecting agency, prior to offering the lot for acceptance test. The firm shall maintain the records with traceability.

Test Scheme & Quality Assurance

Method of Testing: -

Visual and Dimensional Check:

The unit shall be checked visually for all dimensions as per approved design and drawing.

General workmanship should be good; all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic/ electrical items.

Checking of documents of purchase of LED

Check Document of purchase of LED lamps of approved sources viz. NICHIA/ OSRAM/ PHILIPS LUMILEDS/ CREE.

Resistance to humidity test

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48° C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

#### Insulation resistance test

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 MΩ when measured with 500 V megger.

#### HV test

Immediately after insulation resistance test, an AC voltage of 1.72 KV rms (1500 + 2 x rated voltage) of sine wave form of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

#### Over voltage protection

The LED Driver Shall be cut off once voltage exceeds 288 V AC. It shall be reconnected when supply comes within limit.

#### Surge protection

It shall withstand a surge of 4 KV at the input terminals for all types.

#### Reverse polarity

The Luminaries' shall withstand polarity reversal. It shall be operated with reverse voltage for Min. 1 minute at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and Luminary shall operate in a normal way.

#### Temperature rise Test:

Temperature rise Test shall be conducted at 100 V ~ with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum-recorded temperature under worst conditions shall be corrected to 55° C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10° C.

Temperature at junction shall not exceed 100° C when corrected to 55° C. The Luminaries' shall also be subjected for short time rating after continuous loading to

ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85° C environment. In case of exceeding limit, use of MIL-grade component shall be considered keeping RDSO informed.

#### Ra (Colour Rendering Index) measurement test

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardised rated value as per Annex: D of IEC 60081- 1997.

The initial reading of the general colour-rendering index (Ra) shall not be less than the rated value decreased by 3.



The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20,000 burning hours and 70% of the initial lumen after 50,000 hours. The initial lumen will be taken after 100 hours aging.

Photometric test shall be conducted as per Annexure: B of IEC 60081-97.

The lumen maintenance test shall be done as per Annexure: C of IEC 60081-97.

Fire retardant Test

Fire Retardant test shall be conducted as per IEC 60332-1 of the wire used in the luminaries.

Test for IP 65 protection

This test shall be conducted as per IEC 60529.

Environmental tests (Proto type Test)

The Luminary shall meet the following tests as prescribed in IEC-60571.

- (i) Dry heat test.
- (ii) Damp heat test
- (iii) Test in corrosive atmosphere
- (iv) Combined dust, humidity and heat test

Reliability Test

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions.

There shall be no failure during this test.

- (i) The light unit shall be mounted in an oven maintained at 45° C.
- (ii) The light will be operated at the specified maximum voltage and at 45° C for a period of 100 hours.

Photometry Test: -

The test shall be carried out for Total Luminous Flux, Luminous Intensity Distribution, Electrical Power, Luminous Efficacy (calculation), Color Characteristics– Chromaticity, CCT & CRI etc. as per IES LM 79.

Life Test

The lumen maintenance & life test shall be done as per IES LM 80 for LEDs. Endurance Test

The Luminaire shall be kept “ON” with input voltage of 250 V ~ for 200 hours. After this the Luminaire is subjected to 20,000 cycles of “ON” and “OFF”, each cycle consisting of 3 seconds “ON” and 10 seconds “OFF” period. Luminaire should survive this test. Test is to be continued for 20,000 cycles, followed by performance test.

Safety:

The Luminaire shall comply with the safety requirements as per IEC 61195.

All Tests defined for acceptance other than LM 79 and LM 80 are allowed to carry out at Manufacturer works.

#### 4. INFRINGEMENT OF PATENT RIGHTS

Client shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of the components, used in design, development and manufacturing of these light luminaires and any other factor which may cause such dispute. The responsibility to settle any issue rises with the manufacturer.

5. MARKING:

The following information shall be distinctly and indelibly marked on the housing: Year of manufacture/ Batch Number/ Serial Number

Name of Manufacturer (Engraving only, stickers not allowed)

Rated watt and voltage Input frequency

6. METHOD OF MEASUREMENT

Supply of the fixture including transport to site, loading and unloading etc. as specified will be treated as one unit for measurement and payment.

7. TRANSPORT, DELIVERY AND STORAGE

The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the final location of fixture or site store. The fixture should be supplied with required storage arrangements suitable for placing in open storage yard. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.

8. GUARANTEE AND WARRENTY

The Bidder shall stand guarantee for the performance of entire fixtures and components for twenty four (24) months from the date of commissioning or from issuance date of completion certificate, whichever is earlier, as agreed up on and as reproduced in the purchase order within the tolerance specified or as permitted by the relevant standards for the equipment in his scope of supply. The Purchaser also reserves the right to use the rejected equipment or part thereof until the new equipment meeting the guaranteed performance is supplied by the Bidder.

9. SPARES

The bidder shall quote for minimum spares required for two years safe operation of light fixtures along with the offer separately.

## 07 – TECHNICAL SPECIFICATIONS FOR SUPPLY OF EARTHING SYSTEM

## 1.0 SCOPE OF WORK

1.1 Design, assembling, testing, painting, supply, delivery at site with all related accessories as per the specifications as specified below. Compliance with the provisions of this specification shall not relieve the Bidder of the responsibility of furnishing apparatus and accessories of proper design, electrically and mechanically suited to meet the operating requirements under the specified service conditions and be suitable for the purpose of which they are intended.

## 2.0 CODES & STANDARDS

2.1 The design, material, assembling, inspection and testing shall comply with all currently applicable statutes, regulations and safety codes in the locality where the system will be installed. The equipment shall also conform to the latest applicable standards and codes of practice as mentioned below.

### 2.2

Sr.	Item	RelevantIS/IEC
1	CodeofPracticeforEarthing	IS3043
2	InsulationCo-ordinationApplicationGuide	IS3716
3	CodeofPracticeforProtectionofBuildingsand Allied Structures against Lightning	IS2309
4	IndianElectricityRules,1956	
5	IndianElectricityAct,1910	
6	NationalElectricalCode	
7	LowVoltageElectricalInstallations-Part5-54: Selection&ErectionofElectricalequipment-Earthingarrangement&protectiveconductors.	IEC60364
8	ProtectionAgainstLightning-Part3:Protection of structures & life Hazards	IEC62305

## TECHNICAL REQUIREMENTS

4.1 The earth gird shall consist of main grounding grid conductors forming a closed ring network with required number of Rod type earthing stations connected to it to provide a common earth for electrical equipments and metallic structures. Two distinct connections shall be made from each earthing station to the main grounding/earthing mat through GI/Cu. flat.

4.2 Earthing system should offer a resistance of less than 2 ohms throughout the year. In places where Soil resistivity is more, total length of the earthing rod has to be increased by adding 1m length

rods (one over the other) to achieve low and stable resistance value. In rocky places, multiple earth rods have to be installed and inter- connected to get the required value.

Minimum length for each earthing station to be 3 meters.

4.3 The earth bus in required numbers shall be installed in various plant open areas and rooms. Each earth bus shall be provided two distinct connections by GI/Cu flats / Cu. Flexible cable from the main grounding grid conductors available nearby. The plant/building equipment, metallic structures, tanks, etc. shall be brought to earth by providing two distinct connections between earth bus installed nearby and that equipments, tank, apparatus, etc.

4.4 Solid Copper coated rods are recommended as earth electrode than a pipe due to the fact that solid rods have much longer life and can be easily driven by electric/hydraulic hammers. Copper has much longer life than all other materials as explained in IS 3043.

#### 4.5 GENERAL CONSTRUCTIONAL DETAILS

##### 4.5.1 Pipe Electrode Earth Station

1. Copper coated Solid steel Rods shall be made of high tensile low carbon steel rod, molecularly bonded with 99.9% electrolytic copper with minimum coating thickness of 250 microns as per IEC 62561 part -2: Requirement for Conductor & Earth Electrodes.
2. The length of the earth rod shall be 1 meter at least or as per manufacturer's recommendation, so that driving into the ground is easier. For dry areas, length of the rods can go up to several meters by driving the rods one over the other.
3. For all the installation minimum length of the earthing rods shall be 3 mts minimum by adding similar rods.
4. Earth rods should be of diameter 20 mm minimum. Additional rods should be added without external couplers. The earth rods should have peg & bore arrangement or similar such arrangement so that additional rods are added without external couplers.
5. Interconnecting Strips / Earthing Conductor: Copper coated steel strips / tapes should be used to interconnect different earthing rods as well as horizontal earthing (Ring earthing). These strips should have a coating thickness of minimum 70 microns.
6. The earth resistance shall be maintained with a suitable soil treatment.
7. The earth lead shall be fixed to the pipe with a nut and safety set screws. The clamp shall be permanently accessible
8. Connectors/fasteners for connecting Electrode with Earthing conductor/strip should be of Stainless Steel as it is compatible with all other materials viz Copper, GI etc. Fasteners should be made of Stainless steel
9. The depth of an earth electrode pipe shall be in approximately in accordance with the drawing as well as on nature of soil. However as per general guidelines, the pipe electrode shall have to be placed at depth where soft earth is available. This is to reduce the effect of earth resistance.

#### 10. Inspection Chamber :

Should have an inner dimension of 250 mm X 250 mm X 250 mm made of FRP material. Flush Mounted, removable cover of the earth pit should be able to withstand moderate loads.

The area inside the inspection chamber should be such that, the UNIVERSAL CLAMP/EBB/Bus bars not too deep inside the inspection chamber or projecting out of inspection chamber.

The chamber should have facility for marking earth resistance and latest testing date by paint at the cover and previous recorded values inside the cover.

If the earthing is shown in road ways subject to vehicular movement, the Inspection Chamber to be of Cast Iron Type to absorb the vehicular loads without any deformation / damage.

#### 11. Earth Enhancement material:

This is a conductive mineral compound to provide low resistance to the earth termination system. Earth enhancing compound should contain minerals which in normal use is reliable and without creating any hazards to persons and the surroundings.

The material shall be chemically inert to sub soil and shall not pollute the environment. It shall provide a stable environment in terms of physical and chemical properties and exhibit low resistivity. It shall not be corrosive to the earth electrode itself. The material should have low resistivity less than 50 Ohm meter

#### 4.4 EQUIPMENT EARTHING

All apparatus and equipment transmitting or utilizing power shall be earthed in the following manner. Copper/G.I. Earth strips/wires shall be used unless other-wise indicated.

#### 4.5 ELECTRICAL AND PERFORMANCE REQUIREMENTS

##### 4.5.1 Power Transmission Apparatus

1. Metallic conduit shall not be accepted as an earth continuity conductor. A separate insulated continuity conductor of size 100% of the phase conductor subject to the minimum shall be provided.
2. Non metallic conduit shall have an insulated earth continuity conductor of the same size for metallic conduit. All metal junction and switch boxes shall have an inside earth stud to which the earth conductor shall be connected. The earth conductor shall be distinctly coloured (Green or Green / Yellow ) for easy identification
3. Armoured cable shall be earthed by two distinct earth connections to the armouring at both the ends and the size of connection being as for the

metallic conduit.

4. In the case of unarmoured cable, an earth continuity conductor shall either be run outside along with the cable or should form a separate insulated core of the cable

5. Three phase power panel and distribution boards shall have two distinct earth connections of the size correlated to the incoming cable size. In case of single phase DB's a single earth connection is adequate

#### 5.0 DRAWINGS & INFORMATION

5.1 Drawing for Plate Type Earthing Station – Annexure-1

#### 6.0 INSPECTION AND TESTING

6.1 The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS: 3043

6.2 The following earth resistance values shall be measured with an approved earth megger and recorded.

1. Each earthing station
2. Earthing system as a whole
3. Earth continuity conductors

6.3 Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 1 ohm in each case.

6.4 Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed

6.5 All tests shall be carried out in presence of the consultant / client

#### 7.0 METHOD OF MEASUREMENT

7.1 Provision of earthing station complete with excavation, electrode, watering pipe, soil treatment, chamber with cover etc. shall be treated as one unit of measurement

7.2 The following items of work shall be measured and paid per unit length covering the cost of the earth wires / strips, clamps, labour etc.

1. Main equipment earthing grid and connection to the earthing station.

2. Connection to the switch board, power panels, DB etc

7.3 The cost of earthing the following items shall become part of the cost of the item itself and no separate payment for earthing shall be made.

1. Motors - earthing forming part of the cabling / wiring for the motors.
2. Isolating switches and starters should form part of mounting frame, switch starter etc.
3. Light fittings - form part of installation of the light fittings.
4. Conduit wiring, cabling - should form part of the wiring or cabling.
5. Street lighting - should form part of the street light poles

8.0 TRANSPORT, DELIVERY AND STORAGE

8.1 The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the final location of earthing system or site store. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.

9.0 GUARANTEE & WARRENTY

9.1 The Bidder shall stand guarantee for the performance of entire equipment and components for twelve (12) months from the date of commissioning or eighteen

(18) months from the date of dispatch, whichever is earlier, as agreed up on and as reproduced in the purchase order within the tolerance specified or as permitted by the relevant standards for the equipment in his scope of supply.

10.0 SPARES

10.1 Not applicable

11.0 MATERIALS REQUIRED

11.1 All required hardware such as bolts, nuts, washers (round and spring type), anchor fasteners, screws, etc. of sizes and type as required shall be conforming to relevant IS. All hardware shall be hot-dip galvanized or zinc passivated /cadmium plated as

per requirement of work either mechanical fabrication or electrical jointing.

11.2 All other items required for installation shall be as approved by site in-charge.

12.0 INSTALLATION OF SYSTEM

12.1 The plate/pipe electrode, as far as practicable, shall be buried below permanent moisture level but in no case less than 3 M below finished ground level



12.2 The plate/pipe electrode shall be kept clear of the building foundation and in no case, it shall be nearer by less than 2 M from outer face of the respective building wall / column

12.8 Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS: 3043, Code of Practice for Earthing Installation.

12.9 The earth conductors ( Strips / Wires, Hot dip G.I. / copper ) inside the building shall properly be clamped / supported on the wall with Galvanized Iron clamps and Hot Dip GI screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level/

12.10 The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished

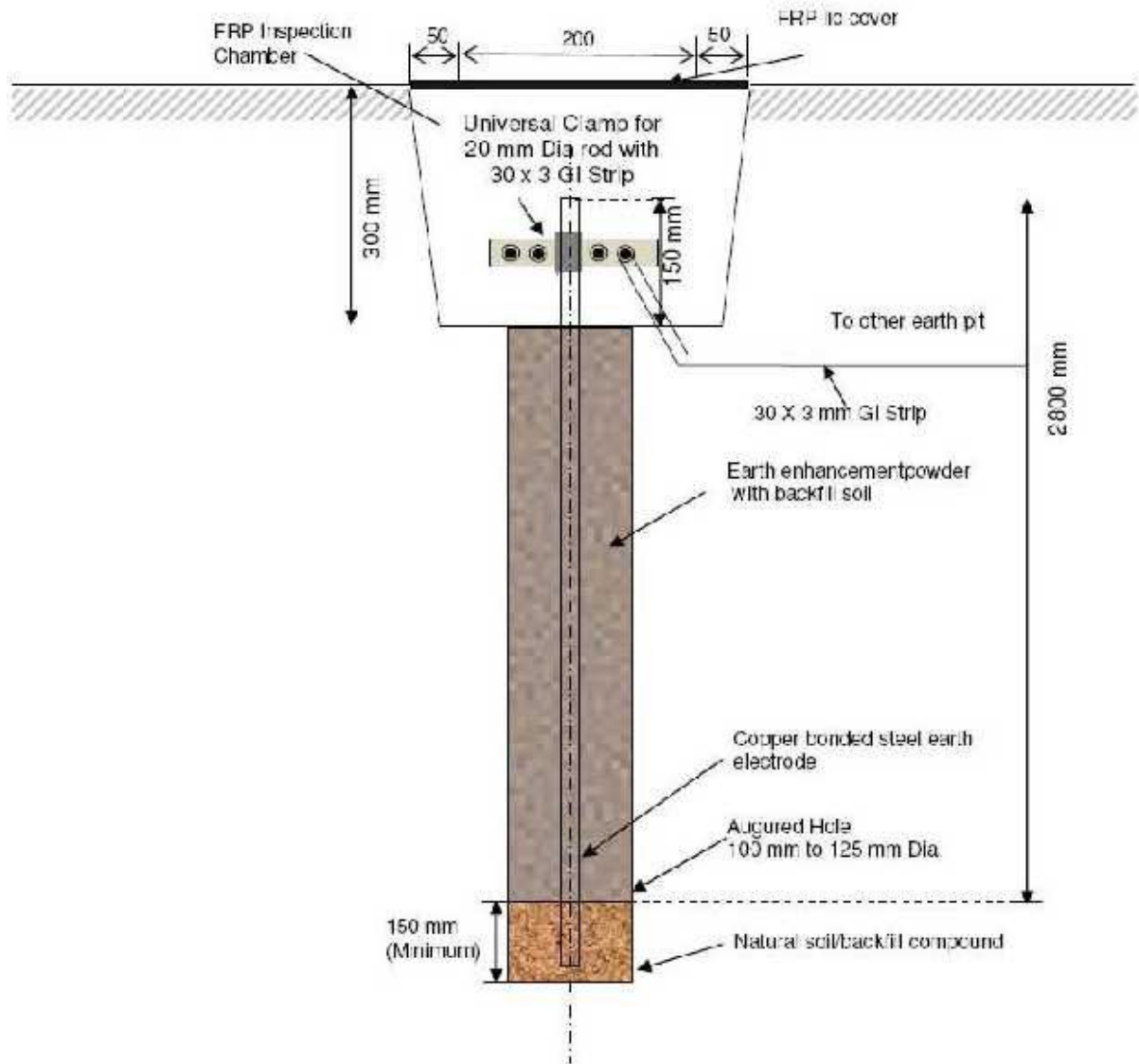
12.11 Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long and bitumen coated.

12.12 The earth conductors shall be in one length between the earthing grid and the equipment to be earthed

12.13 Minimum distance of 2 mtr shall be maintained between other electric conductor, earthing conductor and the conductor laid for the lightning protection system. Earthing and lightning protection system conductors shall be bonded to each other to prevent side flashover in case of non-availability of adequate clearance.

12.14 The earthing met conductors, risers, earthing cables, etc. passing through walls shall be covered with galvanized iron sleeves for the passage through wall. Water stop sleeves shall also be provided wherever the earthing conductor enters the building from outside.

## Earthing Auguring Method



## 08 - TECHNICAL SPECIFICATIONS FOR ELV WIRING

TECHNICAL SPECIFICATIONS FOR ELV WIRING

1.0

1.1

SCOPE OF WORK

This section relates to specification for the supply, installation, connection, testing and commissioning of the wiring for Telephone / Computer / Fire detection / Music & Signage & wiring installation including supply of telephone cables, Multiple flexible wires, Shielded Wire, CAT-5 UTP computer signal wire, Junction boxes, Outlet boxes, and other related accessories required to complete the wiring and installation.

1.2 The main hardware of the systems shall be supplied by the client

2.0 CODES & STANDARDS

2.1 The cables shall be conforming to the following standards of latest revision :

Sr.	Item	RelevantIS	RelevantIEC
1	PVCinsulated(heavyduty)electric cable.	IS:1554(PartI)	
2	Copper conductorsin insulatedcables andcords.	IS: 8130	
3	Mildsteelwires,stripsandtapes.	IS: 3975	

2.2 For Armoured Cables,

Sr.	Item	RelevantIS	RelevantIEC
1	PVCinsulatedandsheathofelectric cables	IS: 5831	
2	Recommended current rating for cables.	IS:3961( PartI)	

2.3 Cables shall also meet the requirement of Indian Electricity rules, Fire Insurance Association and Electrical Inspector.

The wire for the systems shall confirm to IS: 694, 1554, 624 and local fire department.

The CCTV & Security Access System cable shall confirm to BS : 2316 and American Military standard MIL -C - 17 / JSS - 51100 and of Radio frequency co-axial type ( RG - 11 )

3.0 DESIGN BASIS & SITE CONDITIONS

The extra low voltage system wiring installation shall be carried out in the manner as approved by the local Authority. If found necessary, the drawing for installation shall be got approved by the local sanctioning authorities before commencement of the work.

Separate conduits of 25 mm. diameter (minimum) shall be laid for extra low voltage system cables / wires.

3.3 The installation of conduits shall be carried out as per detailed specification given under section "INTERNAL WIRING".

3.4 All cables, lay on cable racks / trays shall be neatly stitched together.

3.5 Extra low voltage system wires / cable terminations both at the junction boxes and at the socket outlets shall be done as per method approved by consultants and in conformity with their rules and regulations.

3.6 The final branch connections with single / twin pair cables in conduits and the minimum number of cables in each conduit shall be as follows:

Conduitdia.inmm.      Max.No.ofcables

- 20 2Nos.singlepair  
 25 6Nos.singlepair  
 32 12Nos.singlepair  
 40 18Nos.singlepair

All the cables/wires provided shall be suitably designed for installation and satisfactory operation as specified below.

Siteconditions	
LocationGujarat	Sitealtitude81Mabovemeansealevel
Ambienttemperature	Relativehumidity
Maximum 45 <sup>0</sup> C	Maximum85%
Minimum 13 <sup>0</sup> C	Minimum25%
Design 50 <sup>0</sup> C	Design 90%at50 <sup>0</sup> C
Electricalsystemdata:	
PowersupplyforEquipment	
Voltage 12Vto90V±15%	Frequency 10Hzto300Hz±3%
Permissiblecombinedvoltage&frequencyvariation ±6%	

Permissible combined voltage & frequency variation ± 6 %

#### 4.0 TECHNICAL REQUIREMENTS

##### 4.1 SYSTEM:

##### 4.1.1 VoltageFrequency

Fire alarm, Security 12 V DC 10 Hz. -100 KHz

Music & P.A. system 30 V AC 20 Hz. - 20 KHz.

Telephone system 90 V AC 300 Hz. - 5 KHz.

4.1.2 The extra low voltage system cables will be terminated on the tag block / junction box located at each floor.

4.1.3 From this tag block / junction boxes, separate M.S. conduits shall run for individual outlet connections to each area through tag boxes / junction boxes.

4.1.4 The conduits shall run in the surface manner in the vertical shaft and shall run in surface / concealed manner at every floor between shaft and the outlet box through tag box / junction boxes located on each floor.

4.1.5 Extra low voltage system cables / multi pair telephone cables shall be pulled through the above conduits and then be connected at both ends.

##### 4.2 MATERIAL OF CONSTRUCTION

##### 4.2.1 Conduit:

M.S. conduit, conduit accessories, steel junction boxes, etc. to be used for telephone wiring system shall have material specifications as described in section under title "INTERNAL WIRING " of this tender document.

##### 4.2.2 Cables & Wires:

The type of cables and the services shall be as follows :

##### 4.3 TELEPHONE CABLE

4.3.1 Telephone multipart cable shall confirm to P & T specifications.

4.3.2 Annealed tinned bare copper conduction 0.6 mm. dia.

4.3.3 Cores twisted into pairs, pairs laid - up, fully filled and taped with suitable absorbent tape.

4.3.4 Armouring of galvanized steel wire.

4.3.5 PVC insulated, PVC inner sheathed and outer sheathed.

4.3.6 Aluminium Mylar tape with drain wire

##### 4.4 FIRE DETECTION & ALARM SYSTEM :

4.4.1 The wire for the systems shall confirm to IS: 694, 1554, 624 and local fire department.

4.4.2 Annealed tinned copper conductor 1.5 mm<sup>2</sup>

4.4.3 2 core twisted into pair

4.4.4 Shielded Al. Mylar tape.

4.4.5 PVC insulated, PVC inner sheathed and outer FRLS sheathed

4.5 C.C.T.V. & SECURITY ACCESS SYSTEM :

The system cable shall conform to BS : 2316 and American Military standard MIL -C - 17 / JSS - 51100 and of Radio frequency co-axial type ( RG - 11 )

4.5.2 Annealed tinned copper conductor.

4.5.3 Polyethylene insulated.

4.5.4 Annealed bare copper braiding.

4.5.5 PVC sheathing

4.5.6 Characteristic impedance - 75 ohm  $\pm$  3

4.6 INSTRUMENT CABLES :

4.6.1 Multi pair cables shall be used for transferring digital / analog signals from electrical meters to PLC.

4.6.2 Cable shall be capable of withstanding normal and short circuit condition of various systems to which it is connected, without damage, transportation to site, installation at site and operation.

4.6.3 Cable shall be capable of performing satisfactorily when laid in trenches, trays and directly buried in the ground.

4.6.4 All overhead wiring shall be supported in cable trays. The shield shall be grounded at one location only. All the wiring, cables, and termination points shall be suitably identified as per applicable codes and practices.

4.6.5 The vendor shall provide detailed cable scheduling mentioning the make, standard followed and other necessary details so as to satisfy the specified requirements.

4.7 SIGNAL CABLES :

4.7.1 Multi core twisted cables shall be rated for 660 / 1100 volts.

4.7.2 The cable shall be 1.0 mm.<sup>2</sup> multi stranded, PVC coated, high conductivity annealed tinned copper conductor with PVC insulation and sheathing, 100% aluminium Mylar shielding with copper drain conductor, galvanized steel armouring and overall PVC sheathing. Rip cord shall also be provided.

4.7.3 Multi core cables shall have the following additional features :

4.7.4 Pair identification by color coding / numbering.

4.7.5 Individual pair shielding and testing, apart from overall shielding and twisting. All the cables shall be of flame-retardant type .All the cables shall be terminated using Siemens type gland.

4.8 JUNCTION BOXES FOR EXTRA LOW VOLTAGE SYSTEM :

4.8.1 The junction boxes / the telephone tag blocks shall be suitable for the multi pair wires / cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks. The cross connecting jumpers shall be insulated wires of same diameter and connected in same manner.

4.8.2 The junction boxes shall be mounted inside fabricated sheet steel boxes with removable hinged covers and lockable type and shall be painted as specified in section "Painting ".

5.0 DRAWINGS & INFORMATION

Not applicable

6.0 INSPECTION AND TESTING

Performance of each equipment in coordination with other systems to prove the functional requirement.

7.0 METHOD OF MESUREMENT

7.1 The extra low voltage system cable shall include supply, laying, connection, testing and commissioning of multi pair cable / wire on ceiling / wall on cable trays / racks including all supports and shall be measured and paid on running length basis. Cable trays / racks shall be paid for separately.

7.2 The multi pair junction boxes for extra low voltage system shall consist of strip, jumpered interconnections enclosure etc. and shall be measured and paid as one unit.

7.3 The conduit wiring for extra low voltage system outlet point shall include wire / cable in M.S. conduits and shall include junction boxes, pull boxes, 2A two pair connector / socket in M.S. box, outlet plate etc. from the floor tag blocks to the outlet point.

#### 8.0 TRANSPORT, DELIVERY AND STORAGE

The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the final location or site store. The ELV Wiring cables/wires should be supplied with required storage arrangements suitable for placing in open storage space. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.

#### 9.0 GURANTEE OF PERFORMANCE

The Bidder shall stand guarantee for the performance of entire wiring for twelve (12) months from the date of commissioning or eighteen (18) months from the date of dispatch, whichever is earlier, as agreed up on and as reproduced in the purchase order within the tolerance specified or as permitted by the relevant standards for the wiring in his scope of supply.

#### 11.0 ATTACHEMENTS

- Datasheet

Sr.No.	Particular	Description
1.1	Category6UTPCable	
1.1.1	Class	Eattenuation
1.1.2	Stander	ISO/IEC 11801, CENELEC EN50173 and TIA/EIA 568B.
1.1.3	Certify	UL
1.1.4	Performanceguaranteed	6connectionsinanylengthchannelconfigurationup to 100mtr
1.1.5	Support	Category6/ClassENEXT,PSNEXT,FEXT,ELFEXT, PSELFEXT and returnloss extrapolated to 250MHz
1.1.6	Capability	Excess of 1Gbpsto theworkstationin accordance with application standard
1.1.7	Supportivestandard	IEEE802.31000BASE-T,TIA-854-A1000BASE-TX, ATMForum CB1Gplusother legacy LANsand applications aswell asVideo also.
1.1.8	Physical Specifications:	
	Weight	notmorethan11.88kg/305m
	NominalJacketThickness	notmorethan0.022in(0.559mm)
	NominalOutsideDiameter	notmorethan0.232in(5.89mm)
	OperatingTemperature	-4°Fto140°F(-20°Cto60°C)
	Gauge:	23AWG
1.2	Category6informationoutlet	

1.2.1	General	Category 6 outlets shall meet or exceed Category 6 transmission requirements for connecting hardware, as specified in TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard and ISO/IEC 11801:21002 Second Edition, CENELEC EN 50173, and TIA/EIA 568B
1.2.2	Standard	TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard and ISO/IEC 11801:2002 Second Edition, CENELEC EN 50173, and TIA/EIA 568B
1.2.3	Compatible with	Category 5E, 5 and 3 cords and cables
1.2.4	Design	Supporting to T568A & B wiring
1.2.5	Capabilities	Being in a modular patching situation or as a modular telecommunication outlet (TO) supporting current 10BASE-T, Token Ring, 100Mbps TP-PMD, 155Mbps ATM, 622Mbps ATM using parallel transmission schemes and evolving high-speed, high-bandwidth applications, including Ethernet, 1000BASE-T and 1 Gbps ATM
1.2.6	Supports	Category 6/Class E NEXT, PS NEXT, FEXT, ELFEXT, PSELFEXT and return loss extrapolated to 250MHz
1.2.7	Certified	UL & cUL
Sr. No.	Particular	Description
1.2.8	Physical Specifications	
A	Dimensions	HxWxD: 2.0 cm x 2.0 cm x 3.1 cm - Universal
B	A/B labeling	
C	Plastic Material	High-impact, flame retardant, thermoplastic
D	Flammability Rating	UL-rated 94 V-0
E	Operating Temperature	14°F to 140°F (-10°C to 60°C)
F	Storage Temperature	40°F to 158°F (-40°C to 70°C)
G	Humidity	95% (non-condensing)
H	TIE/EIA Category	6
I	TIE/EIA Category	6
1.3	Category 6 Patch Panel (24/48 port)	
1.3.1	Electrical performance guaranteed	To meet or exceed TIA/EIA 568-B.2-1 Category 6 & ISO/IEC Category 6/Class E specifications.
1.3.2	Standard	ISO/IEC 11801, CENLEC EN 50173 and TIA/EIA
1.3.3	Certified	UL
1.3.4	Capabilities	network line speeds in excess of 1 gigabit per second
1.3.5	Backward compatible	Category 5 e, 5 & 3 cords and cables
1.3.6	Panel configuration	24/48 port with A/B labeling & 110 IDC connector terminations on rear of panel.
1.3.7	Physical Specifications	
A	Plastic Material	High-impact, flame retardant, thermoplastic



B	Flammability Rating	UL-rated 94 V-0
C	Operating Temperature	14°F to 140°F (-10°C to 60°C)
D	Storage Temperature	-40°F to 158°F (-40°C to 70°C)
E	Humidity	95% (non-condensing)
F	TIA/EIA Category	6
1.4	Category 6 Patch Cord	
1.4.1	Standard	TIA/EIA & ISO/IEC Category 6/Class E specifications
1.4.2	Performance guaranteed	Meet or exceed the channel specifications of the TIA 'Category 6' up to 250 MHz
1.4.3	Supports	Complies Category 6/Class E NEXT, PSNEXT, FEXT, ELFEXT, PSELEFEXT and return loss extrapolated to 250 MHz
1.4.4	Protection	Antisnag features which provide protection from snagging during moves and re arrangements
1.4.5	Backward compatible	Category 5 and category 5E
1.4.6	Physical Specifications	
A	Contact Material	Phosphor Bronze
B	Contact Plating	Gold 50 micro-inch (1.27 microns), nickel 100 micro inch (2.54 microns)
Sr. No.	Particular	Description
C	Insertion Life	750 minimum
D	Plug Material	Polycarbonate UL-rated 94 V-O
E	Operating Temperature	14°F to 140°F (-10°C to 60°C)
F	TIA/EIA Category	6
G	UL and cUL	CM (cordage)
1.5	Face Plate for Information Outlet	
1.5.1	Contains	Slots that cover the screws to house labels and covers Two labels and covers included
1.5.2	Numbering	Both side for installation & maintenance identification
1.5.3	Provision	Blank to fill the unused outlet openings
1.5.4	Material	High impact, flame retardant, UL rated 94V-0 thermoplastic
1.6	Network Rack -12U (each per floor)	
1.6.1	Height	12U
1.6.2	Size	600 mm wide x 450mm deep
1.6.3	Cover	Top
1.6.4	Horizontal Cable Manager	2
1.6.5	Front section	Glass door & lock
1.6.6	MS door & glass door	Powder coated
1.6.7	Bottom/Upper cover	Suitable for sufficient cable opening (30-40 Cat 6 cable)
1.6.8	Fan	Single fan position with loaded fan

1.6.9	Distribution boxes	One 4 port (5 Amp x 4 socket)
1.6.10	Front & rear angles	19 ‘‘
1.7	Network Rack-42U (for server room)	
1.7.1	Height	42U
1.7.2	Size	600 mm wide x 1000 mm deep
1.7.3	Front door	Toughened glass
1.7.4	Cover	Top
1.7.5	Rear MS doors	With venting options
1.7.4	Horizontal Cable Manager	4
1.7.5	Front section	Glass door & lock
1.7.6	MS door & glass door	Powder coated
1.7.7	Bottom/Upper cover	Suitable for sufficient cable opening (00-400 Cat 6 cable)
1.7.8	Fan	4 fan position with 4 cooling fans
1.7.9	Distribution boxes	One vertical box on back side( 5/15Amp x 10 socket)
1.7.10	Front & rear angles	19’’
Sr. No.	Particular	Description
1.8	24 port Layer 2 data switch (each floor)	
1.8.1	Port	24 port 10/100 Mbps RJ45 Ethernet port
1.8.2	10/100/1000 Mbps	2 dual purpose
1.8.3	Power supply redundancy	1 serial port for control and RPS adaptor
1.8.4	Switch	Stackable
1.8.5	Capacity	Minimum 12Gbps Switching capacity 100 Gbps Stacking capacity 9 Mpps Packet Forwarding capacity 75 Mpps total stack packet forward capacity
1.8.6	Features	Protocol and Port based VLAN, 802.1X authentication, MAC based port authentication, Multilayer packet processing, 802.3ad, IGMP snooping, 4 priority queues per port, Jumbo Frame Support, One to One & One to Many port mirroring, SSH2 and SSL support
1.8.7	Foot print	1 RU
1.9	24 port Layer 2+ data switch (each floor)	
1.9.1	Port	24 port 10/100 Mbps RJ45 Ethernet port 4 combo 1000 Base SFP shared with RJ45 Ethernet port
1.9.2	Switch	Stackable switch with dedicated stacking port at back plane
1.9.3	Power supply redundancy	1 serial port for control and RPS adaptor
1.9.4	Capacity	Minimum 94 Gbps aggregate switching throughput capacity Minimum 35 Mpps Packet Forwarding capacity, 230 Mpps total stack packet forward capacity

1.9.5	Features	Protocol and Port based VLAN, 802.1X authentication, MAC based port authentication, Web based authentication, Multilayer packet processing, 802.3ad, IGMP snooping, 8 priority queues per port, Dynamic VLAN assignment, Jumbo Frame Support, One to One & One to Many port mirroring, SSH2 and SSL support
1.9.6	Upgradeable options	Suitable for layer 3 features such as static routes, RIP V2, inter VLAN routing, VRRP
1.9.7	Upgradeable options	Suitable for layer 3 features such as static routes, RIP V2, inter VLAN routing, VRRP

## 09 - Detailed Technical Specification for PVC Pipe & DWC Pipe

ITEM NO. 1 P.V.C. Pipes (RIGID) - 6 Kg.

1. Providing & Fixing P.V.C. Pipes (RIGID) - 6 Kg. ISI marked 110 MM DIA.& 90 MM DIA including fittings make or equivalent as approved by engineer-in-charge . Pipe shall be fixed on the help of clamp at every two meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent ,including cost of all materials including hydraulic testing as directed by engineer-in-charge

(A) 110 mm dia. (B) 90 mm etc. dia.

The P.V.C. pipe shall be approved quality and make of as per IS 13592 : 1992 of appropriate class for sewage, rain water and waste water and shall got approved before use by consultant

/ Engineer in charge. They shall be fixed by means of approved claims or embedded in the structure as instructed by Consultant. The rates inclusive all necessary special such as bends YS, TS, Plug, bends, off sets, shoes, cowl etc. all special fittings shall be of standard make of first class quality and shall in all respect comply with relevant ISS. Nothing extra shall be paid for cutting the pipes for required length or for collar. The overlap of pipes will not be paid. The joints of the pipe shall be filled by properly and it should be watertight.

**INSTALLATION**

**General**

(a) All pipe and accessories shall be handled in such manner as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure pipe coating, if coating or lining of any type of pipe or fitting is damaged, repair shall be made prior to installation. No other pipe or material shall be placed inside of a pipe or fitting after coating has been applied. Pipe shall be placed inside of a pipe or fitting after coating has been applied. Pipe shall be carried into immediately shall be stored in cool, dark place and out of the sun. installation procedures shall provide for safe conduct of the work, careful removal and disposition of materials, protection of property, which is to remain undisturbed, coordination with other work in progress, and protection of utility services.

(b) Joints shall not be covered until approved. Pipe, pipefitting or appurtenances found defective after installation shall be replaced. Pipe shall be laid true to line and grade to form a close concentric joint with adjoining pipe and to prevent offsets of the flow line. Sections of pipe shall be so laid and fitted together that when complete, the sewer shall have a smooth and uniform invert. As the work progresses, the interior of the sewer shall be cleaned of all dirt and superfluous materials, where cleaning after laying is difficult because of small pipe size, a suitable swab or drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed. Pipe cutting where necessary shall be done neatly, without damage to the pipe. Unless otherwise authorized, cutting shall be done by means of an approved type of mechanical cutter.

(c) Each pipe and fitting shall be carefully inspected before and after installation and those found defective shall be rejected. Proper facilities shall be provided for lowering sections of pipe into trenches. Any pipe or fitting that does not allow sufficient space for proper caulking or installation of joint material shall be closed temporarily with wood blocks.

(d) For rain water / waste water pipes shall be covered through masonry wall of brick partition and 20 mm thick sand faced cement plaster.

**Tests**

(a) Tests of completed piping systems shall be conducted in strict accordance with testing procedures and requirements of ASTM C8282 or AWWA C600 as applicable.

(b) Do not backfill piping (more than minimum required to hold in place for testing) prior to receipt of acceptance from Owner's Representative for results of tests.

(c) Conduct repair and retests when required to UN accepted test results at no cost to Owner.

**MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B**

**Description**

Mode of Payment: The rate shall be for a Unit of One Mtr.

**ITEM NO 2. DOUBLE WALL CORRUGATED PIPE**

Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at

required depth for laying of cable. below ground / road surface for enclosing cable and back filling the same to make ground as per original.

#### FOREWORD

This specification is issued under the fixed serial number followed by the year of adoption as standard or in case of revision, the year of latest revision.

This specification requires reference to the following specifications.

- (i) IS:14930 Pt.-I : General requirements of Conduit system for Electrical and Communication installation
- (ii) IS:14930 Pt.-II : Particular requirements of Conduit system for Electrical and Communication installation
- (iii) IS:2530: Method for test for Polyethylene moulding materials and polyethylene compounds.
- (iv) IS:7328: HDPE materials for moulding and extrusion
- (v) IS:12063 : Classification of degrees of protection provided by enclosures of electrical equipment
- (vi) IS:11000(Pt2/Sec1) : Glow-Wire Test and Guidance, Test Methods for Fire Hazard Testing
- (vii) ASTM D 1693 : Test method for environmental stress – cracking of ethylene plastics
- (viii) ASTM D 638 : Standard test method for tensile properties of plastic
- (ix) ASTM D 790 : Test method for flexural properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- (x) ASTM D 2240 : Standard Test method for Rubber property.
  
- (xi) ASTM D 648 : Standard Test method for deflection temperature of plastic under flexure load in the Edgewise Position.

Whenever reference to any specification appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.

#### 1.0 SCOPE

This document specifies the requirement and testing for Double Walled Corrugated (DWC) HDPE Ducts buried underground including ducts & duct fittings for protection wherever required for all types Cables.

#### 2.0 TERMINOLOGY

Terminology as defined in IS: 14930 shall be followed.

#### 3.0 ABBREVIATIONS

- ASTM : American Society for Testing & Materials.
- CC : Cubic Centimeter.
- DSC : Differential Scanning Calorimeter
- DTA : Differential Thermal Analyzer
- DWC : Double Walled Corrugated
- ESCR : Environmental Stress Crack Resistance
- FTIR : Fourier Transform Infrared Spectroscopy
- g : Gram • HDPE : High Density Polyethylene.
- Hr : Hour
- IS : Indian Standard.
- Kg : Kilograms
- MFI : Melt Flow Index.
- mm : Millimeter
- OIT : Oxidation Induction Test
- SPN : Specification Provisional Number.

- UV : Ultra Violet.

#### 4.0 GENERAL REQUIRMENTS

4.1 The DWC Duct shall consist of two layers, the outer layer will be corrugated and the inner layer shall be plain and smooth.

4.2 DWC Duct and conduit fittings within the scope of this specification shall be so designed and constructed that in normal use their performance is reliable and without danger to the user or surroundings.

4.3 When assembled in accordance with manufacturer's instruction as part of a conduit system, they shall provide mechanical protection to Cables contained therein.

4.4 Within the conduit system there shall be no sharp edge, burrs or surface projections which are likely to damage insulated conductors or cables or inflict impurity to the installer or user.

4.5 The protective properties of the joint between conduit and conduit fittings shall be not less than that declared for the conduit system.

4.6 The DWC Duct and fittings shall withstand the stresses likely to occur during transport, storage, recommended installation practice and application.

4.7 The DWC duct shall be supplied in continuous length in coil form or straight length, suitable for shipping and handling purpose.

4.8 For conduit systems that are assembled by means other than threads, the manufacturer shall indicate whether the system can be disassembled and if, so, how this can be achieved.

#### 5.0 REQUIREMENTS OF RAW MATERIALS USED FOR THE DWC HDPE DUCTS

5.1 The base HDPE resin used for the outer and inner layer of the DWC HDPE Duct shall conform to any designation of IS:7328 or to any equivalent standard meeting the requirements given in Table No. 1, when tested as per the standards given therein. However, the manufacturers shall furnish the designation for the HDPE resin as per IS: 7328 as applicable.

5.2 The anti-oxidants used shall be physiologically harmless.

5.3 None of the additives shall be used separately or together in quantities as to impair long term physical and chemical properties of the duct.

5.4 Single pass rework material of the same composition produced from the manufacturer's own production may be used and it shall not exceed 10% in any case.

5.5 The raw material used for extrusion shall be dried to bring the moisture content to less than 0.1%. 5.6 Suitable UV stabilizers shall be used only for manufacture of the non black coloured HDPE duct to protect against UV degradation, when stored in open. The purchaser may ask for UV content test. The test result for UV Content test by FTIR method from any recognized laboratory shall be accepted and the Hindered Amine Light Stabiliser shall be minimum 0.15 %. UV Content test need not to be conducted in case of UV Stabilized raw material is used.

#### 6.0 REQUIREMENT OF DWC HDPE DUCTS

6.1 Visual Requirement: The ducts shall be checked visually for ensuring good workmanship that the ducts shall be free from holes, breaks and other defects. The ends shall be cleanly cut and shall be square with axis of the ducts.

6.2 Colour: The colour of the duct viz. Black, Red, Green, Blue, Orange, Violet, Grey, Brown and Yellow. The purchaser shall specify the colour of the duct at the time of ordering.

6.3 Dimensions: The dimensions of the DWC HDPE Ducts shall be as given in table- 2. Any other sizes other than those mentioned in Table- 2 shall be as per the agreement between the buyer and the seller. Compliance shall be checked as per procedure given in Annexure- A

6.4 Standards Length: Duct up to 50 mm OD nominal size shall be supplied in standard length of 100 mtr.  $\pm$  1% or 6 mtr  $\pm$  1 % and all other sizes will be supplied in standard length of 6 mtr.  $\pm$  1%

6.5 Compression Strength: The conduit system shall have adequate mechanical strength. Conduits when bent or compressed either during, or after, installation according to manufacturer's instructions, shall not crack and shall not be deformed to such an extent that introduction of the insulated conductors or cables becomes difficult or that the installed insulated conductors, or cables are likely to be damaged while being drawn in. Compliance may be checked with the application of force which

shall be at least 450 N, when reaching the deflection of 5%. Test shall be conducted in accordance to the method given in Annexure- B

6.6 Impact Strength: The conduit system shall have adequate mechanical strength. Conduits when exposed to impact either during, or after, installation according to manufacturer's instructions, shall not crack and shall not be deformed to such an extent that introduction of the insulated conductors or cables becomes difficult or that the installed insulated conductors, or cables are likely to be damaged while being drawn in. Compliance may be checked by ensuring there shall be no crack allowing the ingress of light or water between the inside and outside after the test. Test shall be conducted in accordance to the method given in Annexure- C

6.7 Bending Strength: The conduit system shall have adequate mechanical strength. Conduits when bend either during, or after, installation according to manufacturer's instructions, shall not crack and shall not be deformed to such an extent that introduction of the insulated conductors or cables becomes difficult or that the installed insulated conductors, or cables are likely to be damaged while being drawn in. During the test sample shall not flatten Compliance shall be checked by passing a ball having a diameter equal to 95% minimum inner diameter of the sample declared by the manufacturer, through the sample whilst it is bent around the test apparatus. Test shall be conducted in accordance to the method given in Annexure- D

6.8 Oxidation Induction Test (OIT): The OIT in a qualitative assessment of the level (or degree) of stabilization of material. The induction time in oxygen when tested with an Aluminum pan as per method given in Annexure- E shall not be less than 30 minutes.

6.9 Resistance To Flame Propagation: Non flame propagating ducts shall have adequate resistance to flame propagation. Samples of DWC HDPE Ducts shall be checked by applying a 1KW flame. Test shall be conducted in accordance to the method given in Annexure- F Combustion shall stop within 30 Seconds.

6.10 Carbon Black Content: In case of black coloured duct Carbon Black Content by weight should be between 2 % and 3 %. Test shall be conducted in accordance to the IS: 2530

6.11 Anti Rodent Properties: Safety of ducts from the direct attack of subterranean organism anti rodent material is of utmost importance. These ducts shall be evaluated for their safety against rodents before laying them in the fields. Test shall be conducted in accordance to the method given in Annexure- G

6.12 Resistance to External Influences on DWC HDPE Duct Accessories: The accessories in Clause 7.0 shall be tested for external influences as per IS-12063 for ingress of dust & ingress of water. DWC Duct systems when assembled in accordance with the manufacturer's instructions shall have adequate resistance to external influences according to the classification declared by the manufacturer with a requirement of IP 67. Test shall be conducted in accordance to the method given in Annexure- H

6.13 Marking Identification: The conduit shall be prominently marked at regular intervals along their length of preferably 1m but not longer than 3m using indelible ink with following.

- Manufacturers name
- Specification No.
- Name of the duct with size
- Lot No. of the Product
- Date of manufacture
- Product Length
- Purchaser's Name/ symbol

#### 7.0 DWC DUCT ACCESSORIES

7.1 The following accessories are required for jointing the ducts and shall be supplied along with the ducts against specific orders. The manufacturers shall provide complete procedure and method for installation of the accessories. The required quantities of accessories are to be mentioned by the purchasing authority in the purchase order.



7.1.1 Plastic Coupler: The coupler shall be of Push-fit type with O-ring. It is used for jointing two or more ducts. The design of this shall be simple, easy to install and shall provide air tight and water tight joint between the two ducts. The coupler shall insure that the two ducts are butted smoothly without any step formation in the inner surface. The coupler may be straight, bands, T-joints type as per requirements of purchaser.

7.1.2 End Cap: This cap made of suitable plastic material shall be fitted on the both ends of duct, coil after manufacturing the duct. This shall avoid entry of dust, mud and rainwater into the duct during the transit & storage.

7.2 The dimensions of accessories shall be suitable for joining the ducts of dimension as per Cl: 6.3

#### 8.0 PACKING REQUIREMENT

Stores shall be supplied in standard size for delivery and shall be so packed as to permit convenient handling and to protect against loss or damage during transit and storage.

#### 9.0 TYPE TESTS

9.1 Complete DWC Duct systems for each offered size of the duct on fresh samples shall be subjected to following tests minimum after 240 hrs of manufacture.

- a) Visual Requirement (Cl. No. 6.1)
  - b) Color (Cl. No. 6.2)
  
  - c) Dimension (Cl. No. 6.3)
  - d) Standards length (Cl. No. 6.4)
  - e) Compression Strength (Cl. No. 6.5)
  - f) Impact Strength (Cl. No. 6.6)
  - g) Bending Strength (Cl. No. 6.7)
  - h) Oxidation Induction Test (Cl. No. 6.8)
  - i) Resistance to Flame Propagation (Cl. No. 6.9)
  - j) Carbon Black Content (Cl. No. 6.10)
  - k) Anti rodent (Cl. No. 6.11)
  - l) Resistance to External Influences on DWC HDPE Duct (Cl. No. 6.12) accessories
- 9.2 The Oxidation Induction Test, Resistance to Flame Propagating Test, Carbon Black Content Test, Anti Rodent Test on the DWC duct and Resistance to External Influences on DWC HDPE Duct accessories given in Cl. No. 6.8, 6.9, 6.10, 6.11 & 6.12 respectively may be conducted at the manufacturer's laboratory by inspecting authority or at any recognized laboratory.

9.3 The raw material tests of the DWC duct given in Cl. No. 5.0 Table-1 for each grade of raw material shall be conducted. Test may be conducted at the manufacturer's laboratory by inspecting authority or at any recognized laboratory.

9.4 Unless otherwise specified each tests shall be made on three new samples.

#### 10.0 ACCEPTANCE TESTS

10.1 The following test shall be carried after 240 hrs of manufacture on samples selected from the lot as per sampling plan given in Cl 13.0

- a) Visual Requirement (Cl. No. 6.1)
- b) Color (Cl. No. 6.2)
- c) Dimension (Cl. No. 6.3)
- d) Standards length (Cl. No. 6.4)
- e) Compression test (Cl. No. 6.5)
- f) Impact test (Cl. No. 6.6)
- g) Bending test (Cl. No. 6.7)
- h) Resistance to Flame Propagation (Cl. No. 6.9)

10.2 The Resistance to Flame Propagating Test on DWC HDPE Duct given in Cl. No. 6.9 may be conducted at the manufacturer's laboratory by inspecting authority or at any recognized laboratory.

10.3 Unless otherwise specified each tests shall be made on three new samples.

#### 11.0 ROUTINE TESTS

11.1 The following tests be carried out by the manufacturer after 240 hrs of manufacture:-

- a) Visual Requirement (Cl. No. 6.1)
- b) Color (Cl. No. 6.2)
- c) Dimension (Cl. No. 6.3)
- d) Standards length (Cl. No. 6.4)
- e) Compression test (Cl. No. 6.5)
- f) Impact test (Cl. No. 6.6)
- g) Bending test (Cl. No. 6.7)
- h) Resistance to Flame Propagation (Cl. No. 6.9)

11.2 The Resistance to Flame Propagating Test on DWC HDPE Duct given in Cl. No. 6.9 may be conducted at the manufacturer's laboratory by inspecting authority or at any recognized laboratory.

11.3 The Density and Melt Flow Index tests on raw material of the DWC duct given in Cl. No. 5.0 Table-1 for each grade of raw material shall be conducted.

#### 12.0 INSPECTION

12.1 All the gauges/ test & measuring instruments shall be under calibration control at the time of inspection and proof to this office shall be produced.

12.2 Inspection and testing shall be carried out by the inspecting authority nominated by the purchaser to ensure that all the requirements of this specification are complied with for the acceptance of the materials offered by the supplier for inspection.

12.3 The purchaser or his nominee shall have free access to the works of the manufacturer and to be present at all reasonable times and shall be given facilities by the manufacturer to inspect the manufacturing of the duct at any stage of manufacture. He shall have the right to reject whole or part of any work or material that does not conform to the terms of this specification or any equivalent specification or requirement applicable and may order the same to be removed / replaced or altered at the expense of the manufacturer. All reasonable/complete facilities considered necessary by the inspecting authorities for the inspection of the ducts shall be supplied by the manufacturer free of cost.

12.4 The manufacturer shall supply the duct samples and samples of the raw materials free of charge as required by the inspecting authority and shall at his own cost prepare and furnish the necessary test pieces and appliances for such testing as may be carried out at his own premises in accordance with this specification. Failing the existence of facilities at his own premises for the prescribed tests, the manufacturer shall bear the cost of carrying out the tests in an approved laboratory, workshop or test house.

#### 13.0 SAMPLING

13.1 All the length of same nominal size, similar construction and class manufactured from the same material under essentially similar conditions of production shall be grouped together to constitute a lot.

13.2 For judging the conformity of a lot to the requirements of the acceptance tests, sampling shall be done for each lot separately. For this purpose, the number of lengths to be selected at random from the lot shall be in accordance with Table 3.

13.3 These lengths will be selected at random from the lot for taking samples. From each of these lengths, sample of duct shall be taken. The length of the sample shall be sufficient so as to provide test pieces of required lengths as laid down in various test clauses.

#### 14.0 WARRANTY

The manufacturer shall warrant the material covered by this specification to be free from defects in design, material and workmanship under ordinary use and service, his obligation under this warranty being limited to replace free of cost those parts which shall be found defective.

#### 15.0 REJECTION

In case the duct tested and inspected in accordance with this specification, fail to pass the tests or comply with the requirement of the specification, the whole consignment shall be rejected subject to the discretion of the purchaser or his nominee.

#### 16.0 INFORMATION TO BE SUPPLIED BY THE PURCHASER

16.1 Normally the duct will be supplied as per the standard dimensions and length as mentioned in this document. However purchaser may specify his own dimensions/lengths/packing requirements etc. In such cases necessary tolerance shall also be specified by the purchaser.

16.2 Adequate quantity & type of duct accessories shall be supplied along with each lot.

Purchasers may specify additional requirement.

16.3 Inspecting agency for acceptance of material. 16.4 Colour of the Duct.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Mtr.

ANNEXURE – A

DIMENSION OF THE DWC DUCT

1.0 Compliance of the outside diameter shall be checked using a ring gauge or vernier caliper or any suitable method.

1.1 Compliance of the minimum inside diameter shall be checked by measurement according to two perpendicular diameters on the same section and calculating the average value.

1.2 Outside diameter specified are nominal dimensions.

1.3 Outside diameter maximum is nominal outside diameter + (0.018 x nominal outside diameter values) rounded off to + 0.1 mm.

1.4 For sizes other than specified in table-2 minimum inside diameter is nominal outside diameter divided by 1.33

ANNEXURE - B

COMPRESSION TEST

1.0 Conduits are subjected to a compression test as per IS: 14930 (Pt-II). The tests for conduits shall not be started until 240 hrs after manufacture.

1.1 Samples shall be  $200 \pm 5$  mm long.

1.2 Before the test the outside and inside diameters of the samples shall be measure as described in clause 6.3

1.3 The samples shall be compressed between two flat steel plates having minimum dimensions (100x200x15mm), the length 200 mm being along the length of the sample. The sample shall be compressed at a rate of  $15 \pm 0.5$  mm/min and the load recorded at the vertical deflection equivalent to 5% of the average value of the original inside diameter of the sample.

1.4 When reaching the deflection of 5%, the applied force shall be at least 450 N

1.5 After the test there shall be no crack allowing the ingress of light or water between the inside and the outside.

1.6 The deflection is calculated with the inner diameter but the measurement of the outside diameter may be sufficient. In case of doubt, it will be necessary to measure the inner diameter.

ANNEXURE – C

IMPACT TEST

1.0 Twelve samples of the duct each  $200 \pm 5$  mm in length or fittings are subjected to an impact test as per IS: 14930 (Pt-II).

1.1 The test apparatus shall be placed on a firm flat surface. The samples shall be conditioned in a cold chamber at a temperature of  $-5 \pm 1^\circ\text{C}$  for 2 h. The samples shall be removed from the cold chamber and placed on the v-block holder of the impact tester.

1.2 The striker shall fall once on each sample. The time between removal of the sample from the cold chamber and completion of impact shall not exceed 10 seconds. The impact height and mass shall be as follows.

Nominal Size of Conduit	Mass of Striker (+1%/-0%) kg	Fall Height (+0%/-1%)(mm)	Energy Joules
Up to 60 mm	5	300	15

61 to 90 mm	5	400	20
91 to 140 mm	5	570	28
Above 140 mm	5	800	40

1.3 The test sample shall be made on the weakest part of the Duct fittings except that it shall not be applied within 5 mm of any sample entry. Samples of ducts are tested on the center of their length.

1.4 After the test, at least in nine of the samples, there shall be no crack allowing the ingress of light or water between the inside and the outside.

#### ANNEXURE – D

##### BENDING TEST

1.0 This test shall be carried out on pliable conduits.

2.0 The test is made on six samples having an appropriate length as per IS: 14930 (Pt-II). Three samples shall be tested at room temperature; the other three shall be tested at  $-5 \pm 1^\circ\text{C}$ . For the test at  $-5^\circ\text{C}$ , the sample shall be conditioned in a cold chamber for 2 hours. The test apparatus as shown in Figure-2 shall allow to bend the duct with a bending radius equal to the minimum bending radius values specified by the manufacturer. One of the ends of the samples shall be fixed on the test apparatus by means of an appropriate device. The sample is then bent to approximately 90 degree (right angle) and hold.

2.1 During the test, the sample shall not flatten. Compliance shall be checked by passing a ball having a diameter equal to 95% minimum inner diameter of the sample declared by the manufacturer, through the sample whilst it is bent around the test apparatus.

#### ANNEXURE – E

##### OXIDATION INDUCTION TEST PROCEDURE

1.0 A short length of completed duct (approximately 30 cm) shall be sealed at the ends and placed in an oven at temperature of  $68 \pm 1^\circ\text{C}$  for 8 hours. The sample shall then be allowed to cool at room temperature for at least 16 hrs. The samples shall be clean and dry. The sample shall then be tested by means of a Differential Scanning Calorimeter (DSC) or by Differential Thermal Analyzer (DTA).

2.0 Instrument Test Procedure:

2.1 Cell Cleaning: The cell shall be held at approximately  $400^\circ\text{C}$  for 10 minutes in Nitrogen. The cell shall be cleaned after standing over night and between testing of different formulations.

2.2 Temperature Calibration: This has to be done according to the instrument manual. The temperature scale should be adjusted until the determined melting point of pure Indium metal is  $156.6^\circ\text{C}$  at a heat rate of  $5^\circ\text{C}$  per minute or any other heat rate as indicated in the manual of the equipment is permitted.

2.3 Aluminum Pan Preparation: Standard aluminum DSC pans as per ASTM D 4565 are required to hold specimens during testing. A fresh pan shall be used for each test.

2.4 Sample preparation: Take the sample weighing about 5 mg from the duct conditioned as indicated above. Position the sample in the center of the pan.

2.5 Nitrogen Purge: Place the sample pan and reference pan in instrument cell. Flush for 5 minutes with cylinder of nitrogen (99.6% extra dry grade) at  $60 \pm 10$  cc per minute.

2.6 Oxidation Test: Rapidly increase the temperature of the sample ( $20^\circ\text{C}/\text{min}$  or greater) from  $100^\circ\text{C}$  or lower initial temperature to  $199 \pm 1^\circ\text{C}$ . After thermal equilibrium is obtained (steady recorder signal) switch to  $80 \pm 20$  cc per minute oxygen flow and simultaneously start time-base recording. The oxygen used for the test should be equivalent to or better than 99.6% extra dry grade.

2.7 Induction Period: The oxygen induction point shall be recorded as time zero, and the chart speed shall be sufficient to provide a clearly discernible slope at the start of the exothermic reaction. The test in the pure dry oxygen atmosphere shall continue until the exothermic peak is produced. The intersection of the tangent of the exothermic sloped line with the extended base line will be drawn. The time from time zero to is intersection point is read from the base line and recorded as the oxidative induction time.

#### ANNEXURE – F

##### RESISTANCE TO FLAME PROPAGATION TEST PROCEDURE

1.0 Samples of DWC HDPE Ducts shall be checked by applying a 1KW flame.

1.1 A sample of length  $675 + 10$  mm is mounted vertically in a rectangular metal enclosure with one open face, as shown in Figure-3-2 in an area substantially free from draughts. The general arrangements is shown in Figure-3 Mounting is by means of two metal clamps approximately 25mm wide spaced  $550 + 10$  mm apart and approximately equidistance from the ends of the sample. A steel rod of  $16 + 0.1$ mm is passed through the sample. It is rigidly and independently mounted and clamped at upper end to maintain the sample in a straight and vertical position. The means of mounting is such as not to obstruct drops from falling onto the tissue paper. A suitable piece of white pinewood board, approximately 10 mm thick, covered with single layer of white tissue paper is positioned on the lower surface of the enclosure. The assembly of sample, rod and clamping apparatus is mounted vertically in the center of the enclosure, the upper extremity of the lower clamp being  $500 + 10$  mm above the internal lower surface of the enclosure.

1.2 The burner is supported so that its axis is  $45 + 20$  to the vertical. The flame is applied to the sample so that the distance from the top of the burner tube to the sample measured along the axis of the flame is  $100 + 10$  mm and the axis of the flame intersects with the surface of the samples at a point  $100 + 5$  mm from the upper extremity of the lower clamp, and so that the axis of the flame intersects with the axis of the sample.

1.3 The test is carried out on three samples. The flame is applied to the sample for the period specified in Table -4 and is then removed. During the application of the flame, it shall not be moved except to remove it at the conclusion of the period of the test. After the conclusion of the test and after any burning of the sample has ceased, the surface of the sample is wiped clean by rubbing with a piece of cloth soaked with water.

1.4 All three samples shall pass the test. If the sample is not ignited by the flame, it shall be deemed to have passed the test.

If the sample burns, or is consumed without burning, the sample shall be deemed to have passed the test if after burning has ceased, and after the sample has been wiped in accordance with , there is no evidence of burning or charring within 50 mm of the lower extremity of the upper and also within 50 mm of the upper extremity of the lower clamp.

If the sample burns, it shall be deemed to have failed the test if combustion is still in progress 30 seconds after removal of the flame.

If the tissue paper ignites, the sample shall be deemed to have failed the test. For the parts of the same below the burner, the presence of molten material on the internal or external surfaces shall not entail failure if the sample itself is not burned or charred.

2.0 Compliance of DWC HDPE Duct fittings is checked by using the glow wire test IS:11000 (Part 2/Sec 1). The glow wire shall be applied once to each sample in the most unfavorable position of its intended use, with the surface tested in vertical position, at a temperature of  $750^{\circ}\text{C}$ . The sample is deemed to have passed this test if there is no visible flame or sustained glowing or if flames or glowing extinguishes within 30s of the removal of the glow wire.

#### ANNEXURE – G

##### ANTI RODENT TEST PROCEDURE:

The test against rodent may be conducted as per following procedures:

The ducts are to be laid underground in fields and also near urban or rural settlements.

Therefore they should be exposed to 3-4 most predominant rodent species inhabiting these locations.

The test rodent species may include the lesser bandicoot rat, *Bandicota bengalensis*, The Indian gerbils, *tatera indica*, the soft furred field rats, *Millardia meltada* and the house rats, *Rattus rattus*.

The test ducts should be exposed to these rodent species housed individually in iron mesh cages under laboratory conditions. Only freshly capture rodent are to be utilized for the study. The rodents are first acclimatized in laboratory cages for 7-10 days and then the tests be initiated. For each trial, 3-4 rodents of uniform body weight are to be used for the trial.

Two different types of testes may be undertaken for all the ducts.

Choice Tests: In this trial the ducts of 15-30 cm length (one sample each of treated and untreated /control sample) are exposed to the test rodents along with food, thus the rodent had a choice between

the food and the test duct. This test may be run for longer periods (30-45 days). Tap water should be provided ad libitum to the rodents.

NO Choice Test: The rodents are exposed to the test ducts only and no food is given to the rodents during the period of trial. The test ducts (one sample each of treated and untreated /control sample) are to be exposed to the test rodents. This trail may be run for 5-7 days depending upon the health status of starved test rodents. Tap water should be provided ad libitum to the rodents. Observation on tooth marks, rodent behavior toward exposed ducts, relative extent of damage in treated and untreated samples should be computed for both types of ducts. Health status of test animals in choice and no choice test must also be monitored for the record any ill effect of exposure of treated / control ducts on these animals. Number of cases and the extent of rodent bites / scratch marks in control and anti rodent treated ducts may indicate the relative deterrent/repellent properties of the test ducts.

## ANNEXURE – H

### EXTERNAL INFLUENCES TEST PROCEDURE

1.0 The accessories in Clause 7.0 shall be tested for external influences as per IS-12063 for ingress of dust & ingress of water. DWC Pipes systems when assembled in accordance with the manufacturer's instructions shall have adequate resistance to external influences according to the classification declared by the manufacturer with a requirement of IP 67.

2.0 Degree of Protection – Ingress of Foreign Solid Objects.

2.1 An assembly is made of DWC Pipes fittings with a short length of DWC Pipes assembled in each entry. Where necessary, the open ends of the assembly are plugged or are not part of the test.

2.2 The assembly shall be tested in accordance with the appropriate test of IS 12063. 2.3 The assembly tested for numeral 6, shall be deemed to have passed the test if there is no ingress of dust visible to normal or corrected vision without magnification.

3.0 Degree of Protection – Ingress of Water.

3.1 An assembly is made of a DWC Pipe fittings with a short length of DWC Pipes assembled in each conduit entry. Where necessary, the open end of the DWC Pipe is plugged, or is not part of the test.

3.2 The assembly shall be tested in accordance with the appropriate test of IS 12063.

3.3 The assembly tested for numeral 7 shall be deemed to have passed the test, if there is not sufficient ingress of water to form a drop visible to normal or corrected vision without magnification.

Table-1

### RAW MATERIAL REQUIREMENT (Cl. 5.0)

S.No.	Parameter	Specified Limit	Test Method
1.	Density	0.940 to 0.958 g/cc at 27°C	IS:2530 or IS:73282.
2.	Melt Flow Index	0.2 to 1.1 g/10min at 190°C, 5kg load	IS:2530
3.	Tensile Strength at Yield	20 N/mm <sup>2</sup> Minimum	ASTM D638-IV
4.	Elongation at Break	600 % Minimum	ASTM D638-IV
5.	Hardness Shore D	Between 60 and 65 units	ASTM D 2240
6.	Environmental Stress Crack Resistance	No cracking after 96 hrs.	ASTM D 1693
7.	Flexural modulus at 1% strain	690 N/mm <sup>2</sup> minimum	ASTM D 790
8.	Heat Deflection Temperature at 45 g/mm <sup>2</sup>	650°C minimum	ASTM D 648
9.	OIT (in Aluminum Pan)	30 minutes minimum	As per Annexure-E

Table-2 DIMENSIONS (Cl. 6.3)

Sr. No	DWCPPIPEELECTRIESSIZESINMM			
	DuctSize	Nominal OD	Nominal ID	Nominal DeliveryLength (Mtrs)
1	40/32	40	32	100
2	50/39	50	39	100
3	63/50	63	50	100
4	78/63	78	63	6
5	90/76	90	76	6
6	110/96	110	96	6
7	120/103.5	120	103.5	6
8	160/136	160	136	6
9	180/152	180	152	6
10	200/175	200	175	6
11	250/217	250	217	6
12	300/260	300	260	6
13	315/275	315	275	6

Table-3  
SCALE OF SAMPLING  
(Clause-13.0)

LotSize	Fordimensionalrequirements		OtherAcceptancetests
	Samplesize	PermissibleNumberofDefectivesof Defectives	
(1)	(2)	(3)	(4)
Upto 300	13	0	2
301 to 500	20	0	3
501 to 1000	32	1	4
1001 to 3000	50	2	5
3001andabove	80	3	7

Table-4  
TIME OF EXPOSURE OF THE SAMPLE TO THE FLAME  
(Clause-6.9)

Volume- I, (Part-2), Item wise Specifications

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Material	Thickness(mm)	FlameApplication (Tolerances+1 sec.)
Over	Upto	
(1)	(2)	(3)
-	0.5	15
0.5	1.0	20
1.0	1.5	25
1.5	2.0	35
2.0	2.5	45
2.5	3.0	55
3.0	3.5	65
3.5	4.0	75
4.0	4.5	85
4.5	5.0	130
5.0	5.5	200
5.5	6.0	300
6.0	6.5	500

Application: Telecom, Electrical Industry



**10 – TECHNICAL SPECIFICATIONS FOR  
HORIZONTAL OPENWELL  
SUBMERSIBLE PUMP SET COMPLETE  
WITH ACCESSORIES**

S.No	PARAMETER	Details
1.	Natureof liquidtobehandled	rawwater
2.	Densityofliquidtobehandled	1.00Kg/Cm <sup>3</sup>
3.	PHvalueof theliquid	6(min)
4.	Maximumsizeofsolidsallowed	5mm
5.	Ambienttemperature	50DegreeC.max.
6.	Relativehumidity	Upto100%
7.	Working hoursperday	8hours
8.	Pump shallbeabletowithintheheadof	-25%to+15% ofratedhead
9.	Dischargeoutletsize	50mm
10.	Servicelifeof bearings shallbe	25,000hours(minimum)

The SITC (Supply, Installation, Testing & Commissioning) of proposed pump sets shall be high discharge completely submersible type water pump of horizontal version and shall be mounted in Under Water Tank. These pump sets shall deal the raw water.

**I. SCOPE OF SUPPLY:**

1) Pump & Motor set

(Pump & Motor set shall be mounted in Under Water Tank and secured with proper clamping arrangement for handling purpose)

2) DOL or Star Delta Starter suitable to the pump set

3) 50 to 40 mm dia. delivery hose of approximately 40 metres length

4) Suitably rated, PVC insulated Flexible cooper cables for Power & control applications - Keep the length of the pump set cable such that there is no joint allowed in Under Water Tank.

**II. TECHNICAL DETAILS OF PUMP & MOTOR:**

11.	Motor Type	3 Phase totally enclosed typesquirrelcageinductionMotor
12.	SupplyVoltage	415V, +15%/-10%,3Ph.,50Hz.
13.	Degreeof Protection	IP-68
14.	Duty	S-1(continuous)
15.	Classof Insulation	'B'Class
16.	Thermisters	-
17.	MoistureSensor	-
18.	Dryrunprotection	Shallbeprovided

III. RATING OF SUBMERSIBLE PUMP SETS REQUIRED:

S.No.	Headin metres	Dischargein LPM
1	18	276LPM
2	30	210LPM
3	36	120LPM

MATERIAL OF CONSTRUCTION

Impeller : Cast Iron Motor Body : Cast Iron

Delivery Casing : Cast Iron Shaft : Stainless Steel

APPLICATIONS

Industrial service water supply schemes. Domestic and community water supply. Construction Site. Irrigation in horticulture & agriculture. Water supplies for high rise building.

Note: \* Marked pumps are ISI certified and \*\* Marked pumps are star rated. Performance applicable to liquid of specific gravity 1 and Viscosity as of water.

FEATURES

Wide Voltage Design

The motor is designed to withstand wide voltage fluctuations from 200 to 400 volts and reduces motor burning in low voltage.

Flatter Efficiency Curve

Minimum variations in efficiency during entire operating range increases the utility of pump set for variable conditions.

Dynamically balanced rotating parts

Minimum vibrations protect components from damages during the operations, consistent performance as concentricity is maintained

Replaceable Wearing Parts

All wearing parts within the pumps are easily accessible and replaceable which provides ease of maintenance thereby extending the life of the pump.

Easy maintainable designs

Easy maintainable design and better interchangeability of components so that pump can be serviced even at remote locations by semi-skilled technicians.

CED – Cathode Electro Deposition Coating

CED is the latest coating technology for corrosion resistance with uniform coating, provides 5 times more protection over conventional painting, resulting in longer life

High efficiency and energy saving design

Innovative design manufactured at state of art plant, delivers optimum efficiency at lower energy consumption resulting in significant cost savings.

Advanced Water Cooled Motors Designs

The motor is filled with potable water, protects from overheating and facilitates smoother and trouble free operation for the years

Accessories:

Submersible pump set complete with all accessories like portable stand, Cable size according to pump rating and cable length should be such that no joint is made inside the underground water tank. submersible copper cable without joint and 30 Mtr. Long runs required , enclosed with suitable pipe minimum 50 mm dia or next

higher size recommend by the pump mfg. with special /fittings /clamps/base plate etc. shall be provided.

Material of construction shall be as below:

Pump impeller : Stainless Steel /Graded Cast Iron & Dynamically balanced.

Casing : High Grade cast iron.

Wear Rings : High quality abrasion resistance Bronze.

Shaft : Stainless Steel of adequate diameter to ensure rigidity and ground to close tolerances. Cable

Sealing Arrangement : Designed so that no bore well water with sand can enter the motor. Motor

Body : Cast Iron /Stainless Steel

Journal Bearings : Leaded Bronze and Stainless Steel, Water Lubricated, having high load bearing capacity.

Thrust Bearing : Carbon Vs Stainless steel and water lubricated to withstand high axial thrust loads.

Fasteners: Stainless Steel

Portable Stand (Skirt Base) :M.S. fabricated & epoxy coated

#### HANDING OVER DOCUMENTS

The supplier shall submit following:

1. GA drawing
2. Foundation layout
3. Rating and Diagram Plate
4. Data sheet indicating results of tests
5. Test reports
6. O & M manuals

#### METHOD OF MEASUREMENT

Supply of the D.G Set including transport to site, loading and unloading etc. as specified will be treated as one unit for measurement and payment.

#### TRANSPORT, DELIVERY & STORAGE

The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the final location of PUMP SET or site store. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer(Included).

The transportation for any auxiliary item or detachable part of equipment should be simultaneous and carry necessary instructions for assembling and storage requirements.

All metal surfaces shall be thoroughly cleaned of scale, rust and grease etc. Prior to painting. Cleaned surfaces shall be given two coats of primer and prepared for final painting. Final finish shall be free from all sorts of blemishes.

The equipment shall be shipped to site suitably packed to prevent any damage. Each package shall have labels to show purchaser's name, purchase order and equipment no. suitable lifting lugs etc. shall be provided and lifting points shall be clearly marked on the package. Packing shall be suitable for storage at site for a minimum period of 6 months

#### GUARANTEE & WARRANTY

The Bidder shall stand guarantee for the performance of entire equipment and components for the period mentioned earlier (min 1 Year) from the date of handover. The Purchaser also reserves the right to use the rejected equipment or part thereof until the new equipment meeting the guaranteed performance is supplied by the Bidder.

## 11 – TECHNICAL SPECIFICATIONS FOR EXTERNAL LIGHTNING

Technical Specifications For External Decorative Lighting with Data Sheet  
**TECHNICAL SPECIFICATIONS FOR EXTERNAL STREET LIGHT POLE**

**1.0 SCOPE OF WORK**

This section relates to specifications for Design, Supply (wherever called for), Installation, Connection, Testing and Commissioning of Decorative STREET LIGHT Luminaire

The Scope includes:

1. Loading-Unloading at site
2. Unpacking
- 1.1 3. Assembling
4. LED street light luminaire c/w Driver and Pressure Die Cast Aluminum Decorative Poles.
5. Decorative LED luminaire
6. Fixing and connecting wiring to the fixture
7. Testing and commissioning

**2.0 CODES & STANDARDS**

**2.1**

Sr.	Item	RelevantIS	RelevantIEC
1	Generalandsafetyrequiremen tsfor lightfittings	IS1913	
2	Codeofpracticeforlightingpu blicthoroughfares	IS1944	
3	Waterproofoelectric lightingfittings	IS3528	
4	Watertightelectriclightingfitti ngs	IS3553	
5	M.S.tubularandotherwroughts teelpipefittings	IS1239	
6	Luminariesforstreetlighting.(P arts/Sec.3)	IS10322	
7	Classificationofdegreeof protectionsprovidedbyenclosu res.		IEC60529
8	Fixedgeneralpurposeluminar ies		IEC60598-2-1
9	Generalrequirementandtests		IEC60598-1
10	LimitsforHarmoniccurrentemi ssion--THD<10%		IEC61000-3-2
11	Specificationfor PermittedHumidityTest		IEC60068-2- 38
12	Methodforrandomsampling	IS4905	
13	LEDluminairephotometrymea surement.	LM79	
14	LumenMaintenance	LM80	

**3.0 DESIGN BASIS & SITE CONDITIONS AND DESIGN CRITERIA FOR VENDORS**

3.1 All the equipment and components provided and accessories shall be suitably designed for installation and satisfactory operation as specified below.

Siteconditions

Location Gujarat	Site altitude 81M above mean sea level
Ambient temperature	Relative humidity
Maximum 45 <sup>0</sup> C	Maximum 85%
Minimum 13 <sup>0</sup> C	Minimum 25%
Design 50 <sup>0</sup> C	Design 98% at 50 <sup>0</sup> C
Seismic factor Zone III as per IS:1893	Environmental Tropical/humid/corrosive/Dusty conditions
Electrical system data:	
Power supply for Equipment	
Voltage 230V ±5%	Frequency 50Hz ±3%

### 3.2 DESIGN CRITERIA FOR VENDORS

The lighting calculations are to be carried out using the computer programme DIALUX

4.10 OR AGI 32 and shall include the average horizontal illuminance on the pathway,

3.2.1 the average horizontal illuminance for ROAD on either side of the POLE / luminaire location, the glare, and the uniformity ratios including the average to minimum and the maximum to minimum.

3.2.2 The following parameters are to be specifically adhered to:

1. The average horizontal and vertical illuminance on the pathway shall be 10-12 LUX uniformly distributed when measured between poles located at spacing between poles shown in drawings and similar distance on perpendicular either side of the post top location.

2. Uniformity ratio maximum to minimum shall not exceed 5:1.

3. Uniformity ratio average to minimum shall not exceed 3:1.

3.2.2

4. Glare shall be minimum almost No Glare.

The lighting calculations will be based on a light loss factor (or) Maintenance Factor of 0.8 and a calculation grid of 1 metre intervals along the pathway and 0.5 metre intervals across the pathway.

3.2.3

The pole spacing will be governed by the drawings provided along with the tenders. In general the design shall be based on pole spacing as shown in tender drawings between each pole.

### 4.0 TECHNICAL REQUIREMENTS

#### 4.1 SYSTEM

4.1.1 The lighting installation for the project shall be carried out by use of outdoor type, weather proof luminaires, to be mounted on pole and as shown in drawings.

4.1.2 Fitting including all accessories having IP66 protection Class (Optics Compartment)

4.1.3 The control gear shall be designed in such a way so that temperature rise of heat sink shall not be more than 40 Deg. C with respect to ambient temperature.

4.1.4 For External street lighting, luminaire shall be low glare such that it shall not cause inconvenience to the public viewed directly.

In general all luminaires shall be Dark Sky Compliant as required by ECBC / Green Building Norms. Variation in illumination level shall be ±1% is allowed in input voltage range from 120 V AC to 270 V AC.

4.1.7 Electric power supply at 415 volt, three phase, four wire, 50 Hz. to be tapped from the lighting panel / or 230 V will be available at each pole foundation.

4.1.8 The electric power shall be distributed to the lighting poles through electric cables and shall be distributed equally on three phase of the electric power supply system.

Wherever required and suiting to aesthetic value Individual control fuse with junction box

4.1.9

4.1.10

shall be provided on each poles. The junction box shall be weather proof (IP-66, IK-10), having gasketed lockable hinged cover.

The light poles shall be earthed individually with coil type earth station using 8 SWG G.I wire.

#### 4.1.11

Electric cable required for the street lighting installation shall be 1100 volt grade, PVC insulated and sheathed, armoured cable having stranded Al/Cu. conductor of rating as mentioned in the drawing / BOQ.

#### 4.1.12

Technical details of the fixtures IP & IK etc should be clearly mentioned in catalogue on website. Any deviation in the technical criteria must be supported by test from UL or ERDA lab and must be presented at the time of tender submission

### 4.2 LED LUMINAIRES:

4.2.1 High power and high lumen efficient LEDs suitable for following features shall be used:

The working life of the lamp at junction temperature of 110 Deg. Centigrade for 350 mA to 700 mA current shall be more than 50,000 hours of accumulative operation and

a shall be suitable for continuous operation of 24 hours per day .these features shall be supported with datasheet. After 50,000 burning hours, the luminaire intensity shall be at least 70%.

b Adequate heat sink with proper thermal management shall be provided.

c Color temperature of the proposed white color LED shall be 3000k – 3500 k.

The direct output of LED shall be more than 115 lumen per watt at minimal operating d current and shall ensure guaranteed operation life of 50,000 burning hours with

Controlled junction temperature of 110 Deg. Centigrade.

e. System Efficiency including all LED, driver electronics etc. shall be more than 85%. f Power factor of complete fitting shall be more than 0.95.

The driver card shall withstand 440V and shall resume normal working when nominal g voltage is applied again.

Thermal management shall be designed in such a way that the LED junction h temperature shall not exceed beyond 40 Deg. Centigrade over ambient temperature.

Design ambient conditions are mentioned above in the specifications.

The manufacturer will have to submit the LM-79, LM-80, L70 and B50 life expectancy i performance reports to support the above compliance.

LEDs should be fitted with wide angle low glare and high transmittance lenses and zero j upward light ratios with full cut off beyond 80o.

k Ambient Operating temperature - 10oC to + 50oC.

The system should also be provided with suitable protections against voltage peaks/ l surges.

### 4.2 LIGHTING POLES / CONSTRUCTION

#### 4.2.1 DECORATIVE LED STREET LIGHT LUMINAIRE

The quality and performance is expected to be of EN60598-1 CE1 34-21 (European)

##### 4.2.1.1

standards & degree of protection should be according to EN 60529 European standards.

##### 4.2.1.2

Street light fitting should Providing Street light pole bracket consisting of" B" Class MS .pipe of 4.2 cms. outside dia. complete with suitable MS sleeve tubing of required size and length suitable for 76.5mm/80mm/require size of pole top having nuts and bolts for fixing the brackets and having spread of 0.5 mtr. Length with 110 deg. with vertical plane and suitable welded stiffener reducer and nipple with check knut complete painted with one coat. of Red oxide / PU base primer and two coats of Aluminum / PU paint. paint The luminaries shall be generally having direct type but low glare considering public promenade.

##### 4.2.1.3



Street light pole shall be tropicalised for local conditions as defined in the specifications above and vendor shall guarantee the performance requirements are met as per defined in the tender documents.

4.2.1.4

The luminaire housing shall be completely made of pressure die cast aluminum with higher thermal conductivity, corrosion resistant pressure die cast body with suitable epoxy powder coated / PU painted. The color in general shall be Dark Grey / Graphite Black.

4.2.1.5

The luminaire complete with LED section, Optics etc shall be dust and Weather proof (Min IP-66) protection as per IEC – 60529.

The complete assembly along with optics and diffuser shall be Vandal proof; minimum

4.2.1.6 of IK-08 protection is required for post top luminaires. The diffuser shall be made from high quality, UV stabilized and Non-Yellowing Polycarbonate / PMMA.

4.2.1.7 The street light luminaire shall be suitable for direct mounting on pole bracket

The gasket shall be EPDM or Silicon Rubber Gaskets only; all screws shall be Allen-Key

4.2.1.8

4.2.1.10

4.2.1.11

type or requires special tools for opening of the housing / control gear box and shall be of Stainless Steel.

The base compartment (Control Gear Compartment) shall be provided with wooden back board and enough space to terminate 4 Core 16 Sq. mm Aluminum Armored cable with loop in and loop out multi way connectors strips; 2 A DP MCB along with the Driver fixed on the wooden back board, 2 nos. Earthing Studs etc

The compartment door shall be secured with tamper resistant special bolts requiring special tools and shall be provided with suitable gasket to comply with IP 66 requirements.

4.2.1.12 The pole shall be complete with all mounting accessories, switchgear and connector strips.

4.2.1.13 The poles shall conform to the drawings and where such drawing is not available, the contractor shall make such drawing and have it approved before fabricated.

4.2.1.14 The poles shall be PU painted; the color of the paint shall match the post top luminaire with 2 coats of epoxy primer applied before painting.

4.2.1.15 The luminaire lumen output shall be enough at minimum system wattage so as to cover wide area.

4.2.1.16 The luminaire Color Temperature to be as per datasheet.

4.2.1.17 Vendor to submit the detailed calculation for lux level with uniform distribution including the lux distribution curve /graph/spatial distribution with dimension.

Supplier will be solely responsible for testing and performance compliance of the

4.2.1.18 luminaries after installation and shall also ensure the specified and uniform illumination and comfort level on the horizontal plane at plaza level.

### 4.3 CABLE LAYING (NOT APPLICABLE)

Electric cable for the street lighting installation shall follow specification under the

4.3.1

heading “L.T XLPE cable”.

4.3.2

Cable shall be terminated in a 4-way terminal block inside the pole or to the attached junction box as shown on drawings.

4.3.3

Cable route shall be as shown on the drawings or the contractor shall mark out the route and lay the cables only upon approval of the route.

4.3.4

Cable laying shall be done with excavation, backfilling of trench with sand & bricks at bottom & top.

#### 4.4 EARTHING

4.4.1 All light fixtures and poles shall be earthed as specified under section "EARTHING". Earth electrode shall be of 8 SWG coil type and shall otherwise meet to the specification

##### 4.4.2

given under heading "Earthing".

#### 5.0 INSTALLATION OF SYSTEM

Lighting installation shall be carried out as per details shown in the drawing.

The poles shall be erected in perfect plumb with concrete foundation at a location shown in the drawing. The foundation shall be designed to withstand the static load as well as wind velocity and bending moment of the pole and shall be approved by the client prior to execution.

The civil foundation will be provided by Civil Contractor. The Cables will be provided at the foundation; based on the distribution luminaire vendor to install the pole and connect the power and earthing cables.

The luminaries shall also be installed on the pole and be electrically wired to the respective driver at base compartment..

Earthing installation shall follow the details for the same shown in the drawing.

On completion of the installation, the street light poles shall be painted with two coats of metal primer (Red Oxide) followed by two coats of Synthetic enamel of the shade as approved by the Engineer-in-charge.

#### 6.0 DRAWING & INFORMATION

On award of the contract, the contractor shall submit the fully dimensioned general

##### 6.1

arrangement drawings complete with plan, elevation and sectional views. As built drawing should be submitted indicating cable rout, exact position of light fixtures.

#### 7.0 INSPECTION & TESTING

Test certificate should be produced for IR test carried out on all LT cables and panels. All the lamps should be controlled as per required control logic. Operation of timer, contactor circuits should be tested.

Tests are classified as:-

##### 7.1

Prototype test Type test Acceptance test Routine test.

Report of actual Lux level should be submitted.

#### 8.0 METHOD OF MEASUREMENT

Supply, Installation, connection, testing and commissioning of each light fitting with

##### 8.1

lamp, control gear, earthing etc. shall be considered as one unit for measurement and payment.

Supply, installation, connection, testing and commissioning of each lighting pole, concrete coping/foundation, base plate, junction box/access panel, internal connection from fuse to the light fixture with 2.5 mm.<sup>2</sup> copper conductor wire, earthing etc. shall be considered as one unit for measurement and payment.

All cabling work shall be measured on the basis of unit length and the cost shall include, cost of cable, excavation, laying, back filling, cable terminations and connection in junction box or pole terminal box etc.

#### 9.0 TEST

i) Visual and Dimensional Check:

The unit shall be checked visually for all dimensions as per approved design and drawing. General workmanship should be good; all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic / electrical items.

ii) Checking of documents of purchase of LED

iii) Check Document of purchase of LED lamps of approved sources

iv) Resistance to humidity test

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48 deg. C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

v) Insulation resistance test

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 M when measured with 500V megger.

vi) HV test

Immediately after insulation resistance test, an AC voltage of 1.72 KV RMS (1500 + 2x rated voltage) of sine wave form of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

vii) Over voltage protection

The Luminaire shall withstand at 300V AC for two minutes.

viii) Surge protection

It shall withstand a surge of 1.5Kv 3% for 50 microsecond's 20 % at the input terminals for all types. (Tests shall comply with Clause 5.4 of latest IEC 60571-1).

ix) Temperature rise Test:

Temperature rise Test shall be conducted at 180VAC with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum-recorded temperature under worst conditions shall be corrected to 550C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 100 C.

Temperature at junction shall not exceed 100 0 C when corrected to 550C. The Luminaire shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 850C environment.

x) Ra (Colour Rendering Index) measurement test

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one Steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardised rated value as per Annex. D of IEC 60081 - 1997.

The initial reading of the general colour-rendering index (Ra) shall not be less than the rated value decreased by 3.

The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20000 burning hours and 70% of the initial lumen after 50000 hours. The initial lumen will be taken after 100 hours aging.

Photometric test shall be conducted as per annexure B of IEC 60081-97.

The lumen maintenance test shall be done as per annexure C of IEC 60081-97.

xi) Lux measurement

Lux measurement with the help of Lux meter shall be done at a distance as shown above. Value obtained shall not be less than the Lux specified in the table therein, considering 10% Lumen is absorbed by the reflector.

xii) Fire retardant Test

Fire Retardant test shall be conducted as per IEC 332-1 of the wire used in the fittings.

xiii) Test for IP66 protection

This test shall be conducted as per IEC

xiv) Environmental tests

The Luminaire shall meet the following tests as prescribed in IEC – 60571.

a) Dry heat test.

b) Damp heat test

c) Test in corrosive atmosphere

d) Combined dust, humidity and heat test

xv) Reliability Test

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions. There shall be no failure during this test.

a) The light unit shall be mounted in an oven maintained at 75°C.

b) The light will be operated at the specified maximum voltage and at 75°C for a period of 100 hours.

xvi) Life Test

The lumen maintenance & life test shall be done as per annexure C of IEC 60081-97.

xvii) Endurance Test

The Luminaire shall be kept "ON" with input voltage of 250VAC for 200 hours. After this the Luminaire is subjected to 20,000 cycles of "ON" and "OFF", each cycle consisting of 3 seconds "ON" and 10 seconds "OFF" period. Luminaire should survive this test. Test is to be continued for one lakh cycles, followed by Performance test.

xviii) Safety:

The Luminaire shall comply with the safety requirements as per IEC 61195.

#### 9.0 TRANSPORT, DELIVERY & STORAGE

The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the

##### 9.1

final location or site store. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.

#### 10.0 GUARANTEE & WARRENTY

The Bidder shall stand un-conditional guarantee for the performance of entire

##### 10.1

luminaire equipment and control gear components with LED lamp for 5 years from the date of commissioning

### DATASHEET

SR. NO.	PARTICULARS	REQUIRED DATA FROM VENDOR FOR POST TO PLANTERN
1.	Overall Power Consumption	
2.	Power Factor	
3.	Frequency	
4.	Type of LED	
5.	Lumen/LED	
6.	Driver Voltage Range	
7	No Load Power Consumption of Driver	
	Full Load Efficiency of Driver	
	Load Regulation of Driver	
	Driver Voltage withstand capacity in hours	
8.	Driver Current (should be variable voltage constant current) (120 Volt AC to 270 Volt AC)	

9.	TypeofHeatSink	
10.	TemperaturecapacityofHeatSink	
11.	ProtectionClassofLampCompartment	
12.	ProtectionClassofControlGear	
	IKRATING-(IK08)	
13.	MaterialOfFitting	
14.	MaterialOfHousing	
15.	MaterialOfPole	
16.	LuminousFlux(lm)	
17.	Colortemperature(K)-3000kOR3500k	
18.	ColorRenderingIndex	
19.	THDin%	
19.	Averagelifetimewithafluxmaintainedat70% ofinitialflux.E.g.-L70-Xhours-50,000hoursmin.	
20.	UnifiedGlareRation(UGR)	
21.	VendorbeaoriginalmanufacturerofLEDpostof lanternworldwideorcollaborationandsince	
22.	ReplacementGuaranteeyears(min.5years)	

12 - TECHNICAL  
SPECIFICATIONS FOR  
MEDIUM VOLTAGE  
PANEL

## TECHNICAL SPECIFICATIONS FOR MEDIUM VOLTAGE PANEL

## 1.0 SCOPE OF WORK

1.1 This scope shall cover design, manufacture, check test, and supply of medium and low voltage motor/power control Panel boards, MCB distribution boards etc. as described in this specification, as per drawings and schedule of quantities.

## 2.0 CODES &amp; STANDARDS

2.1 The Panels shall comply with the latest edition of relevant Indian Standards and Indian Electricity Rules and Regulations. The following Indian standards shall be complied with:

Sr.	Item	RelevantIS	RelevantIEC
1	Generalrequirementsforswitchgearandcontrolgearforvoltagesnot exceeding1000VACor1200VDC	IS:4237	
2	Switchgearbusbars,mainconnectionandauxiliarywiring,markingandarrangement.	IS:375	
3	Degreeof protection provided byenclosuresfor Low voltageswitch gearandcontrolgear.	IS:2147	
4	Terminalmarkingforelectricalmeasuringinstrumentandtheiraccessories.	IS:8197	
5	Dangernoticeplates	IS:2551	
6	CodeofPracticeforselection,installationand maintenance ofswitchgearandcontrolgear.	IS:10118	
7	Specificationfor factorybuilt assembliesofswitchgearandcontrolgear forvoltageupto and including1000VACand1200VD.C.	IS:8623	
8	Miniaturecircuitbreakers.	IS:8828	
9	Currenttransformers	IS:2705	
10	Voltage transformer	IS:3155	
11	Electricalrelayforprotection	IS:3231	
12	Indicatinginstruments	IS:1248	
13	Integratinginstruments	IS:722	
14	Controlswitchesandpushbuttons	IS:6875	
15	ACmotorstartersofvoltage not exceeding1000V	IS:1822	

The Panels also require approval of the client/consultant at various stage of their manufacture such as design, selection, construction, testing, shipping etc.

## 3.0 DESIGN BASIS &amp; SITE CONDITIONS.

Siteconditions	
LocationGujarat	Sitealtitude81Mabovemeansealevel
Ambienttemperature	Relativehumidity
Maximum 45 <sup>0</sup> C	Maximum85%
Minimum 13 <sup>0</sup> C	Minimum25 %

Design 50 <sup>0</sup> C	Design 90 %at50 <sup>0</sup> C
Seismicfactor ZoneIIIasperIS:1893	Rainfall618mm/year
EnvironmentalTropicalconditions	LocationofEquipmentIndoor
Electricalsystemdata:	
PowersupplyforEquipment	
Voltage 415kV±5%	Frequency 50Hz±3%
Permissible combinedvoltage& frequencyvariation ±6%	System design faults level(Symmetrical) 15kAfor1sec.max.
System earthing LVside neutral solidlyearthed	Wiring3phase,4wireon415Vsystem
Auxiliarypowersupply:-----	
Powersupply	240VAC,1-Ph,50Hz
ControlSupply	-----
Spaceheaterpowersupply	240VAC,1-Ph,50Hz
Illuminationpowersupply	240VAC,1-Ph,50Hz
Plug-socketpowersupply	240VAC,1-Ph,50Hz

#### 4.0 TECHNICAL REQUIREMENTS

All the Panels shall be metal clad, totally enclosed, rigid, floor mounting, air insulated, cubicle type suitable for operation on three phase/single phase, 415 V/240 V, 50 Hz., neutral effectively grounded at transformer and short circuit level as mentioned in the drawings.

All the outdoor panel shall be double door type with IP54 protection class construction.

All the indoor panel shall have IP51 protection class construction.

The painting of all the metal part shall be as per the painting specification defined in the datasheet.

The Panels shall be designed to withstand heaviest condition at site, with maximum expected ambient temperature of 45<sup>o</sup>c, 90% humidity and salty, dusty weather.

#### CUBICAL TYPE PANELS:

##### 4.1 STRUCTURE

4.1.1 The Panels shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation having dead front operated and floor mounting type.

4.1.2 All CRCA sheet steel used in the construction of Panels shall be 2 mm. thick and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet steel shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

4.1.3 The Panels shall be totally enclosed, completely dust and vermin proof and degree of protection being not less than IP: 51. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully gasketed with foam rubber and/or rubber strips and shall be lockable.

4.1.4 All panels and covers shall be properly fitted and secured with the frame and holds in the panel correctly positioned. Fixing screws shall enter into holes, taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of Panels.

4.1.5 A base channel of 100 mm. x 50 mm. shall be provided at the bottom. A clearance of 300 mm. between the floor of the Panels and the bottom of the lower most units shall be provided.



4.1.6 Panels shall be preferably arranged in multi-tier formation. The Panels shall be of adequate size with a provision of 20% spare space to accommodate possible future additional switchgear. The size of the Panels shall be designed in such a way that the internal space is sufficient for hot air movement and the electrical component does not attain temperature more than 450c. The entire electrical component shall be derated for 500c. The ratings indicated in the drawing are derated for 500c.

4.1.7 Knock out holes of appropriate size and number shall be provided in the Panels in conformity with the number, and the size of incoming and outgoing conduits/cables.

4.1.8 Alternately, the Panels shall be provided with removable sheet steel plates at top and bottom to drill holes for cable/conduit entry at site.

4.1.9 The Panels shall be designed to facilitate easy inspection, maintenance and repair.

4.1.10 The Panels shall be sufficiently rigid to support the equipment without distortion under normal and under short circuit condition. They shall be suitably braced for short circuit duty.

#### 4.2 PROTECTION CLASS:

4.2.1 All the indoor Panels shall have protection class of IP 51 for indoor installation and IP 54 for outdoor installation.

#### 4.3. PAINTING:

4.3.1 The painting shall be with 2 coats of epoxy primer along with two coats of PU paint [Anti-corrosive paint]. Paint shade shall be confirmed with the client.

#### 4.4 CIRCUIT COMPARTMENTS:

4.4.1 Each circuit breaker and switch fuse unit shall be housed in separate compartments and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the breaker/switch fuse unit in 'ON' and 'OFF' position. Safety interlocks shall be provided for air circuit breaker to prevent the breaker from being drawn out when the breaker is in 'ON' position.

4.4.2 The door shall not form an integral part of draw out position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tiers in a vertical section.

#### 4.5 INSTRUMENT COMPARTMENTS

4.5.1 Separate adequate compartment shall be provided for accommodating instruments, indicating lamps, control contactors/relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker/switch fuse unit, busbar and connections.

#### 4.6 BUS-BARS:

4.6.1 The busbar shall be air insulated and made of high quality, high conductivity, high strength Aluminum.

4.6.2 The busbar shall be of 3 phases and neutral system with separate neutral and earth bar. The bus bar and interconnection between bus bars and various components shall be of high conductivity Aluminum. The busbar shall be of rectangular cross-section designed to withstand full load current for phase bus bars and half rated current for neutral bus bars and shall be extensible on either side. The busbar size shall be as per drawing. The busbar shall have uniform cross-section throughout the length.

4.6.3 The bus bars and interconnections shall be insulated with heat shrinkable PVC sleeve and be colour coded in red, yellow, blue and black to identify the 3 phases and neutral of the system if specified in datasheet. The busbar shall be supported on unbreakable, non-hydroscopic SMC/DMC insulated supports at sufficiently close intervals to prevent bus bars sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 15 KA RMS symmetrical for 1 sec. and a peak short circuit withstand of 31.5 KA minimum.

4.6.4 The bus bar shall be housed in a separate compartment. The bus bar shall be isolated with 3 mm. thick Bakelite sheet to avoid any accidental contact. The bus bar shall be arranged such that minimum clearance between the bus bars to be maintained as below:

Between phases: 25 mm. minimum

Between phases and neutral : 25 mm.

Between phases and earth : 25 mm.

Between neutral and earth : 20 mm. minimum

4.6.5 All bus bar connections shall be done by drilling holes in bus bars and connecting by chromium plated or tinned plated brass bolts and nuts. Additional cross-section of bus bar shall be provided in all Panels to cover up the holes drilled in the bus bar. Spring and flat washers shall be used for tightening the bolts.

4.6.6 All connections between bus bars and circuit breakers/switches and cable terminals shall be through aluminum strips of proper size to carry full rated current. These strips shall be insulated with insulating tapes.

4.7 ELECTRICAL POWER AND CONTROL WIRING CONNECTION:

4.7.1 Terminal for both incoming and outgoing cable connections shall be suitable for 1100 V grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable for connections of solder-less sockets for the cable size as indicated on the appended drawings for the Panels.

4.7.2 Power connections for incoming feeders of the main Panels shall be suitable for 1100 V grade aluminum conductor (LT XLPE) cables.

4.7.3 Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance.

4.7.4 Both control and power terminals shall be properly shrouded.

4.7.5 10% spare terminals shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block, so that not more than one outgoing wire is connected per terminal.

4.7.6 Terminal strips for power and control shall preferably be separated from each other by suitable barriers of enclosures.

4.7.7 Wiring inside the modules for power, control, protection and instruments etc. shall be done with use of 660/1100 V grade, PVC insulated copper conductor cables conforming to IS: 694 and IS: 8130. Power wiring inside the starter module shall be rated for full current rating of respective contactor, but not less than 4.0 sq.mm. cross-section area. For current transformer circuits, 2.5 sq.mm. copper conductor wire shall be used. Other control wiring shall be done with 1.5 sq.mm. copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solderless sockets at the ends before connections are made to the terminals.

4.7.8 Control power for the Motor starter module shall be taken from the respective module switchgear outgoing. Control power wiring shall have control fuses, (HRC fuse type) for circuit protection. All indicating lamps shall be protected by HRC fuses.

4.7.9 Particular care shall be taken to ensure that the layout of wiring is neat and orderly. Identification ferrules shall be fitted to all the wire termination for ease of identification and to facilitate checking and testing.

4.7.10 Spring type washers shall be used for all copper and aluminium connections.

4.7.11 Final wiring diagram of the Panels power and control circuit with ferrules numbers shall be submitted along with the Panels as one of the documents against the contract.

4.8 TERMINALS:

4.8.1 The outgoing terminals and neutral link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformers for instruments metering shall be mounted on the disconnecting type terminal blocks. No direct connection of incoming or outgoing cables to internal components of the distribution board is permitted; only one conductor may be connected in one terminal.

4.9 WIRE-WAYS:

4.9.1 A horizontal PVC wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

4.10 CABLE COMPARTMENTS:

4.10.1 Cable compartments of adequate size shall be provided in the Panels for easy termination of all incoming and outgoing cables entering from bottom or top. Adequate supports shall be provided in the cable compartments to support cables. All outgoing and incoming feeder terminals shall be brought out to terminal blocks in the cable compartment.

4.11 EARTHING:

4.11.1 Copper earth bus of 40 X 6 mm shall be provided in the Panels for the entire length of the panel. The frame work of the Panels shall be connected to this earth bar. Provisions shall be made for connection from this earth bar on both sides of the panels to the main earthing bar coming from the earth pit. Door earthing shall be provided for all the compartments.

4.11.2 The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp, and the clamp shall be made for connection from this earth pit on both sides of the Panels.

4.11.3 The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp, and the clamp shall be ultimately bonded with the earth bar.

4.12 LABELS:

4.12.1 Engraved metal labels shall be provided on all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet.

4.13 NAME PLATE:

4.13.1 A name plate with the Panel's designation in bold letters shall be fixed at top of the central panel. A separate name plate giving feeder details shall be provided for each feeder module door.

4.13.2 Inside the feeder compartments, the electrical components, equipments, accessories like switchgear, control gear, lamps, relays etc. shall suitably be identified by providing stickers.

4.13.3 Engraved name plates shall preferably be of 3 ply, (Red-White-Red or Black-White- Black) lamicold sheet. However, black engraved Perspex sheet name plates shall also be acceptable. Engraving shall be done with square groove cutters.

4.13.4 Name plate shall be fastened by counter sunk screws and not by adhesives.

4.14 DANGER NOTICE PLATES

4.14.1 The danger notice plate shall be affixed in a permanent manner on operating side of the Panels.

4.14.2 The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.

4.14.3 The danger notice plates, in general, meet the requirements of local inspecting authorities.

4.14.4 Overall dimensions of the danger notice plate shall be 200 mm. wide x 150 mm. high.

4.14.5 The danger notice plate shall be made from minimum 1.6 mm. thick mild steel sheet and after due pre-treatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.

4.14.6 The letters, the figures, the conventional skull and bones etc. shall be positioned on plate as per recommendation of IS: 2551-1982.

4.14.7 The said letters, the figures and the sign of skull and bones shall be painted in signal red colour as per IS: 5-1978.

4.14.8 The danger plate shall have rounded corners. Location of fixing holes for the plate shall be decided to suit design of the Panels.

4.14.9 The danger notice plate, if possible, be of ISI certification mark. Suitable Voltage rated rubber mates to be provided.

4.15 INTERNAL COMPONENTS:

4.15.1 The Panels shall be equipped complete with all types of required number of auto transformer starters, switch fuse units, contactors, relays, fuses, meters, instruments, indicating lamps, push buttons, equipment, fittings, bus bars, cable boxes, cable glands etc. and all the necessary internal connections/wiring as required and as indicated on relevant drawings. Components necessary for the proper and complete functioning of the Panels but not indicated on the drawings shall be supplied and installed on the Panels.

4.15.2 All parts of the Panels carrying current including the components, connections, joints and instruments shall be capable of carrying their specified rated current continuously, without temperature rise exceeding the acceptable values of the relevant specifications at the part of the Panels.

4.15.3 All units of the same rating and specifications shall be fully interchangeable.

## COMPONENTS

### 4.16 GENERAL:

4.16.1 The type, size and rating of the components shall be as indicated on the relevant drawings. While selection of the capacity of the components resulting from the prevailing conditions like ambient temperature shall be allowed for. The thermal and magnetic trip rating shall be compensated for the ambient temperature.

The ratings indicated on the drawing are ratings anticipated at prevailing site conditions.

### 4.17 MINIATURE CIRCUIT BREAKERS:

4.17.1 Miniature Circuit breakers shall be current limiting type conformed with British standard BS: 3871 (Part I) 1965 and IS: 8825. The housing of MCBs shall be heat resistant and having a high impact strength. The fault current of MCBs shall not be less than 9000 A at 230 V. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical 'ON' and 'OFF' indications.

4.17.2 The circuit breaker dollies shall be of the trip free pattern to prevent closing the breaker on a faulty circuit.

4.17.3 The MCB contacts shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCBs shall be provided with magnetic fluid plunger release for over current and short circuit protection. The overload or short circuit device shall have a common trip bar in the case of DP and TPN miniature circuit breakers. All the MCBs shall be tested and certified as per Indian Standards, prior to installation.

### 4.18 FUSE:

4.18.1 Fuses shall be of high rupturing capacity (HRC) fuse links and shall be in accordance with IS: 2000-1962 and having high rupturing capacity of not less than 35 MVA at 415 V. The back-up fuse rating for each motor/equipment shall be so chosen that the fuse does not operate on starting of motors/equipment. HRC fuses shall be of the make as specified in Make of Material.

### 4.19 AIR CIRCUIT BREAKER:

#### 4.19.1 Construction:

The ACBs shall have following features:

1. Motorized with 230 V A.C. motor.
2. 230 V A.C closing and shunt trip coil
3. Draw out type with "service", "test", "isolated" and "maintenance" position.
4. Safety shutter of Fibre glass/polycarbonate sheet of 2mm thickness shall be provided
5. Mechanically trip free plus anti-pumping feature is to be provided.
6. Electrical trip free plus anti pumping shall be provided with relay ONLY and not by contactors.
7. Electrical/Mechanical operation counter shall be provided.
8. Door interlock with defeat features to be provided.
9. ACB shall be lockable in isolation position.

#### 4.19.2 Release:

1. Thermal Magnetic release shall be direct acting type, tripping ACB mechanically.
2. Short circuit, overload and earth fault protection shall be provided.
3. Vendor to suggest release type for feeders of supply range characteristic and accuracy.

#### 4.19.3 ACB Performance:

1. ACB performance inside panels at ambient 50 Degree.
2. Ith Symmetrical breaking, 35KA
3. Making capacity peak 87.5 KA
4. Short time rating, 1sec. 35KA

### 4.20 CONTACTORS:

4.20.1 The contractors shall meet with the requirements of IS: 2959 and BS: 775.

The contractors shall have minimum making and breaking capacity in accordance with utilisation category AC3 and shall be suitable for minimum Class II intermittent duty.

If the contractor forms part of a distribution board then a separate enclosure is not required, but the installation of the contractor shall be such that it is not possible to make an accidental contact with live parts.

#### 4.21 CURRENT TRANSFORMER:

4.21.1 Where ammeters are called for C.T.s shall be provided for current measuring. Each phase shall be provided with separate current transformer of accuracy Class I and suitable VA burden for operation of associated metering and controls. Current transformer shall be in accordance with IS: 2705 - 1964 as amended upto date.

#### 4.22 PUSH BUTTONS:

4.22.1 The push button unit shall comprise of the contact element, a fixing holder, and a push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. continuous current rating. The actuator shall of standard type and colour as per its usage for ON, OFF and TRIP.

#### 4.23 INDICATING LAMPS:

4.23.1 Indicating lamps shall be transformer operated low voltage rated and shall be supplied complete with translucent covers to diffuse the lamp light.

Colour shade for the indicating lamps shall be as below – the LED shall be 22.5 mm and self coloured:

ON indicating lamp	:	Red
OFF indicating lamp	:	Green
TRIP indicating lamp	:	Amber
PHASE indicating lamp	:	Red, Yellow, and Blue

#### 4.24 DIGITAL MULTI FUNCTION METER

4.24.1 The load manager shall be digital type with RS485 port. It should measure KW, KVA, KVAR, V, I, PF etc.

#### 5.0 DRAWING & INFORMATION

5.1 Prior to fabrication of the Panels the supplier/contractor shall submit for consultant's approval the shop/vendor drawing consisting of G.A. drawing, sectional elevation, single line diagram, bill of material etc. and design calculations indicating type, size, short circuiting rating of all the electrical components used, busbar size, internal wiring size, Panels dimension, colour, mounting details etc.. The contractor shall submit manufacturer's catalogues of the electrical components installed in the Panels.

#### 6.0

##### 6.1

#### INSPECTION & TESTING

At all reasonable times during production and prior to transport of the Panels to site, the supplier/contractor shall arrange and provide all the facilities at their plant for inspection.

6.2 Testing of Panels shall be carried out at factory and at site as specified in Indian standards in the presence of consultant. The test results shall be recorded on a prescribed form. The test certificate for the test carried out at factory and at site shall be submitted in duplicate to the consultant for approvals.

#### 7.0 METHOD OF MEASUREMENT

7.1 All the items will be measured as mentioned in Bill of quantity.

#### 8.0 TRANSPORT, DELIVERY & STORAGE

8.1 The prices shall be F.O.R. site basis including packing & forwarding charges. The quoted price must include all the costs for necessary mode of transportation up to the final location of site or site store. All incidental expenses during transportation shall be part of quoted prices including transit insurance. The charges for loading and unloading of equipments at site should form part of offer.

#### 9.0 GUARANTEE & WARRENTY

9.1 The Bidder shall stand guarantee for the performance of entire equipment and components for twelve (12) months from the date of commissioning or eighteen (18) months from the date of dispatch, whichever is earlier.

#### 10.0 SPARES

10.1 The bidder shall quote for minimum spares required for two years safe operation of transformer along with the offer separately.

11.0 ATTACHMENTS

11.1 • Data Sheet

NOTE: VENDOR MUST HAVE CPRI APPROVED LICENSE FOR ELECTRICAL PANEL MANUFACTURING.

TECHNICAL DATA SHEET FOR MEDIUM VOLTAGE DISTRIBUTION BOARD

SR. NO.	PARTICULARS	DESCRIPTION
1.0	SITECONDITION	
1.1	Type	Indoor
1.2	Mounting	Floor,Indoor
1.3	AmbientTemperature	50°C.
1.4	Atmosphere	Corrosive,Humid&Dusty
2.0	OPERATIVECONDITION	
2.1	Voltage	415V± 10%
2.2	No.OfPhase	3
2.3	System	3Ø,4WIRE
2.4	Frequency	50HZ,+3%/-6%.
2.5	FaultLevel	18MVA
2.6	FaultCurrent	AsperSLD
3.0	CONTROLSYSTEM	
3.1	Voltage ForIndication ForMetering ForProtection	230V A.C. 230V A.C. 230V A.C.
3.2	ControlSupplyThroughControl Transformer	230V A.C.only
3.3	ControlWiring	2.5MM² FRLSCu.Wire 4.0MM²FRLScu.WiseforCTckt.
4.0	BUSBAR	
4.1	PhaseBusbar	
A.	Material	Copper
B.	Support	SMC/DMC
C.	Insulation	EpoxyMoulded(Resin)
D.	InsulatingBarriers	FibreGlass/PolyCarbonateOfMinimum1.5Mm ThickAndTo BeOfFr4Class
E.	CurrentDensity	1.0Amp./mm²
4.2	NeutralBusbarMaterial	Copper
4.3	Earth Busbar Material	GI
5.0	SourcechangeoverSystem	NotRequired
6.0	PAINTING	
6.1	SheetShouldBe7TankProcessed,OvenBaked At310°C. WithPowdercoating.	
6.2	TypeOfPrimer	EPOXYPRIMER
6.3	TypeOfPaint	RAL7032
6.4	Shade	Shallbeconfirmedwithclient
	Exterior	Shallbeconfirmedwithclient
6.5	Interior	IP51
6.6	DegreeOfProtection	35°C.aboveambient

	Max. Temperature Rise Inside The Panel (°C.)	
7.0	CONTROL WIRING	
7.1	Wire Size	According to Load
8.0	HARDWARE (ZINC PLATED)	YES
9.0	SPACE HEATER	230 V A.C. With thermostat control
10.0	POCKET FOR DRAWINGS AT DOOR	YES
11.0	Illumination and switched power plug	YES

## 13 - TECHNICAL SPECIFICATION FOR FIRE FIGHTING (PROTECTION) SYSTEM



## 1.0 SCOPE OF WORK

The scope includes fire protection system only, the detection is covered under separate tender

- 1.1 Fire Hydrant system
- 1.2 Fire Sprinkler System for basement
- 1.3 Fire Extinguishers

The detailed scope is described in the chapter “Extent of Work. “

## 2.0 FIRE EXTINGUISHERS

### 2.1 GENERAL:

The scope of work under this part of the specification covers supply and installation of internal appliances as per requirements specified in schedule & marked on drawings and instructions of engineer-in-charge.

Makes of all the appliances supplied and installed shall be as per the ‘List of Approved Make ‘ or as approved by LFA and shall be of identical design for the entire premises.

Mounting accessories, indicator boards etc are part of the scope of supply of internal appliances.

### 2.2 SPECIFICATIONS:

Internal appliances with various fire extinguishing medium shall conform to the following specifications and shall be installed and maintained as per IS: 2190 / NFPA 10

Portable Extinguishers of the following types shall be installed.

- 1. Dry chemical Powder type
- 2. Co2 type
- 3. Water / Foam type
- 4. ABC type

#### 2.2.1 DRY CHEMICAL POWDER TYPE:

The Dry chemical powder type shall be of 5 Kg. Capacity and shall have the IS mark 2171 or latest Indian standard complete with powder and charged including with fixing bracket, fitted with gunmetal cap, and discharge hose and open grip nozzle.

#### 2.2.2 CO2 TYPE:

The Co2 Extinguisher shall be ISI mark, with initial charge with high pressure cylinder, complete with wheel type valve, internal discharge tube, with high pressure discharge hose with horn and suspension brackets. The extinguisher shall have ISI mark of 2878 or latest Indian standard and capacity shall be 2 Kgs.

#### 2.2.3 WATER / FOAM TYPE :

The water type extinguisher shall conform to IS 15683 or latest Indian Standard having 9 ltr. capacity & will be with fixing arrangement with all accessories.

2.2.4 ABC (Powder) TYPE : 6 Kg ABC (Powder) type fire extinguisher shall conform to IS 15683 or latest Indian Standard & will be with all accessories & mounting arrangement.

However, type & capacity of fire extinguishers are to be provided according to local CFO requirement

## 3.0 PIPE WORK

### 3.1 GENERAL REQUIREMENTS:

3.1.1 All the materials shall be of TAC/LFA approved, best quality conforming to the specifications and subject to the approval of the Client or his representative. If so directed, materials shall be tested in an approved testing laboratory & the contractor shall produce the test certificate in original to the Engineer-in-charge & the entire charges for original as well as repeated tests shall be borne by the Contractor.

3.1.2 Before welding, the pipe faces shall be cleared & then shall be welded conforming to IS : 9595 – 1980. The electrodes used for welding shall comply with IS:814. the laying of welded pipe shall also comply to IS 5822 – 1986. The welding joints shall be tested in accordance to IS:3600, Part 1973.

3.1.3 Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.

3.1.4 Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.

3.1.5 Pipes shall be securely fixed to walls, and ceilings by suitable clamps or supported at every 3 mtr. & at change of direction as required. Only approved type of anchor fasteners shall be used for RCC ceiling and walls.

3.1.6 Valve and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.

### 3.2 PIPING

Pipes of the following types are to be used:

3.2.1 M.S. pipes as per IS: 1239, heavy duty (for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall be lagged as per IS: 10211.

3.2.2 MS pipe lines upto 150 mm dia. shall have all fittings as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be fabricated from IS: 3589 Gr.320 pipes as applicable or from steel plates.

3.2.3 For MS pipelines upto 50 mm dia screwed jointing shall be adopted, while for pipelines above 50 mm dia welded or flanged construction is to be carried out or as specified in Schedule of quantities.

3.2.4 Hangers and supports shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor, braces, dampener, expansion joint and structural steel to be attached to the building structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultant / Client / Architect.

3.2.5 The piping system shall be capable of withstanding 150% of the working pressure including water hammer effects.

3.2.6 Flanged joints shall be used for connections to vessels, equipment, flanged valves and also on suitable straight lengths of pipeline of strategic points (@ at every 15-20 mtr.) to facilitate erection and subsequent maintenance work.

3.2.7 Excavation for pipe line shall be in open trenches. Pipes shall be buried atleast one meter below ground level and shall have 230 mm x 230 mm masonry supports atleast 300mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand: 8 stone aggregate) of size 380 x 380 x 75 thick resting on firm soil.

3.2.8 Wherever required Contractor shall support all trenches or adjoining structures with adequate supports to prevent land slides.

3.2.9 On completion of testing and painting trenches shall be refilled with excavated earth in 15 cm layers and compacted.

3.2.10 Contractor shall dispose off all surplus earth within the site.

3.2.11 Contractor shall provide suitable cement concrete anchor blocks for overcoming press ure trusts in underground / external pipes. Anchor blocks shall be of cement concrete 1:2:4 mix.

### 4.0 VALVES

4.1 Valves shall be used to start, stop or control flow. Non-return valves shall be provided unidirectional flow.

4.2 Butterfly valve conforming to BS 5155 or as indicated in BOQ will be used for isolation of flow in pipelines. Optionally, gate valves having outside screw rising spindle shall be used and shall be as per IS: 780 / 14846 PN 1.0/1.6, as applicable. For sizes 50mm to 200mm, Butterfly valve shall be as per IS: PN = 1.6 or as specified in Schedule of quantities. Non-return valves shall be swing check/spring operated type. An arrow mark in the direction of flow shall be marked on the body of the valve. These valves shall conform to IS:5312 for swing type or API 596/598 for spring type check valves

4.3 Valves below 50 mm size shall have screwed ends while those of 50 mm and higher sizes shall have flanged connections. Drain lines will have locks for draining.

### 5.0 INTERNAL HYDRANT:

Internal hydrant shall be provided at each landing or at suitable location consisting of single

/ twin headed gunmetal landing valve as indicated in BOQ with 63 mm dia oblique female instantaneous pattern with caps & chains. Outlet and 80 mm inlet (IS: 5290-1969) with separate shut off valve. Landing valves shall be 63 mm dia. oblique female instantaneous pattern with caps and chains. Landing valves shall be of gunmetal and fitted with instantaneous coupling conforming to IS: 901. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS: 318-1962. The valve spindle shall be of brass rod conforming IS: 320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969. The coupling shall be fitted with an internal plug secured by chain landing valves shall be installed on hydrant riser at a height of

1.0 to 1.2 meter from the floor level.

Each internal hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with nozzle conforming to IS:903.

#### 6.0 HOSES

Hoses pipes shall be of fabric reinforced rubber lines as per IS:636 Type II or canvas hose as per IS:4927, with nominal size of 63 mm and lengths of 15 meter or 7.5 meter, as per quantities specified for in schedule or bill of quantity.

All hose pipes shall carry ISI marking on the body of the hose.

The hose shall have instantaneous spring lock-type coupling on ends. The instantaneous coupling shall be as per IS: 901. It shall be fixed to each other by copper rivets and galvanized M.S. wires and leather bands. All coupling shall be interchangeable with each other, and shall bear ISI markings.

#### 7.0 HOSE CABINETS ( HOSE BOX )

Each hydrant shall be housed in a Hose cabinet of suitable size. The hydrant cabinet shall hold double / single headed hydrant as specified, 2 hoses and one branch pipe as required. Internal hydrants shall normally fit the size of the niche made for it. The cabinet shall be of minimum 16 SWG M.S. sheet with centre opening, double glass front doors (cleat glass of 4mm thickness). The glass shall be firmly fixed by means of steel clips and screw with rubber beading. Hinges shall also be screwed and not welded. The corner members (frame) shall be of 25 x 25 x 3 mm thick angle. The hose box shall be firmly fixed to the wall/support by means of brackets and dash fasteners. The steel work shall have one coat of primer and two coats of red paint. The words "Yard Hydrant", "Hydrant" etc. should be painted in white or red on the glass in 75 mm high letters. The hose box shall be lockable for internal hydrant installation.

#### 8.0 HOSE REEL

The hose reel shall be directly tapped from the riser through a 25 / 32 mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The hose reel shall be swinging type (180degrees) and the entire drum, reel etc. shall be as per IS: 3876 and IS: 884. The rubber tubing shall be of best quality and the nozzle shall be shut off type.

#### 9.0 BRANCH PIPES

Branch pipe shall be of either gun metal or aluminium and should conform to IS: 903. One end of the branch pipe will receive the coupling while the other end shall have a nozzle screwed to it. It shall bear ISI marking.

#### 10.0 YARD / EXTERNAL HYDRANT

Yard or External Hydrants shall be as per IS: 908 and the valve as per IS:5290. The hydrant shall consist of stand post assembly and a masonry base 200 mm X 200 mm X 200 cm high and shall be made at the point where it comes out of the soil. The valve shall complete with hand wheel, quick coupling connection spring and blank cap. The hydrant shall be laid on 150 dia. or as mentioned in BOQ.

Yard or External hydrant shall be controlled by a cast iron sluice valve. Hydrant shall have oblique female instantaneous pattern 63 mm diameter outlets with caps and chains. The hydrant shall be of gunmetal and flange inlet and single outlet conforming to IS: 5290, a duck foot bends and flanged riser of required height to bring the hydrant to level above ground. The valve body, stop valve, check valve, nut, instantaneous female outlet and blank cap shall be of leaded-tin bronze conforming to Grade-II of IS:318-1962. The valve spindle shall be of brass rod conforming IS:320 - 1962. The hand wheel shall be mild steel or cast iron washers gaskets shall be of rubber conforming to IS:638 - 1965 or leather conforming to IS:581 : 1969.

Each external hydrant shall be provided with two nos. 63 mm. Diameter 15 mtr. Long hose pipe with gunmetal male and female instantaneous type coupling, machined wound with G.I. wire hose of IS 636 type A and couplings to IS:903 with IS certification, gunmetal branch pipe with 20 mm nozzle conforming to IS:903.

#### 11.0 VALVE CHAMBERS

A valve chamber shall be brick masonry chamber in cement mortar 1:5 (1 cement: 5 coarse sand) on cement concrete foundation 150 mm thick foundation 1:5:10 mix (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size), 15 mm thick cement plaster inside and outside finished with a floating coat of neat cement inside with cast iron surface box approved by fire brigade including excavation, back filling, complete. The wall shall be 230 mm thick with heavy duty ISI marked C.I. manhole covers.

#### 12.0 FIRE BRIGADE INLET CONNECTION

A fire brigade inlet connection with a non-return valve shall be provided to facilitate the fire brigade to pump water into the installation by the use of their own equipment. Four way or 150 mm dia connection to the system shall comprise of four instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 150 mm dia. sluice valves, non- return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

Two way or 100 mm fire brigade inlet connection to the system shall comprise of two instantaneous pattern 63 mm dia. male inlets shall be with caps and chains complete with 100 mm dia sluice valve, non-return valve housed in a M.S. cabinet with glass fronted door. The cabinet shall be suitable for recess mounting.

#### 13.0 SYSTEM DRAINAGE

The systems shall be provided with suitable drainage arrangements with MS piping of 50 mm dia. complete with all accessories, and provided with drain valve.

#### 14.0 HYDRANT SYSTEM

14.1 The hydrant system shall comprise of AC motor driven pump sets. Diesel pump, Jockey pump etc. with all required accessories including valves, appurtenances, instrumentation and controls etc. complete in all respects. The system shall cover the entire area from independent pipe work from the fire water pump set. The hydrant work shall remain pressurized through the proposed Jockey pump taking care of any leakages in the system pipelines and valve glands. All pumps / motors / engines to be of makes approved by local Fire Authority.

14.2 The hydrant system shall be kept charged by pressurized water at approximately 7.5 Kg/cm<sup>2</sup> at all times. In the event of fire when any of the hydrant valves in the net work is opened, the resultant fall in header pressure should enable starting the Electric Motor driven fire water pumping set through

pressure switches automatically. One Diesel Engine / DG set driven pump shall be a stand-by pump serving hydrant system & sprinkler both. In case of failure of electricity or failure of Elec. Pump to start on demand, the stand-by DG set operated pump shall automatically take over. Apart from the automatic starting of the pump sets, provision shall be kept for manual starting also. However shifting down of the pump sets shall be manual.

14.3 The hydrant system in the yard shall be furnished with external hydrants consisting of landing valves (positioned approx. one meter above ground level) fitted M.S. (Heavy) flanged single headed stand pipes installed on underground hydrant headers distributed 45 M apart approximately or as marked on the plan.

The entire system including all pumps, motors, diesel pump set and panels shall be of approved make by TAC / Local Fire Authority.

## 15.0 SPECIFICATION FOR PUMPS AND ANCILLARY EQUIPMENT

### 15.1 SCOPE OF WORK

15.1.1 Work under this section shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely install electrically operated pumps for fire hydrant installations as required by the drawings and specified hereinafter or given in the schedule of quantities.

15.1.2 Without restricting to generality of the foregoing the pumps and the ancillary equipment and shall include the following:

- a) Electrically operated pumps having twin outlets with motors base plate and accessories.
- b) Pump suction and delivery headers, valves, air vessel and connections.
- c) Pressure gauges / pressure switch.
- d) Only single point 3 phase supply will be made available to the Contractor. From there, all provision viz. Electrical switchboard, wiring, cabling, cable tray, control panel, earthing, etc. shall be made.

### 15.1.3 GENERAL REQUIREMENT

- a) Pumps shall be installed true to level on suitable concrete foundations. Base plate shall be firmly fixed by foundation bolts properly grouted in concrete foundations.
- b) Pumps and motors shall be truly aligned with suitable instruments.
- c) The pump shall have single suction & twin discharge connection
- d) All pump connections shall be standard flanged type with appropriate number of bolts.
- e) Manufacturer instructions regarding installation connections and commissioning shall be followed with respect to all pumps, switchgear and accessories.

### 15.1.4 FIRE AND JOCKEY PUMPS

- a) The main Fire hydrant & Sprinkler pumps shall be End Suction Back Pull Out type while Jockey pumps shall be of Centrifugal Monoblock Pump type having following specifications.

- b) Shut off head should not exceed 140% of rated head. Pump shall not develop less than 65% of rated head at 150% of rated capacity.

**MATERIALS OF CONSTRUCTION**

Part Material

Casing Cast Iron

Impeller Bronze IS:318, Gr. LTB 2

Casing Wearing SS

Shaft AISI – 410 / Stainless Steel

Shaft Sleeve S.S. 316

Stuffing Box Gland Packed

- c) Pumps shall be provided with pressure gauge with isolation cock on the delivery side.
- d) In case of motor driven pump the motor rating should be adequate to drive the motor rating should be adequate to drive the pump at 150% of rated discharge.
- e) The pump and its prime mover (Electric motor or Diesel Engine) shall comply with all the equipment of the Rules of the Traffic Advisory Committee.
- f) All pumps shall have positive suction & shall be provided with suction strainer of SS & CI bell mouth. In case of negative suction suitable priming arrangement shall be provided.
- g) All the pumps shall have single suction & twin discharge connections i.e. low pressure & high pressure to serve designated lower & higher floors respectively as per drawing.

**A) JOCKEY PUMP**

Starting and stopping of Jockey Pump set shall be automatic at predetermined levels through pressure switch. However, arrangements for manual start and stop of the pump shall also be made. Jockey Pump shall take care of small leakages in the piping system and pumps cushion tanks. Jockey pump shall have also single suction & twin discharge connections.

**B) ELECTRIC DRIVEN**

Electrically driven pumps shall be provided with totally enclosed fan cooled, foot mounted, squirrel cage induction motors suitable for fire pumps with IP-55 enclosure.

The motors should be rated not to draw more than 4.5 times the starting current.

Motors shall be atleast equivalent to the horse power required to drive the pump at 150% of its rates discharge.

The motors shall be wound for class-F insulation and windings shall be vacuum impregnated with heat and moisture resisting varnish, glass fiber insulated.

C) DIESEL ENGINE

- a) Diesel engine shall have suitable no. of cylinders with individual heat assemblies. The engine shall be water cooled and shall include heat exchanger and connecting piping strainer, isolating pressure reducing valves, bye-pass line, exhaust pipe, silencer, day tank for fuel all interconnected piping etc., complete in all respects.
- b) Engine shall be direct injection type with low noise and exhaust omission levels,
- c) The speed of engine shall match the pump speed for direct drive.
- d) The engine shall be capable of being started without the use of the wicks, cartridge heater plugs or either at engine room temperature of 4°C and shall take full load within 15 seconds from the receipt of the signal to start.
- e) The engine shall effectively operate at 46°C ambient temperature at 150 meter above mean sea level.
- f) Engine shall be suitable for running on high speed diesel oil.
- g) The system shall be provided with a control panel with push button starting arrangement also wired to operate the engine on differential pressure gauge.
- h) The entire system shall be mounted on a common structural base plate with anti- vibration mounting, Dunlop make, and flexible connections on the suction and delivery piping.
- i) Contractor provide one fully mounted and supported Day Oil Tank fabricated form 6mm thick MS sheet electrically welded for 8 hours working load and having suitable capacity of oil. Provide level indicators – low level and full level in the Day Oil Tank on the control panel through float switches and an breather. Day Oil Tank shall also be provided with filling connection (Threaded) with cap, gauge glass indication and cocks, drain cock, inspection / cleaning cover with gasket and nuts / bolts. MS dyke to hold 150% of the Day Tank capacity to be built around the Day Tank.
- j) Contractor to provide one exhaust pipe with suitable muffler (residential type) to discharge the engine gasses to outside in open air as per site conditions (Contractor to check the site).
- k) Contractor to provide all accessories, fittings and fixtures necessary and required for a complete operating engine set. The exhaust pipe shall be taken outside the building with minimum number of bends (approx. length 30 Meters) and shall be duly heat insulated with 50mm thick glass wool covered with 24 gauge aluminum cladding.
- l) Contractor shall indicate special requirements, if any, for the ventilation of the Pump Room.

Noise & Vibration level of the pump driven by motor/engine shall be within the acceptable limits of ISO 2372, IS 11727.

15.1.5 BOOSTER PUMP (Not Applicable)

A booster pump shall be provided at terrace to pressurize the wet riser system. The pump shall be centrifugal end suction / monoblock type.

#### 15.1.6 BASE PLATE

Pumps and motors shall be mounted on a common structural base plate and installed as per manufacturer's instructions.

#### 16.0 CUBICLE TYPE SWITCH BOARD/L.T. PANEL

Cubicle type switchboards and components shall conform to the requirements of the latest revision including amendments of the following codes and standards.

IS: 8623 Specification for factory built assemblies of switchgear and control gear for voltage upto and including 1000V AC / 1200V DC.

IS: 4237 General requirements for switch-gear and control-gear for voltage not exceeding 1000-V.

IS: 2147 Degree of protection provided by enclosure for low voltage switch-gear and control-gear.

IS: 1018 Switch-gear and control-gear selection/installation and maintenance. IS: 6005 Code of Practice for phosphating of iron and steel.

IS: 13947-1993/Air circuit breaker / moulded case circuit breaker. IEC 947 - 1989

IS: 1248 Direct acting indicating analogue electrical measuring instruments and testing accessories.

IS: 2705 Current transformers for metering and protection with classification Part - I, burden and insulation. II & III 1964

#### 17.0 AIR CUSHION TANK

Every wet riser shall be provided with an air cushion tank at its top most point. The air cushion tank shall be provided with an automatic air release cock, 20 mm dia. drain pipe, drain valve and shut off valve.

#### 18.0 PRESSURE GAUGE

All pressure gauges shall be dial type with Borden tube element of SS 316. The dial size shall be of 150 mm diameter and scale division shall be in metric units marked clearly in black on a white dial. The range of pressure gauge shall be 0-10 kg.sq.cm or as specified in BOQ. The pressure gauges shall be complete with isolation cock, siphon tubing, etc.

#### 19.0 PRESSURE SWITCHES

19.1 The pressure switch shall be industrial type single pole double throw electric pressure switch designed for starting or stopping of equipment when the pressure in the system drops or exceeds pre set limits. It shall comprise of a single pole change over switch, below element assembly and differential spindle.

19.2 All pressure switches shall have ¼" BSP (F) inlet connection and screwed cable entry for fixing cable gland. All control cabling shall be provided.

#### 20.0 SPRINKLER HEADS



Sprinkler heads shall be provided at approximate spacing so as to cover 12 sq.mtr. per sprinkler head in case of ordinary hazard for basement having car parking area. The spacing shall however be in uniformity with the drawings and properly coordinated with electrical fixtures, ventilation ducts and grilles and other services along the ceiling. Sprinkler heads shall be gunmetal quartz bulb type with a temperature rating of 68°C. Sprinkler heads shall be of upright conventional type with fusible link for operation. Sprinkler head shall be approved by the under writers Laboratories (U.L.) or Fire Officers Committee (FOC). The finish shall be as specified in bill of quantities.

Contractor shall install cabinet (fabricated from 16 Gauge M. S. sheets with lockable glass shutters. Shelves for keeping spare sprinklers and spanner at locations approved by the Engineer-in-Charge and given in the schedule of quantities. The contractor shall also give required tools for removing and fixing of different types of sprinkler free of cost as directed by Engineer-in-Charge.

## 21.0 SPRINKLER SYSTEM

### 21.1 GENERAL:

To supply, install, testing and commissioning of sprinkler system as per drawing and Sprinkler heads spacing shall be in conformity with the drawings and properly coordinated in reflected ceiling with electrical fixtures, ventilation ducts and grills and other services along the ceiling.

Sprinkler heads shall be brass / gunmetal with quartz bulb with temperature rating of 68 degree celsius. Sprinkler heads shall be of type and quality approved by the local fire brigade authority. The inlet shall be screwed. Sprinkler heads shall be pendent, recessed or special side type. All sprinklers shall conform to the specifications given by TAC, IS, NFPA, FOC, UL & FM.

### 21.2 UPRIGHT TYPE SPRINKLER HEAD

Sprinkler heads shall be quartzite bulb type with bulb, valve assembly, yoke and the deflector. The sprinkler shall be of approved make and type with 15 mm nominal diameter outlets.

The bulb shall be made of corrosion free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall be shatter when the temperature of the surrounding air reaches at 68 c. Upright sprinklers shall be considered for basement.

The nominal bore shall 15 mm diameter and colour of liquid shall be as per temperature rating.

### 21.3 FLOW SWITCH

Flow switch shall have a paddle made up of flexible material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle / pipe through a connecting socket. The switch shall be potential free in either NO or NC position as required. The switch shall be able to trip and make/ break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Fire alarm panel. The seat shall be of stainless steel. The flow switch shall have IP: 55 protections.

The flow switch shall work at a minimum flow rate of 100 LPM. Further, it shall have a retard to compensate for line leakage or intermittent flows.

### 21.4 BUTTERFLY VALVE

The Butterfly valve shall be suitable for waterworks and tested to minimum of 16 kg/sq cm Pressure. The valves shall fulfill the requirements of BIS(Indian Standard)BS: 5155 or AWWA C 504, API 609 and MSS-SP-67.

The body shall be of cast iron to IS: 210 in circular shape and of high strength to take the minimum water pressure of 10 kg/sq cm. The disc shall be heavy-duty cast iron with anti- Corrosive epoxy or nickel coating.

The valve seat shall be high grade elastomer or nitrile rubber. The valve in closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be of ENB grade carbon steel.

The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

The valve shall be supplied with manual gear operated opening/ closing system by lever.

#### 21.5 DRAIN VALVE

50 MM / or as specified in SOQ diameter MSpice conforming to I.S.:1239 (heavy grade) with 50 mm diameter / or as specified in SOQ gunmetal full way valve shall be provided for drainage of any water in the system in low pockets.

#### 22.0 TESTING OF THE HYDRANT SYSTEM:

22.1 All air shall be trapped from the pipeline through hydrants & air valves. Each section of the pipe shall be slowly filled with the water & allow to stand the water for 2 hours minimum with the ends closed. No joints / connection shall be leaked within this duration. The hydraulic test pressure shall be 1.5 times the design pressure.

22.2 Flushing of underground connections: Underground mains and lead-in connections to system risers shall be flushed before connections made to piping in order remove foreign

materials which may have entered the underground during the course of installation. For hydrant system the flushing operation shall be continued until water is clear.

22.3 Underground mains and lead-in connection shall be flushed at a flow rate of not less than 480 ltrs. per minute.

22.4 Provision shall be made for the disposal of water issuing from test outlets to avoid property damage.

#### 22.5 Acceptance Test

At the time of taking over, the hydrant system shall fulfill the following acceptance tests:-

22.5.1 Starting up of the pressure suction (Jockey Pump) : The pressure switch shall be set at 3.5 kg/cm<sup>2</sup> at the lower limit and 7.5 kg/cm<sup>2</sup> at the upper limit. The system drain shall be opened to cause a drop in the pressure. The Jockey Pump shall start as soon as the pressure gauge needle falls down to 3.5 kg. The Jockey pump shall also stop automatically when the system has been pressurised again upto 7.5kg/cm<sup>2</sup>.

22.5.2 The main electrical pump shall be set to start at 3.5 kg/cm<sup>2</sup>. An external hydrant valve using a single length of hose and branch pipe shall be fully opened to cause a drop of pressure in the system. At first, the jockey pump shall start when the pressure drops from 7 kg. Further, drop in the pressure from 3.5 kg should be allowed to test automatic start-up of the electrical pump. The electrical pump

shall continue to run atleast for 5 minutes and register rise in the pressure upto 3.5 kg the Jockey Pump shall be automatically start at this. The electrical pump shall be stopped manually by pressing the stop button.

22.5.3 After having the system got fully charged at 7.5 kg/cm<sup>2</sup> the external hydrant valve using hose and branch pipe at (ii) above shall be opened. When the pressure has dropped from 3.5 kg/cm<sup>2</sup>, the electric main pump shall come into operation automatically. After the main pump has run for 5 minutes, the power supply in the pump house shall be switched off. The diesel pump shall automatically come into operation immediately.

22.5.4 All these tests mentioned above shall be repeated after one hour interval. The result of all the tests shall be identical again. After the system has satisfactorily withstood the above tests, it can be taken over from the contractor.

### 23.0 START-UP/SYSTEM TESTING

It will be the responsibility of the tenderer to cause interim/stage inspection by the Local Fire Authority LFA/ Chief Fire Officer C.F.O during execution of the work as and when so called for by the Employer / Consultant and shall carry out any rectification / modification as may be suggested by the Local Fire Authority (LFA), Chief Fire Officer (CFO).

Soon after the work is completed, the contractor shall inform the LFA/CFO in writing with a copy to the Consultant/Employer for getting the complete system including all sub system and instrumentation, control etc. thoroughly inspected and tested for satisfactory performance. After satisfactory completion of tests of the systems by the LFA / CFO, the contractor shall be required to submit as built drawings to the Consultant / OWNER which have been so approved.

### 24.0 COMMISSIONING OF SYSTEM

24.1 Pressurised the fire hydrant system by running the main fire pump and after attai required pressure shut off the pump.

24.2 Open bye-pass valve and allow the pressure to drop in the system. Check that the jockey pumps cuts-in and cuts-out at the pre-set pressure. If necessary adjust the pressure switch for the jockey pump. Close bye-pass vavle.

24.3 Open bye-pass valve and allow the water to flow into the fire water tank in order to avoid wastage of water. The main fire pump should cut-in at the preset pressure and should not cut-out automatically on reaching the normal line pressure. The main fire pump should stop only by manual push button. However, the jockey pump should cut out as soon as the main pump starts.

24.4 Switch off the main fire pump and test check the diesel engine driven pump in the same manner as the electrically driven pump.

24.5 When the fire pumps have been checked for satisfactory working on automatic controls, open fire hydrant simultaneously and allow the hose pipe to discharge water into the fire tank to avoid wastage. The electrically driven pump should run continuously for eight hours so that its performance can be checked.

24.6 Diesel engine / DG set driven pump should also be checked in the same manner as given in clause above by running for 8 hours.

24.7 Check each landing valve, male and female couplings and branch pipes for compatibility with each other. Any fitting which is found to be incompatible and does not fit into the other properly, shall

be replaced by the Contractor. Landing valves shall also be checked by opening and closing under pressure.

#### 25.0 HANDING OVER

25.1 All commissioning and testing shall be done by the Contractor to the complete satisfaction of the Engineer-in-Charge / Consultants, and the job handed over to the Client.

25.2 Contractor shall also hand over to the Client all maintenance and operation manuals and all items as per the terms of the contract.

## 14 - TECHNICAL SPECIFICATIONS FOR CCTV SYSTEMS

## Material specification CAMERA

<b>Indoor IR Dome Varifocal Camera, IP Indoor IR Dome Fixed Camera, IP Outdoor IR Bullet Varifocal Camera</b>		
<b>Sr.No.</b>	<b>Feature</b>	<b>Vendor Compliance (Yes/No)</b>
1	The camera shall incorporate a 1/2.8" progressive CMOS/MOS sensor	Yes
2	The camera shall support 1280(H)x960(V) pixels effective with 2.8mm lens <b>(2048x1536)</b>	Yes
3	The camera shall have a minimum illumination of 1 lux in color mode.	Yes
4	Supported Resolutions shall be 1280x960 at 25fps and 720p at 30fps or better <b>(2048x1536)</b>	Yes
5	The Camera shall use H.264/H.265 and MJPEG compression.	Yes
6	Camera should support minimum simultaneous MJPEG and two independent H.264/H.265 high profile streams which are different resolutions	Yes
7	Camera shall incorporate bandwidth management per stream by selecting the particular area in the given field of view of camera to enhance bandwidth optimization.	Yes
8	Angular field of View of camera shall be Horizontal: 185 deg or more	Yes
9	The camera shall feature to transform shadows and dark areas into natural and crisp images in real time.	Yes
10	The camera shall reproduce The camera shall also feature intelligent digital back light compensation, digital wide dynamic range circuit, digital noise reduction and electronic sensitivity-up for real surveillance purposes under severe conditions.	Yes
11	The power source for the camera shall be PoE IEEE 802.3af (2.8W) compliant power device.	Yes
12	The camera shall be able to support uni-cast and multi-cast transmissions.	Yes
13	The camera shall have a built-in web server so that access to the IP video stream can be obtained using Internet Explorer Version 6.0 or better.	Yes
14	The Bandwidth Limit shall be adjustable to from 64 kbps to 4096 kbps or unlimited.	Yes
15	The camera shall be capable of being configured to automatically transmit alarm images transfer via FTP file transfer and/or e-mail. In addition the camera shall support the scheduled transfer of image data via FTP to an FTP server.	Yes
16	The camera shall support following protocols: TCP/IP, UDP/IP, HTTP, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP and SNMP.	Yes

17	The camera shall support IPV4 and IPV6 network addressing.	Yes
18	The camera shall be capable of operating at an Ambient Temperature of 0 degrees C ~ +40 deg Celsius and IP66 rated	Yes
19	Safety/Regulation: CE/FCC	Yes
20	Approve make : Hikvision, Panasonic, Honeywell	Yes
21	The bidders have to submit project specific manufacturer authorization letter (MAF) stating support and right to bid on OEM's behalf for this project. Generic MAF will not be acceptable. Bidders failing to submit the MAF are liable for disqualification.	Yes

Material

Rack mountable 1.5U NVR: Supports up to 32 cameras at 1080p resolution video recording & video playback at real time, with 4 SATA HDD capacity, HDMI & VGA output

<b>VideoRecordingHardware</b>		
<b>Sr.No.</b>	<b>Feature</b>	<b>VendorC ompliance (Yes/No)</b>
1	Main Processor:Dual Core	Yes
2	O.S.:Linux/Windows	Yes
3	Shouldsupportmin32IPcameras	Yes
4	Audio:1channelInput(RCA),1channelOutput(RCA)	Yes
5	DisplayInterface:1HDMI,1VGA	Yes
6	DisplayResolution:1920×1080,1280×1024,1280×7201024×768	Yes
7	OSD:Cameratitle,Time,Videoloss,Cameralock, Motiondetection, Recording	Yes
8	Compression:H.264/H.265MJPEG	Yes
9	Resolution:3Mp(2048×1536)/1080p(1920×1080)/720p(1280×720) /D1(704×480)/VGA(640×480)/CIF(	Yes
10	RecordMode:Manual,Schedule{Regular(Continuous),VMD,Alarm},Stop	Yes
11	RecordingInterval: Recordingduration:1~120min(default: 60min), Pre-record:1~30sec,Post-record: 10~300sec	Yes
12	AlarmAction:Recording,PTZ,Tour,Alarm,VideoPush,Email,FTP, Buzzer&Alarmpop-up	Yes
13	Analytics:VideoMotionDetection, VideoLoss&CameraBlank	Yes
14	AlarmInout:4channel RelayOutputs:2channel	Yes
15	SearchMode:Time/Date,Alarm,VMD&Exactsearch(accuratetosecond),Smartsearch	Yes
16	Playback :Play,Pause,Stop,Rewind,Fastplay,Slowplay,Nexttle, Previous le, Nextcamera,Previouscamera,Fullscreen,Repeat, Backupselection,Digital zoom	Yes

**ClientPC**

17	Backupmode: USBdevice/Network	Yes
18	Ethernet: 1RJ45port(10/100/1000Mbps)	Yes
19	Networkfunction:HTTP,TCP/IP,IPv4/IPv6,UPnP,RTSP,UDP,SMTP,NTP, DHCP, DNS,IPFilter, PPPoE,DDNS, FTP,AlarmServer	Yes
20	MaxUsers:120	Yes
21	Smart PhoneSupportshouldbeavailable	Yes
22	InternalHDD:upto8TBwithmin2slots	Yes
23	ExternalInterface:	Yes
	USB:2ports(1RearUSB3.0,1FrontUSB2.0) RS232: 1 port, ForPCcommunication&Keyboard RS485: 1port, ForPTZcontrol	
24	Safety/EMSStandard: Safety -CE, IEC60950-1 EMC-55022ClassB,EN55024	Yes
25	OperatingTemp:-10°C~+55°C/ OperatingHumidity:10%~90%RH	Yes
26	Approvemade: Hickvision,Panasonic,Honeywell,HP,IBM	Yes
27	The bidders have to submit projectspecificmanufacturerauthorizationletter (MAF) stating support and right to bid on OEM's behalf for this project. Generic MAFwillnotbeacceptable.Biddersfailingtosubmitthe MAFareliablefordisqualification.	Yes



<b>Sr.No.</b>	<b>Feature</b>	<b>VendorC ompliance (Yes/No)</b>
1	Intel Corei7orhigher	Yes
2	8GBofRAMDDR3,	Yes
3	4SATAHDDhard drive( <b>8TBSATA</b> )	Yes
4	1GBPCI-Expressx16dual-headvideoadapter,100/1000Ethernet NetworkInterface Card	Yes
5	16xDVD+/-RWDivealongwithappropriateOperatingSystem	Yes
6	Approvemake:HP,Dell	Yes

**42"LED**

<b>Sr.No.</b>	<b>Feature</b>	<b>Vendor Compliance (Yes/No)</b>
1	Type:LED	Yes
2	Size:42"FlatScreenathighresolution	Yes
3	16:9Aspectcontrol	Yes
4	ViewingAngle:178deg	Yes
5	Resolution:1920x1080FullHDIPSLED	Yes
6	Input: Composite video/AV/VGA/HDMI	Yes
7	ContrastRatio:20000:01	Yes
8	Approved Make:Samsung,Sony,Panasonic	Yes

Material

24p 10/100/1000 MBPS PoE Network Layer 2 manageable Switch

<b>28port10/100L2managedPOEswitchwith4nos10/100/1000gigabitports(ifrequired)</b>			
<b>S.N.</b>	<b>Features</b>	<b>RequiredParameter</b>	<b>Vendor Compliance(Yes/No)</b>
1	10/100baseport	28	Yes
2	10/100/1000 Tport	2	Yes
3	Combo 10/100/1000T/SFPport	2	Yes
4	Switchcapacity	17Gbps	Yes
5	Flash	16MB	Yes
	CPU Memory	128MB	
6	POE Power	375W	Yes
7	Certifications	UL(UL60950),CSA(CSA 22.2),CEmark,FCCPart15 (CFR 47)ClassA	Yes
8	Approved Make	Cisco,Avaya,HP	Yes

Material

12u Network / AV Rack

- It should be able to house all the network switches and recording hardware.
- Approved make : Valrack, APW, Rittal

Material

LAN cable of following size in existing pipe as per direction'[C] CAT – 6

<b>CAT6UTPCables</b>			
<b>Sr. no.</b>	<b>Parameter</b>	<b>Tenderrequirement</b>	<b>VendorC ompliance (Yes/No)</b>
1	ISO/IEC-11801(2edition)ClassD,UL-94V0ratedplastics,RoHScompliance,ANSI/TIA/EIA-568-B.2-1Category6, Extrapolatesupto600Mhz	MustComply	Yes
2	Outerdiameter:6.0mm	Must comply	Yes
3	Cablesshield	Unshielded	Yes
4	Numberof conductors	8	Yes
5	Stranding	4twistedPair	Yes
6	Conductortype	23AWGbare annealed copper	Yes
7	Cablejacketmaterial	PVC	Yes
8	Approved Make	Cisco, R & M, Nortel,3Com,Digilink	Yes

Material

PVC Conduit

- 25mm ISI mark
- Approved make : BPE or Equivalent

## 15 - GENERAL PARTICULARS AND REQUIREMENTS ELECTRICALS

## 1. GENERAL

These specifications shall be read in conjunction with Condition of Contract, Bill of Quantities and Drawings to cover the Supply, Erection, Testing, and Commissioning of Electrical work.

### 1.1 Scope of work

The general character and the scope of work to be carried out under this contract are illustrated in Drawings, Specifications and Schedule of Quantities. The Contractor shall carry out and complete the same work under this contract in every respect in conformity with the contract documents and with the direction of and to the satisfaction of the Engineer. The contractor shall supply all labor, materials and equipment as required and specified for supply, Installation, Testing, Commissioning and Handing Over of the complete Electrical System. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings / Documents as being furnished or installed but which is necessary and customary to be performed under this Contract.

The Supply Authority will terminate their supply feeder in the HT metering panel from where the scope of this tender starts including installation of the Metering Panel.

The electrical Work mainly comprises of but not limited to –

- LT Power Distribution
- Light, FAN & Plug Point
- Cables and Wires
- SITC of Section Pillar, PCC Panel etc.
- Earthing System
- Light Design As per Lux Level Requirement & Execute accordingly.
- Get Permission of Concern Authority to Finished Work
- Liasoning Work for Power Supply

For execution of entire system, following are included in the Contractor's scope of

work as well as in the rates quoted by them -

- Prepare Light Design As per Lux Level Requirement, Finalize it with GMC Department Executive & PMC, Execute tender items as per final & approved design. Get Permission of Concern Authority to Finished Work, Get Power Supply from concern Electricity Board and complete Liasoning Work needed for it.
- Prepare Shop drawings / As built drawing and submit in 5 no. of sets.
- List of recommended spares, as installed drawings, operation and maintenance manual for the Electrical work.
- All major Civil / Structural works for Stadium Mast. Minor Civil works like excavation for trenches / underground pipes / conduits pedestal supports, chasing in the wall / ceiling or making hole in the RCC floor / ceiling or in brick wall for piping, Cables, Supports, grouting etc. including making good after completion or any other minor civil works required in connection with the installation of the systems are in Contractors scope.

## 2 Electrical Operation Considerations

- The design ambient temperature shall be considered as 45°C unless otherwise specified.
- The relative humidity shall be considered as 90%
- The system voltage and frequency variations shall be as given below:

- Voltage + 5% Frequency : + 3%
- Combined voltage and frequency variation will not exceed 8%
- Under transient conditions voltage variation may be – 20% or + 10% of nominal voltage, this shall have no consequence on equipment operation
- Seismic Zone : Zone III
- Hot, Arid and Dry Climate.

#### 2.1 Bye-laws and Regulations.

The installation shall be in conformity with the Bye-laws. Regulations and Standards of the Bureau of Indian Standards. Latest Rules of Local Authorities and other statutory boards concerned shall also become applicable to the Installation. The cost of Inspector and approval of statutory authorities as and when required from

commencement of work to completion of work shall be borne by the contractor except the statutory fees for permanent work.

#### 2.2 Shop Drawings / As-Built Drawings

Shop drawings / As-built drawings are to be prepared by the Contractor as stated in Scope of Work.

#### 2.3 Material and Equipment

All materials and equipment shall in general have ISI Mark whichever available. The valid ISI certificate wherever available along with manufactures test certificate to be submitted before or along with dispatch of materials. Make shall be strictly in conformity with the list of approved manufacturers.

#### 2.4 Manufacture Instructions

Where manufacturer has furnished specific instructions, relating to the material and equipment used in this project covering points not specifically mentioned in these documents, such instructions shall generally be followed in call cases. The specific requirement should be brought in to the notice of Engineer for their decisions.

### 3. Inspection and Testing

The Owner may carry out inspection and testing at manufacturer's works for this contract. NO equipment shall be delivered without prior written confirmation from Architect / Engineer. In case factory inspection is carried out, then all traveling and lodging expenses shall be borne by the Owner. However, all expenses related to testing shall be to Contractors account. Tests on site of complete works shall demonstrate the following among others.

That the equipment installed complies with specification in all respects and is of the correct rating for the duty and site conditions.

That all items operate efficiently and quietly to meet the specified requirements. That all electrical circuits are correctly protected and that protective devices are properly co-ordinate.

The contractor shall provide all necessary instruments and labor for testing shall make adequate records of test procedures and readings shall repeat any tests requested by the Architect / Engineer and shall provide test certificate signed by a property authorized person. Such test shall be conducted on all materials and equipment and tests on completed work as called for by the Architect / Engineer at

contractor's expenses unless otherwise called for.

If it is observed that the installation or part thereof is not satisfactorily carried out. Then the contractor shall be liable for the rectification and re testing of the same as called for by the Architect / Engineer decision as to what constitutes a satisfactory test shall be final.

The above general requirement as to testing shall be read in conjunction with any particular requirements specified elsewhere. All tests shall be carried out by a test house approved by the Architect / Owner.

### 3.1 Samples

The Contractor shall be required to have samples of various materials to be kept at site after approval by the Architect / Engineer.

### 4. Measurements

All measurements shall be as specified in Technical Specification or BOQ. In absence of any such method of measurement in the said documents, relevant IS Codes or any other approved standard shall be followed.

4.1 Bidders shall furnish the Technical Data Sheet as specified hereinafter.

## TECHNICAL SPECIFICATION ELECTRIC WORK

### SR NO 1. LT SWITCHGEAR PANEL

#### 1.1 Scope

This specification covers the design, material, construction features, manufacture, supply, inspection and testing at the manufacturer's works, delivery and performance testing of L.T. Switchgear panel of voltage not exceeding 1000 V AC.

The switchgears would comprise of LT switch boards, power panels, control panels and Distribution Boards (DBs) required for the supply of power to the medium voltage equipment.

#### 1.2 Codes & Standards

The design, construction, manufacture and performance of equipment shall conform

to latest applicable standards and comply with all currently applicable statutes, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the VENDOR of this responsibility.

Equipment shall conform to the latest applicable Standards as mentioned. In case of conflict between the Standards and this specification, this specification shall govern.

All components shall be of reputed/ approved make and subject to Client's approval.

#### 1.3 Tests

A. All tests shall be conducted in accordance with the latest edition of IS:2834 and as applicable for the controls.

B. Type test certificates for similar capacitor units shall be furnished.

#### 1.4 Constructional Features

A. Switchgear panel shall be

- (a) of the metal enclosed, indoor, floor mounted modular type
- (b) made up of the requisite vertical sections
- (c) of dust and vermin proof construction
- (d) provided with a degree of protection

- (e) easily extendable on both sides by the addition of vertical section after removing the ends covers.
  - (f) provided with a metal sill frame made of structural steel channel section properly drilled for mounting the Switchgear along with necessary mounting hardware. Hardware shall be zinc plated and passivated.
  - (g) provided with labels on the front indicating the switchgear designation.
  - (h) provided with cable entry facilities at top and bottom with 3 mm thick removable gland plates and necessary cable glands.
  - (i) of uniform height of not more than 2200 mm
  - (j) of single front execution
  - (k) provided with gaskets all round the perimeter of adjacent panels, panel and base frame, removable covers and doors.
  - (l) provided with busbars running at the top or bottom, as required, all along the length of the switchgear in a separate sheet steel enclosure.
- B. Operating devices shall be incorporated only in the front of the Switchgear.
- C. The switchgear shall be provided into distinct vertical sections each comprising :
- (a) A completely metal enclosed busbar compartment running horizontally.
  - (b) Individual feeder modules arranged in multi tier formation.
  - (c) Enclosed vertical bus bars serving all modules in the vertical section.
  - (d) A vertical cable alley covering the entire height.
  - (e) A horizontal separate enclosure for all auxiliary power and control buses, as required, shall be located so as to enable easy identification, maintenance and segregation from the main power buses. Tap-off connections from these buses shall be arranged separately for each vertical section.
  - (f) Each vertical section shall be equipped with space heaters which may be located in the cable alley.

Current transformers shall not be directly mounted on the buses. Current transformers on circuit breaker controlled circuits shall be mounted on the fixed portion of the compartment. In breaker compartments, suitable barriers shall be placed between circuit breakers and all control, protective and indication circuit equipment including instrument transformers. External cable connections shall be carried out in separate cable compartments for power and control cables. After isolation of power and control connections of a circuit, it shall be possible to safely carry out maintenance in a compartment with the bus bars and adjacent circuits live. Cable alleys shall be provided with suitable hinged doors. It shall be possible to safely carry out maintenance of cable connections to any one circuit with the bus bars and adjacent live circuits. Adequate number of slotted cable support arms shall be provided for dressing the cables. The withdraw able chassis housing circuit breakers shall be of the fully draw out type.

#### 1.5 Sheet Metal Work

The switchgear frame shall be fabricated using suitable white CIRCA sheets of thickness not less than 2.5 mm.

Frames shall be enclosed by white CRCA sheet of thickness not less than 2 mm smoothly finished, levelled, and free from flaws. Doors and covers shall be made of white CIRCA sheets of thickness not less than 2mm. Stiffeners shall be provided wherever necessary.

The complete structure shall be rigid. self-supporting, free from vibration, twists and bends.

#### 1.6 Painting

All sheet steel parts shall undergo rust proofing process to include degreasing de- scaling and phosphating process with 7 tanks process. The steel works shall then be painted with the two coats



of zinc chromate primer final paint shall be powder coated in approved shade as per relevant IS. Thickness of powder coating shall be 65 microns.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Sq Mtr.

## SR NO 2. CIRCUIT BREAKERS

### 2.1 General

Circuit Breaker shall be :-

- A. of the air break draw out type. electrically operated & mounted along with its operating mechanism on a wheeled carriage moving on guides, designed to align correctly and allow easy movements.
  - B. of the shunt trip type
  - C. provided with mechanically operated targets to show 'Open', 'Closed', 'Service' and 'Test' positions of the circuit breaker.
  - D. provided with mechanically operated, red 'trip' push button, shrouded to prevent accidental operation.
  - E. provided with locking facilities in the 'Service', 'Test', and 'Isolated', positions. In test position the breaker will be tested without energising the power circuits. The breaker shall remain fully housed inside the compartment in the test position.
  - F. provided with 6 NO and 6NC potential free auxiliary contacts, rated 10A at 240V A.C. and 1A (inductive breaking) at 220 V D.C.
  - G. provided with 'red', 'green' and 'amber' indicating lamps to show 'closed', 'open' and 'Auto-trip' conditions of the circuit breaker when breaker operation is controlled by a control switch.
  - H. Circuit breaker closing and trip coils shall be rated for satisfactory operation on a control supply system.
  - I. Closing and trip coil shall operate satisfactorily under the following conditions of supply voltage variation:
    - (a) Closing coils-85% to 110% of rated voltage
    - (b) Trip coils - 50% to 110% of rated voltage
  - J. Conforming to IEC 947 1 & 2.
- Circuit breakers shall be provided with the following interlocks.
- K. It shall not be possible to plug-in a closed circuit breaker, or to draw out a circuit breaker in the closed position.
  - L. It shall not be possible to operate a circuit breaker unless it is in the fully plugged-in, test, or fully isolated position.

### 2.2 Operating Mechanism

- A. Power operated mechanism shall be of the motor wound spring charging stored energy type. The closing action of the circuit breaker shall charge the tripping spring ready for tripping. Speed of closing of contacts shall be independent of the speed with which the handle is operated. All stored energy mechanisms shall be provided with mechanical indicators to show the 'charged' and 'discharged' conditions of the spring.
- B. Circuit breakers provided with stored energy operating mechanisms shall be provided with the following interlocks. The circuit breaker shall not close unless the spring is fully charged. Shocks, vibrations, or failure of springs shall not operate the breaker or prevent intended tripping.

C. Power operated mechanism shall be provided with a universal motor suitable for operation on DC. control supplies with voltage variation from 85% to 110% rated voltage, designed to enable a continuous sequence of closing and opening operation as long as power is available and at least one opening

operation on power supply failure, provided with emergency manual charging facilities, provided with facilities for remote panel Closing & opening operations.

D. The control scheme will be as follows for remote control:

E. All spare potential free contacts of all ACBs, MCCBs and contactors in main LT panel shall be wired up to the terminal block of individual module.

F. Spring charging time for power operated mechanism shall not exceed 15 seconds. Power operating mechanism shall be provided with the following additional features. Closing of the circuit breaker shall automatically initiate recharging of the spring ready for the next closing stroke. The motor shall be mechanically decoupled as soon as the emergency manual charging handle is coupled. The circuit breaker mechanism shall make one complete closing operation once the control switch has been operated and the first device in the control scheme has responded even though the control switch is released before the closing operation is complete provided there is no counter trip impulse. Closing controls shall be so arranged that only one closing operation of the circuit breaker shall result from each close initiating impulse, even if the breaker trips while the initiating device is held in the 'close' position. An electrical anti pumping relay shall be provided on the circuit breaker chassis for this purpose, in addition to the mechanical anti pumping feature incorporated in the circuit breaker.

### 2.3 Protection Coordination

The circuit breaker shall be provided with microprocessor based overload, short circuit and earth fault protection releases, each with a wide setting range integrated in one module.

The microprocessor based trip units shall be provided with following features:-

A. designed to withstand tough industrial environments i.e. high ambient temperatures, switching surges, electromagnetic interferences, vibrations and switching areas.

B. reliably self-powered by built in current transformers.

C. Motor setting shall be provided with 20 m sec delay to eliminate nuisance tripping caused by high peaks during motor start. It shall also provide single

phasing protection.

D. LED display indication of each of over load, short circuit and earth fault.

E. Integrated test button to check the healthiness of trip unit electronics and associated CT circuits without tripping the breakers.

F. Alarm display for microprocessor fault.

G. Query feature to indicate tripping cause upto 48 hours after instant of tripping without back up supply.

H. Other features such as switchable zone scheme memory, opto-coupled outputs for remote signaling of a trip cause, switchable thermal memory, over temperature indication, communication capability.

It shall be the responsibility of the VENDOR to fully co-ordinate the overload and short circuit tripping of the circuit breakers with the upstream and downstream circuit breakers/fuses/motor starters. to provide satisfactory discrimination.

#### 2.4 Moulded Case Circuit Breaker

MCCB shall be capable of breaking short-circuit currents up to levels as specified in Bill of Quantities / Drawing.

Moulded case circuit breakers shall be made of insulating case and cover made of high strength, heat resistant and flame-retardant thermosetting insulating material conforming to IEC 947 Part 2 of 1989, BS 3871, 1965 or other applicable standards.

The switching mechanism shall be quick make/quick-break type with double break contact system utilizing a trip free toggle mechanism. The handle position shall give positive indication of whether the breaker is ON (top), OFF (down) or TRIP (midway). For overload protection, three bimetal magneto-thermal release and electromagnetic releases for short circuit protection to be provided. The magneto-thermal release shall be variable and direct acting. All releases shall operate on a common trip bar so that all phases are disconnected in the event when fault occurs even on only one of them. The tripping mechanism shall be of an inverse time characteristics to prevent tripping on temporary overloads and shall not be affected by normal variation in ambient temperature.

The terminals shall have sufficiently large dimensions to accept links or cable lugs of suitable sizes. These shall be of a reputable manufacturer.

#### 2.5 Switches /Miniature Circuit Breakers (MCB)

A. Switches/MCBs shall be hand operated, air break, quick make, quick break type conforming to applicable standards.

B. The switch shall be protected by fuse and the MCB shall be provided with overload/short-circuit protective device for protection under overload and short-circuit conditions. The switch action shall be trip free to inhibit closing under fault conditions. All brass parts shall be electroplated and all steel parts cadmium plated and all contacts silver plated. The minimum breaking capacity of MCBs shall be 10 kA r.GI. at 415V/220V D.C.

C. Switch shall have provision for locking in both fully open and closed positions. MCBs shall be provided with locking facility.

D. The connections between switch and fuse shall be insulated and all live connections shall be shrouded.

E. Miniature circuit breakers shall be as specified elsewhere or approved. Each miniature circuit breaker shall be provided with spring-washer at each cable termination.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

#### SR NO 3CABLE TRAYS & RACEWAYS

##### 3.1 Scope

This specification covers the design, manufacture, testing at works, inspection and delivery at site of cable trays.

##### 3.2 General

It is proposed that cables to be laid in the basement and vertical service shafts but not within lift shafts) will be laid on suitable cable trays.

Power and data wiring to Workstation receptacles shall be through conduits up to the nearest wall. It shall drop to FFL concealed in ceiling or boxed in an aesthetically pleasing enclosure. Wiring up to workstation shall run in raceways.

### 3.3 Constructional Features

#### 3.3.1 Material

The cable trays are to be manufactured from 2mm thick cold rolled sheet steel. The same shall be shaped and cut using power driven dies/ cutters/ presses to the specified sizes and bolted/ together to form a standard length of cable tray and its accessories.

#### 3.3.2 Finishing

The manufactured trays and all the accessories should undergo seven tank treatments and should be hot-dip galvanized as per BS-2629 The zinc coating of 60 microns has to be uniformly guaranteed The trays will be tested for this at site at random and the contractor should make available at site Alcometer (or approved equivalent meter) for carrying Out the test at site. The owners reserve the right to at random inspect the trays being manufactured at the manufactures factory.

The width of the cable trays is specified in the schedule of quantities. The other details will be as shown in the drawings.

GI coupler plates with GI Jointing hardware is to be included in the rates of the contractor.

In case of GI perforated tray of width 150mm the height of the side walls shall be 50mm.

The following accessories are also to be supplied and installed by the contractor and the cost of the same is to be included in the rates for straight lengths to be quoted in the schedule of quantities.

Couple plates and hardware (as stated above).

(a) Vertical elbow up

(b) Reducer

(c) Horizontal Tee

(d) Horizontal Cross Piece

(e) Horizontal Elbow

(f) Vertical Elbow Down

(g) Providing cold galvanized paint touch up at site wherever trays, accessories and supports are cut/ drilled after hot dip galvanizing.

#### 3.3.3 Bends

The trays should have radius so as to enable a bending radius of 12 x Dia. of largest cable to be laid in the tray.

#### 3.3.4 Supporting Steel Work For Trays

Supporting structural steel members to be made from 50mm x 50mm x 6mm GI. angles, 50mm x 6mm GI. flats for trays of width 600mm & above and 40mm x 40mm x 6mm GI. angles, 40mm x 6mm GI. flats for trays of width less than 600mm and GI. channels duly hot dip galvanized. In general on horizontal runs cable trays of width > 600mm & above will be supported at every 1 Mtr. and trays of smaller width be supported at 1.2 Mtr intervals. In vertical runs the trays should be supported at every 1 Mtr interval. Every horizontal bend will also be given an extra support.

### 3.3.5 Measurement

The installed trays and accessories will be measured at the central axis of the tray and bends. Bends, reducers, elbows, coupler plates, hardware & steel supports will not be measured separately.

### 3.3.6 Floor Raceway

Floor raceway of hot dip galvanised / aluminium sheet of 14 g / 2.0 mm shall be used and the dimensions for the same shall be as per the BOQ. The raceways shall be as per the make specified in the tender, The raceways shall be free of any sort of welding edges or other sharp edges to protect cutting of wires during pulling. The raceways shall be laid with use of junction boxes fabricated from 14 g hot dip GI as per drawing.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Rmtr.

## SR NO 4EARTHING

### 4.1 Scope

This specification covers the supply, installation testing and commissioning of the Earthing system.

### 4.2 Standards

- A. IS 62305 2010 - Code of Practice for the protection of buildings and allied structures against lightning
- B. IS: 3043 (1987) - Code of Practice for earthing
- C. Indian Electricity Rules 1956
- D. Indian Electricity Act 1910
- E. CEIG Regulations

### 4.3 General Requirement

Complete earthing system comprising earth electrodes in conjunction with earth grid shall be provided for the substation and control room for achieving a safe step and touch potential. The exact location of Earth Bus/conductor, earth electrodes and earthing points on the equipment shall be determined at site in consultation with the contractor. Any change of methods, routing and size of conductor shall be subject to approval by the contractor.

#### 4.3.1 Details of Earthing System:

- A. Main Earth Grid- 50 x 6mm GI Flat
- B. Power Transformer Neutral - 50 x 6mm Cu. Flat
- C. Transformer Body - 50 x 6mm GI Flat
- D. Equipment to Main Grid- 25 x 6mm CI Flat
- E. DBs/Junction Boxes - 8 SWG GI Wire
- F. Lightning Protection - 1 x 70 mm Cu flexible

#### 4.3.2 Earth Electrodes in Earth Pits Plate Earthing

Plate electrodes of G.I. shall be 600 x 600 x 6mm. thick and of copper shall be 600 x 600 x 3mm. thick unless otherwise specified.

Earth bus is a Copper/G.I. strip or flat of specified size interconnecting all earth electrodes. This will be laid throughout the length of electrical shaft (2 nos. per shaft).

#### Chemical Earthing Electrode

Supplying & erecting earth pit of minimum bore dia.150mm size approved make

Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free G.I.Pipes having Outer pipe dia of 50mm having 80-200 Micron galvanising, Inner pipe dia of 25 mm having 200-250 Micron galvanising, connection terminal dia of 12mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation.

Length of Pipe : As per mentioned in BOQ

Back filling Compound : As per mentioned in BOQ or Required to achieve desire resistance level.

#### 4.3.3 Artificial Treatment of Soil

If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance to earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by adding sodium chloride, sodium carbonate, copper sulfate, salt and soft coke or charcoal in suitable proportions.

#### 4.3.4 Resistance to Earth

The resistance to each earthing system shall not exceed 1.0 ohm.

#### 4.3.5 Earthing Station

##### Plate Electrode Earthing

A. Earthing electrodes shall consist of a galvanized iron plate not less than 600mm x 600mm x 6mm thick or copper plate not less than 600mm x 600mm x 3mm thick, as called for in the schedule.

B. The plate electrode shall be buried as far as practicable below permanent moisture level but in any case not less than 2.5 mtrs. below ground level.

C. Earth Electrode shall not be installed in proximity to a metal fence. It shall be kept clear of the building foundations and in no case shall it be nearer than 2 mtrs. from the outer face of the wall.

D. The earth plate shall be set vertically and surrounded with 150 mm. thick layer of charcoal dust and salt mixture. 20mm.G.I. pipe shall run from the top edge of the plate to the ground level.

E. The top of the pipe shall be provided with funnel and a mesh for watering the earth through the earth. The main earth conductors shall be connected to the electrode just below the funnel, with proper terminal lugs and check nuts. The funnel over the G.L pipe and earth connections houses in a masonry chamber, approximately 350mm. length x 300mm. wide and 300mm. deep. The masonry chamber shall be provided with a cast iron cover resting over a C.I. frame embedded in masonry.

#### 4.4 Earthing Layout

Earthing conductors in outdoor areas shall be buried at least 600mm below finished grade level unless stated otherwise.

Wherever earthing conductors cross cable trenches, underground service ducts, pipes, tunnels, etc. it shall be laid minimum 300 mm below and shall be re-routed in case it fouls with equipment structure foundations.

Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on earthing terminals of the equipment/structure, if the equipment is available at the

time of laying the grid, otherwise "earth riser" shall be provided near the equipment foundation, pedestal for future connections to the equipment earthing terminals.

Earthing conductors along their run on cable trench ladder columns, beams, walls, etc. shall be supported by suitable cleating at intervals of 750 mm. Earthing conductors along cable trenches shall be cleated to the wall nearer to the equipment.

Cable trays and supports shall be connected to the earth mat at every 30 meters interval. Wherever it passes through walls, floors, etc. GI sleeves shall be provided for the pasGMCe of the conductor. Earthing conductor around the building shall be buried in earth at a minimum distance of 2000 mm from the outer boundary of the building.

#### 4.5 Jointing

Earthing connections with equipment earthing pads shall be bolted type. Contact surface shall be free from scale, paint enamel, grease, rust or dirt. Two bolts shall be

provided for making each connection. Bolted connections, after being checked and tested shall be taped with PVC tape.

Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

#### SR NO 5 WIRING

##### 5.1 Point Wiring

##### 5.1.1 Scope

Providing specified size of FRLS insulated, copper conductor, 1.1kV grade, ISI marked of required color coding of approved make both for supply and earthing and drawing these wires through already laid Medium duty PVC conduits with fish wire, ferruling by coding tags as per relevant drawings and duly connecting with lugs, complete finishing, removing debris from site; testing the installations for safety and beneficial use.

##### 5.1.2 Wires: Mains I Sub-mains I Circuit Mains (comprising phase and neutral wires):

The wires shall be 650 / 1100 V, PVC insulated, FRLS unarmored with stranded copper conductors, unless otherwise specified. The wires shall conform to IS:694.

The minimum area of conductors shall be 1.5 sq. mm for light fittings; 2.5 sq.mm for receptacles rated 6 A receptacles and 4 sq.mm for 16 A and above.

The wires shall be coated red, yellow, and blue for R, Y, B phase and black for neutral. Unless otherwise specified, external lighting cables shall be of 1.1 kV grade, 3C, PVC insulated and armoured type fed from main distribution boards.

Lugs:

Copper lugs of required size and type.

Glands:

Glands at terminating end of required size and type.

Other Material:

Rubber grommet, bush, harnessing material, etc.

### 5.1.3 Drawing of Wires

Wires shall be drawn with adequate care. Correct color coding as per shall be used for phase, neutral and earth. Wires shall not have intermediate joint in between terminals of the accessories. Earth-wire and Return wire (neutral may be looped only within circuit. For lighting load or single phase distribution wires of two different phases shall not be drawn in single pipe. Lead wires of sufficient extra length shall be provided and shall be terminated in the terminals of accessories only, with correct type of and correct size of tugs.

Bush shall be used at pipe opening to protect wire insulation from getting damaged due to burrs or sharp edges.

### 5.1.4 Testing:

Insulation resistance test:

All wiring shall be tested with 500V meggar between phases, phase-neutral and to Earth. IR value shall not be less than 1 M-ohm.

Polarity test:

Polarity test shall be carried out for ensuring correct polarity plug and switch.

Table No- I

Colour Code for Wires

Type	Colour
Phase	Red, Yellow, Blue
Neutral	Black
Earth	Green

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

### SR NO 6 SWITCHES & SOCKETS

#### 6.1 Switches

The switches shall be single pole, single or two way as shown in respective internal

lighting drawings. They shall be of moulded type rated for 250 volt, and of full 6 / 16 A capacity. They shall be provided with insulated dollies and covers.

The switches shall be rocker operated with a quiet operating mechanism with bounce free snap action mechanism enclosed in an arc resistant chamber. The switches shall have pure silver and silver cadmium contacts. The switches shall be flush modular type. The make of the switches shall be as indicated in the drawings or BOQ or make of material or as suggested and approved by the client. The switches installed in outdoor area shall be industrial, metal clad type, and shall be provided in weather proof enclosures, complete with weather proof gasket covers.



## 6.2 Sockets

Each socket shall be provided with control switch of appropriate rating. The sockets shall be moulded type, rated for 250 volts, and either of full 6 A or 16 A capacity, as mentioned on the drawings.

Sockets shall be of three pin type, the third in being connected to earth continuity conductor. The socket shall be flush modular type. The sockets installed in machine room, plant room or wet / damp area shall be metal clad weather proof type. The finishing and make of all the sockets shall be same as light switch. The socket shall have fully sprung contacts and solid brass shrouded terminals to ensure positive electrical connections.

The sockets shall be provided with automatic shutters, which open only when earth pit of the plug inserts in the socket.

The socket shall be provided with three pin plug top suitable to the socket and of the same make as socket.

## 6.3 Boxes

The boxes for switches and sockets shall be 18 gauge galvanised sheet steel as manufactured by the switch manufacturer and suitable to accommodate grid type switches. The size of enclosure boxes shall be chosen to accommodate the number of switches to be installed at the particular location.

Separate screwed earth terminal shall be provided in the box for earthing purpose. All boxes shall have adequate no. of knock out holes of required diameter for conduit entry. Switch boxes to receive switches, socket outlets, power outlets, Telephone outlets, fan regulators, etc. shall be fabricated to the approved shape and size to accommodate all the devices without overcrowding. Outlet boxes to receive ceiling fan shall be fitted with adequately sized rod I hook to fix ceiling fan. The boxes shall be of minimum depth of 65 mm.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

## SR NO 7CONDUITS

### 7.1 Scope

Providing specified rigid PVC conduit and laying I erecting in RCC work, such as slab, beam, column before casting, surface, wall, ceiling, etc including entries through wall as per requirement and as per approved method of construction. The scope also includes supply and installation of accessories for the PVC pipes of same make as that of pipe; such as spacers, saddles, couplers, bends, inspection or non- inspection type elbows, tees, junction boxes of required ways and resin I adhesive to make all joints rigid, duly finishing, removing debris from site. Hardware like sheet metal screws of specified sizes, washers, raw/ PVC/ fill type plugs, wooden gutties.

### 7.2 Material

All conduits, fittings & accessories shall be rigid PVC conduit as indicated in the BOQ and shall comply with IS:9537. All pipes shall have ISI mark on each length of conduit. The minimum size of conduit shall be 20 mm.

The conduits shall be uniformly circular in cross section. The nominal length of conduit used shall be 3 or 4 meter. Joints shall be avoided as far as possible in the conduits The interior of conduit shall be free from obstruction which might interfere with ready introduction I withdrawal of maximum no. of

cables permitted. The ends of conduits shall be reamed and filed to remove rough edges and inside surface shall be smooth and free from burrs and other defects. All conduits shall be provided with approved type of fish wire.

### 7.3 Method of Construction

#### 7.3.1 General:

Work shall be done in co-ordination with civil work to suit final approved layout. Conduit shall be duly clamped and size of conduit shall be correct depending on number of wires to be drawn. Separate pipe shall be used for each phase in single phase distribution and also for wiring other utilities like data, telephone, TV cabling, etc, for which distance between pipes shall be not less than 300mm or anti electrostatic partition is to be provided. Adequate use of conduit accessories shall be made at required locations. Entries in wall shall be at level of corresponding conduit with color coding. (For visual identification). Flexible conduits shall be used at expansion joints. Erection shall be done as per the layout finalized, with minimum sharp bends, with junction boxes at angular junctions and for straight runs at every 425m, in such manner so as to facilitate drawing of wires. All bending of conduits shall be done in approved manner without changing the cross-section.

**TableNo. 2.ColourCodingforConduitsin Wall Entry**

<b>Conduitfor</b>	<b>Colour</b>
Light/Power Circuit	Black
Securitywiring	Blue
FireAlarm wiring	Red
LowVoltagecircuits	Brown

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Mtr.

### SR NO 8 TESTING AND COMMISSIONING

#### 8.1 General

The testing and commissioning for all electrical equipment at site shall be according to the procedures laid down below:

All electrical equipment shall be installed, tested and commissioned in accordance with the latest relevant Standards and Codes of Practices published by Indian Standards Institution wherever applicable and stipulations made in relevant general specifications.

The testing of all electrical equipment as well as the system as a whole shall be carried out to ensure that the equipment and its components are in satisfactory

condition and will successfully perform its functional operation. The inspection of the equipment shall be carried out to ensure that all materials, workmanship and installation conform to the accepted design, engineering and construction standards as well as accepted codes of practice and stipulations made in the relevant general specifications.

All tests shall be carried out by the contractor using his own instruments, testing equipment as well as qualified testing personnel. The results of all tests shall be conforming to the specification requirements as well as any specific performance data guaranteed during finalization of the contract. Test sheets shall be prepared & submitted to contractor for approval within 1 month of award.

#### 8.2 Preparation of the Plant for Commissioning

After completion of the installation at site and for the preparation of plant commissioning, the contractor shall carry out check and testing of all equipment and installation in accordance with the agreed standards, Codes of Practice of Indian Standards Institution and specific instruction furnished by the particular equipment suppliers as well as contractor.

Checking required to be made on all equipment and installations at site shall comprise, but not be limited to the following. The following checks shall be made on all equipment and installations at site: Physical inspection for removal of any foreign bodies, external defects, such as damaged insulators, loose connecting bolts, loose foundation bolts etc-

Check for grease, insulating/lubricating oil leakage and its proper quantity Check for the free movement of mechanism for the circuit breakers, rotating part of the rotating machines and devices. Check for tightness of all-cable, busbar at termination/joints ends as well as earth connections in the main earthing network.

Check for clearance of live busbar and connectors from the metal enclosure. Check for proper alignment of all draw out device like draw out type circuit- breakers. Continuity check in case of power cables Checking of all mechanical and electrical interlocks including tripping of breakers using manual operation of relay.

Checking of alarm and annunciation circuits by manual actuation of relevant relays like Buchholz relay in case of transformer.

Check and calibrate devices requiring field adjustment calibration like

adjustment of relay settings etc.

Check proper connection to earth network of all non-current carrying parts of the equipment and installation.

Tests reports for all meters are to be furnished.

The tests that shall be carried out on the equipment shall include but not be limited to the following:

#### 8.3 Low Voltage Switchgear (up to 1000V AC or 1200V DC)

Insulation resistance test with 1000V megger for main circuits. The minimum value of insulation resistance shall be 1 mega ohm.

Insulation resistance test with 500V megger for control metering and relaying circuits The minimum value of insulation resistance shall be mega ohm Relay operation test by primary & secondary injection method.

Functional tests of control circuit.

Checking of settings of all relay / releases as per single line diagram/specification. ON/OFF operation of breakers both manually and electrically in "Test" as well as "Service" positions.

#### 8.4 Cables

Insulation resistance test with 2,500 V megger for high voltage power cables rated above 1.1 KV grade and 1,000 V megger for cables rated up to 1.1 KV grade.

All cables of 1.1 KV and all HV cables shall be subjected to high voltage test after joining and terminating but before commissioning as per relevant standards.

In each test, the metallic sheath/screen/armour should be connected to earth.

Continuity of all the cores, correctness of all connections as per wiring diagram, correctness of polarity and phasing of power cables and proper earth connection of cable glands, cable boxes, armor and metallic sheath, shall be checked.

Power frequency withstand test.

Operational tests to know the correct functioning of all devices associated with the transformer

#### 8.5 Earthing System

Tests to ensure continuity of all earth connections.

Tests to obtain earth resistance of the complete network by using earth tester. The test values obtained shall be within the limits.

All documents / records regarding test data, oscillo graphs and other measured values of important parameters finalized after site adjustment shall be handed over to the Contractor in the form of test reports for their future use and reference.

All Checks/tests etc. to be carried out in presence of contractor's representative.

#### SR NO 9. GI POLE

Supplying & erecting Galvanized iron pipe post "B" class 88.9 mm O.D 6 mtr. Long duly painted with two coats of aluminum paint complete with metallic base- plate of 300 mm x 300 mm x 4mm thick for using as a compound light pole with approx. weight 47 Kg.

#### DETAILED TECHNICAL DATA SHEET FOR GI POLE

##### GI POLE

- Height of POLE : 6Mtr
- Raw material : B CLASS GI PIPE
- Approx Weight : 47Kg
- No. of section : ONE
- Metal protection treatment : HOT DIP GALVANIZED As Per BS  
729 or Equivalent. Both Internally & externally
- Thickness of Galvanization : As per IS 2629 / IS 2633 / IS 4759
- Terminal box power control : Sheet metal box of suitable size in  
2mm Thick to accommodate required

##### MCB

- Thickness of Galvanization : Average 85 Microns
- Outer Diameter : 88.9 mm

#### ***(TEST TO BE CARRIED OUT AT OEM END / FACTORY)***

Dynamic Loading as per Prevailing at Site

- Max. wind speed : 180 Kms Per Hour as per IS  
875-1987 Part III

- Max.gustspeedtime : 3 seconds
- Height above ground level (These :  
6Mtr  
above two levels are measured)
- FactorofSafetyforwindload : 1.25
- FactorofSafetyforother load : 1.15(asperTRNo. 7)

***(Testreportshallbeproduced)***

#### FoundationDetails

- sizeoffoundation :AsperManufacturer'sdesign
- DesignsafetyFactor :AsperIS:456
- ConsideredWindpressure(Kg./Sq.mm):As perIS:875-1987
- ConsideredWindspeed(KM./hrs.) :AsperIS:875-1987
- AverageSoilbearingcapacity :Aspersiterequirement
- Numberoffoundationbolts :4Nos.

***(Testreportshallbeproduced)***

#### LUMINARIES

- Type :LED, OUTDOOR
- Quantity :AsPerLightDesign

***(Testreportshallbeproduced)***

#### EARTHING

- Earthing : Suitable size earth terminations shall be provided to connect with the proposed earth pit.
- No.ofconnection :ONE
- Finallength :150 Cm

#### General

- The POLE, Foundation and electrical drawing should be approved before commencement of work
- All safety measures shall be adopted while execute (E & C) the work

#### GUARANTY & WARRANTY

- One-year GUARANTY & WARRANTY certificate shall be provided by the Manufacturer of POLE and free service for first year shall be provided as when required for attending the breakdown etc
- For Light Fixtures there are two years of warranty from the dispatch date of materials.

- MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

- Mode of Payment: The rate shall be for a Unit of One No.

SR NO 10. LED LIGHT

10.1 CODES & STANDARDS: -

Codes)

IEC 60529 Classification of degree of protections provided by enclosures (IP

EN 55015, CISPR15 Limits and methods of measurement of radio disturbance characteristic of electrical lighting and similar equipment.

IEC 62031 LED modules for general lighting-Safety requirements IEC 61547-EMC Immunity requirement

IEC 60598-2-1 Fixed general purpose luminaries

IEC 60598-1 Luminaries - General requirement and tests

IEC 61000-3-2 Electro Magnetic compatibility (EMC)- Limits for Harmonic current emission — (equipment input current  $\leq 16$  A per phase.

IEC 60068-2-38 Environmental Testing: Test Z- AD: composite temperature/ humidity cyclic test

IEC 61347-2-13 Lamp control gear: particular requirements for DC or AC supplied electronic control gear for LED modules.

IS 10322 Specification for the luminaries IS 4905 Method for random sampling

LM 79 LED luminary photometry measurement. LM 80 Lumen Maintenance

IEC 62384 DC or AC supplied electronic control gear for LED modules performance requirements

IEC/ PAS 62612 Self-ballasted LED lamps for general lighting services- Performance requirements

10.2 ENVIRONMENTAL CONDITIONS: -

The average atmospheric condition during the year is mentioned below. The equipment shall be designed to work in such environmental conditions:

- (i) Maximum ambient air temperature: 50° C
- (ii) Minimum ambient air temperature: 10° C
- (iii) Max. Relative humidity: 90%
- (iv) Average Rainfall: 55 inches
- (v) Atmosphere: Dusty and Heavy chemical smoke at times in certain areas.
- (vi) Coastal area: The equipment shall be designed to work in coastal area in humid, salt laden and corrosive atmosphere.

10.3 CONSTRUCTIONAL FEATURES:

10.3.1 General:

- a) Luminaries shall be made of die cast aluminum/ extruded Aluminum body with powder coated finish having safety.
- b) Heat sink used should be aluminum extrusion having high conductivity. Heat sink should be integrated within luminaries and efforts shall be made to keep the overall outer dimensions optimum such that it permits sufficient heat dissipation through the body itself so as to prevent abnormal temperature inside the luminaries and consequential damage to cover, gasket material, LEDs, lenses and drivers.

- d) LED must be mounted on Metal core PCB with suitable large area surface by means of fins to dissipate the conduct heat. The fins must be exposed to ambient flowing air.
- e) All luminaries shall be provided with toughened glass of min. 0.8 mm thickness of sufficient strength. UV stabilized Poly carbonate material is also acceptable. High efficiency prismatic diffuser/Lens under the LED chamber to protect the LED and luminaries shall be provided.
- f) The minimum IK protection of optic cover shall be IK 05. The test material certificate shall be provided.
- g) Suitable number of LED lamps shall be used in the luminaries. The manufacturer shall submit the proof of procurement of LEDs from OEMs at the time of testing.
- h) Suitable reflector/ lenses may also be provided to increase the illumination uniformity and distribution.
  
- i) The electrical component of the LED and LED driver must be suitably enclosed in sealed unit to function in environment conditions mentioned earlier.
- j) The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided in input side.
- k) Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.
- l) The equipment should be compliant to IEC 60598-1, IEC 62031 and IEC/PAS 62612 depending on the type of luminary.
- m) The LED Module(s), Driver gear, etc. shall be designed in such a way so that temperature of heat sink shall not exceed 70° C.
- n) All the material used in the luminaries shall be halogen free and fire retardant confirming to standard.
- o) The infrastructure for Quality Assurance facilities to verify/ test/ prove above specifications must be available at the manufacturing facility. The compliance shall be indicated clearly in the tender itself.
- p) All fasteners must be of stainless steel.
- q) All glands inside/ outside luminaries must be metallic
- r) Heat sink must be thermally connected to MCPCB/ LED light source.

10.3.2 High power and high lumen efficient LEDs suitable for following features shall be used:

- a) The working life of the lamp at junction temperature of 85° C (max) at operating current shall be more than 50,000 working hours of accumulative operation and shall be suitable for continuous operation of 24 hours per day. These features shall be supported with datasheet.
- b) Adequate heat sink with proper thermal management shall be provided.
- c) Lumen maintenance report as per LM 80 guidelines shall be produced for the power LEDs used.
- d) Thermal management shall be in such a way that LED soldering point temperature shall not go beyond 75° C.
- e) The LED luminaries shall be free of glare.

10.3.3 LED DRIVER specification used for light:

- a) Current waveform should meet relevant nation and international standard.
- b) LED Driver shall withstand, withstand voltage up to level mentioned elsewhere in tender and restore once normal working when normal voltage is applied.
- c) The life of the driver should more than 25000 Hrs.
- d) Maximum Temperature rise  $\leq 30^{\circ} \text{C}$  @  $45^{\circ} \text{C}$  Tamb. With safety margin of  $10^{\circ} \text{C}$ .
- e) The control gear should be compliant to IEC 61347-2-13, IEC 62031 and IEC 62384 as per the requirements.
- f) The driver of the luminaries should have Short Circuit, Over Voltage, over current, over temperature, Under Voltage, String Open protections.

10.3.4 The electronic components used shall be as follows:-

- a) The protective cum adhesive coating used on PCBs should be cleared and transparent and should not affect colour code of electronic components or the product code of the company.
- b) The construction of PCBs and the assembly for components for PCBs should be as per IS standards.

10.4 Illumination Level:

The luminaries shall be so designed that the illumination level shall be evenly distributed and shall be free from glare. The lux distribution curve/ graph/ spatial distribution shall be submitted.

#### GENERAL DATA SHEET

Sr. No.	Parameter	Value/Detail
4.1.1	RatedSupplyVoltage	230V ~, 50 Hz
4.1.2	Inputsupplyvoltagegerange	120-270V
4.1.3	ExpectedInputFrequency	50 Hz +/-3%
4.1.4	Working Temperature	+5°to +50° C
4.1.5	Working Humidity	10%-90%RH
4.1.6	UGMce hours	Dusk to dawn
4.1.7	Power Factor	≥0.90
4.1.8	Index of Protection Level	IP 66 as per IEC 60529.
4.1.9	Surge Protection	4 KV
4.1.10	LED Chip efficacy	≥ 120 lm/ W
4.1.11	Driver Efficiency	> 85%
4.1.12	Junction Temperature of LED	< 85° C
4.1.13	Rated Life @ L70	50,000burning hours at 35° C ambient
4.1.14	Nominal Correlated Colour Temperature	5000° K to 6000° K
4.1.15	Dispersion Angle	Minimum 120°
4.1.16	Tilting angle	Adjustable
4.1.17	Maintenance factor of	0.85
4.1.18	Colour Rendering Index	≥85
4.1.19	Total Harmonic Distortion	< 10 % (EMI/ EMC Certification)
4.1.20	LED MAKE	Cree/ Osram/ Nichia/ Philips Lumileds

Particulars and Details to be submitted by the bidder:

In order to properly assess and due diligence on submissions, the Bidder should provide following information on the quality and photometric of proposed luminaries.

1. General Description
2. Electrical specifications
3. LED chip and driver information



4. Photometric information to be submitted

10.5 TESTS & CERTIFICATES:

Tests are classified as:-

Type test Acceptance test

` Routine test.

The luminaries' should be tested as per IEC 60598-2-3: 2002 standards and following test reports should be submitted: -

- (i) Heat Resistance Test
- (ii) Thermal In SITU Test
- (iii) Ingress Protection Test
- (iv) Drop Test
- (v) Electrical/ Insulation Resistance Test,
- (vi) Endurance Test,
- (vii) Humidity Test,
- (viii) Electrical and Photometric Measurements Test Report (IES LM 79)
- (ix) LED Lumen Maintenance Test Report (IES LM 80)
- (x) Vibration test as per ANSI

10.5.1 Type Test: -

Type test certificates for both the luminaries' shall be provided with the technical-bid.

10.5.2 Acceptance Tests: -

These tests are carried out by an inspecting authority at the supplier's premises on sample taken from a lot for the purpose of acceptance of a lot. Acceptance tests shall not be carried out from particular size from the lot on which type tests have already been conducted. Recommended sampling plan is given below.

Sample size and criteria for conformity

The luminaries shall be selected from the lot at random. In order to ensure randomness of selection, procedures given in IS 4905-1968 (Reaffirmed 2001) may be followed.

10.5.3 Routine Tests:

These tests shall be performed by the manufacturer on each complete unit of the same type and the results shall be submitted to the inspecting agency, prior to offering the lot for acceptance test. The firm shall maintain the records with traceability.

Method of Testing: -

Visual and Dimensional Check:

The unit shall be checked visually for all dimensions as per approved design and drawing.

General workmanship should be good; all the components properly secured and sharp edges shall be rounded off. Check the marking and quality of the workmanship visually. Check the rating and make of electronic/ electrical items.

Checking of documents of purchase of LED

Check Document of purchase of LED lamps of approved sources viz. NICHIA/ OSRAM/ PHILIPS LUMILEDS/ CREE.

Resistance to humidity test

This is carried out by suspending the painted panels in corrosion chamber maintained at 100% RH and temperature cycle of 42 to 48° C for 7 days and examining it for any sign of deterioration and corrosion of metal surface.

Insulation resistance test

The insulation resistance of the unit between earth and current carrying parts shorted together shall not be less than 2 MΩ when measured with 500 V megger.

HV test

Immediately after insulation resistance test, an AC voltage of 1.72 KV rms (1500 + 2 x rated voltage) of sine wave form of 50 Hz shall be applied for one minute between the live parts and frame. There shall not be any kind of break down, flashover or tripping of supply.

Over voltage protection

The LED Driver Shall be cut off once voltage exceeds 288 V AC. It shall be reconnected when supply comes within limit.

Surge protection

It shall withstand a surge of 4 KV at the input terminals for all types.

Reverse polarity

The Luminaries' shall withstand polarity reversal. It shall be operated with reverse voltage for Min. 1 minute at maximum value of voltage range. At the end of this period, the supply shall be made correct polarity and Luminary shall operate in a normal way.

Temperature rise Test:

Temperature rise Test shall be conducted at 100 V ~ with full load. The temperature rise shall be recorded by temperature detectors mounted at the specified reference points on the body of semiconductors, capacitors and other components as agreed between purchaser and manufacturer. The maximum- recorded temperature under worst conditions shall be corrected to 55° C and compared with maximum permissible temperature (for power devices at junction). Under loading conditions as specified above, the corrected temperature of the power devices shall have a safety margin of minimum 10° C.

Temperature at junction shall not exceed 100° C when corrected to 55° C. The Luminaries' shall also be subjected for short time rating after continuous loading to ensure the temperature rise is within the permissible limit. The maximum temperature rise of the electronics devices on the PCBs shall be in limit for industrial grade components suitable for 85° C environment. In case of exceeding limit, use of MIL-grade component shall be considered keeping RDSO informed.

Ra (Colour Rendering Index) measurement test

The lumen is the unit of luminous flux, which is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

The initial reading of the chromaticity co-ordinates x & y shall be within 5 SDCM (Standards Deviation for Colour matching) from the standardised rated value as per Annex: D of IEC 60081-1997.

The initial reading of the general colour-rendering index (Ra) shall not be less than the rated value decreased by 3.

The lumen maintenance of the lamp shall not be less than 80% of the initial lumen after 20,000 burning hours and 70% of the initial lumen after 50,000 hours. The initial lumen will be taken after 100 hours aging.

Photometric test shall be conducted as per Annexure: B of IEC 60081-97.

The lumen maintenance test shall be done as per Annexure: C of IEC 60081-97.

Fire retardant Test

Fire Retardant test shall be conducted as per IEC 60332-1 of the wire used in the luminaries.

Test for IP 65 protection

This test shall be conducted as per IEC 60529.

Environmental tests (Prototype Test)

The Luminary shall meet the following tests as prescribed in IEC-60571.

- (i) Dry heat test.
- (ii) Damp heat test
- (iii) Test in corrosive atmosphere
- (iv) Combined dust, humidity and heat test

Reliability Test

The reliability can only be determined in actual service. However, the following tests shall be carried out on the prototype to simulate as close as possible, the service conditions.

There shall be no failure during this test.

- (i) The light unit shall be mounted in an oven maintained at 45° C.
- (ii) The light will be operated at the specified maximum voltage and at 45° C for a period of 100 hours.

10.5.4 Photometry Test: -

The test shall be carried out for Total Luminous Flux, Luminous Intensity Distribution, Electrical Power, Luminous Efficacy (calculation), Color Characteristics- Chromaticity, CCT & CRI etc. as per IES LM 79.

Life Test

The lumen maintenance & life test shall be done as per IES LM 80 for LEDs.

Endurance Test

The Luminaire shall be kept "ON" with input voltage of 250 V ~ for 200 hours. After this the Luminaire is subjected to 20,000 cycles of "ON" and "OFF", each cycle consisting of 3 seconds

“ON” and 10 seconds “OFF” period. Luminaire should survive this test. Test is to be continued for 20,000 cycles, followed by

performance test.

Safety:

The Luminaire shall comply with the safety requirements as per IEC 61195.

All Tests defined for acceptance other than LM 79 and LM 80 are allowed to carry out at Manufacturer works.

10.6 MARKING:

The following information shall be distinctly and indelibly marked on the housing: Year of manufacture/ Batch Number/ Serial Number

Name of Manufacturer (Engraving only, stickers not allowed)

Rated watt and voltage Input frequency

**MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B**

**Description**

**Mode of Payment: The rate shall be for a Unit of One No.**

### 11. WaterPurifier

Brand Name	EurekaForbes
ItemWeight	6.50kilograms
ManufacturerSeriesNumber	Aquaguard
ModelNumber	GWPDAG20010000
NumberofItems	1
PartNumber	AG200
Special Features	UV,Gravity

### 12. LIFT

Supplying, Erecting, Testing & Commissioning the Automatic passenger / stretcher lift having following main features:\

[1] GEAR LESS LIFT DRIVE comprising of High Starting torque Lift duty 3 phase 440 V A. C. Permanent magnetic synchronous motor of proper rating with high efficiency shall be used.

[2] Micro processor based / PLC, ACVVVF, vector control drive with encoder feedback closed loop system shall be used for lift car and door operation which shall be full collective selective operation hall call demand response, UP/DOWN hall stops, Main, Up/ Down Contactor with overload and phase reversal relay and safety controls.

[3] Car with M S platform with bracings of adequate size and to sustain the impact load cabin + passenger with safety factor of fire for steel and side panels of Stainless steel of sheet of grade 304 duty. Car ceiling will be S.S. finishes with aesthetic appearance with LED ceiling lights. Car flooring shall be of anti skid PVC with choice of colour of engineer in charge. Car doors shall be of stainless steel grade 304, hairline finish with centre opening

/ telescopic automatic doors. Car panel will also be S.S. 304 finished with emergency stop device, mechanical door safety device, facility of auto/ attended mode. All car panel buttons and all floor switches must be with brail language as per lift act.

[4] All landing doors shall be fully automatic centre opening/ telescopic opening made of hairline finish steel grade of 304 with key holes and infrared curtains with Unlocking facility from outside.

[5] Appropriate battery operated emergency light in the car along with alarm switch shall be provided.

[6] Digital scrolling indicator system for up-down arrow along with floor position indicator shall be provided inside the car and at all floors.

[7] Full height infra red curtain with multiple criss / crossing light beams shall be provided.

[8] Automatic Rescue Device (ARD) shall be provided accordingly of passenger capacity.

[9] Audio visual indication in the lift car showing over loading shall be provided such that doors kept open till excess load is removed.

[10] Spring buffers/PU Buffers shall be provided.

[11] Car fan with automatic sleep timer shall be provided.

[12] Voice annunciator with suitable music shall be provided in lift car.

[13] Self diagnostics system for operational and safety parameters shall be provided in control panel.

[14] Mechanical over speed governor, door key holes in the floor doors, fireman switch shall be provided.

[15] Lift machine hoisting arrangement in the lift machine room and monkey ladder for lift pit should be provided by the lift agency, along with the other steel structure works, foundations for the machine etc...

[16] In the hoist way fascia plate shall be provided without any extra cost, where ever required as / if directed by engineer in charge.

[17] Permanent wiring in lift machine room and lift well with proper numbers of light points, with fixtures, exhaust fan and plug points shall be provided by the agency. Power supply of 3 phase 440 V shall be made available by department in lift machine room.

[18] Any civil/ electrical works for additional and alteration in lift shaft and machine room related to erection of lift shall be made by lift agency without any extra cost.(granite/marble fixing around all landing door openings are not in lift agency's scope.)

[19] Agency has to provide all working drawings and documents and liaison services for obtaining all necessary permission from lift inspector and other authorities.

[20] As per statutory requirement of Got. Of Gujarat lift & escalator act 2000, lift agency has to provide

1. Car top safety barricade
2. Push & talk communication system.
3. Fireman's switch operation at Ground Floor

1. ABOUT SPECIFICATIONS:

1. This specification covers the requirement of design, manufacture, supply, erection, testing and commissioning of Passenger/Fire lift as specified.

2. It is not the intent to specify completely herein all details of the equipment. Nevertheless, the equipment shall be complete and operative in all aspects and shall conform to highest standard of engineering, design and workmanship.

3. Any material or accessory which may not have been specifically mentioned but which is necessary or usual for satisfactory and trouble free operation and maintenance of the equipment shall be furnished without any extra charge.

2. CODES & STANDARDS:

1. All equipment and materials shall be designed, manufactured and tested in accordance with the latest applicable Indian Standards (IS) except where modified and/or supplemented by this specification. Generally, the equipment should meet the requirements of the following standards and rules :

- a) IS : 14566 – Electric Traction Lifts
- b) Gujarat Lifts and escalator act (2001)
- c) National Building Code 2005 with latest amendments.
- d) Indian Electricity Acts and Rules.

2. In addition, other national/international rules and regulations as applicable to the equipments/work shall be followed. In case of any discrepancy, the more restrictive rule shall be binding.

3. BRIEF SCOPE OF WORK

- I. Supply, installation, testing and commissioning the elevator of required specifications
- II. To provide all necessary scaffolding
- III. Minor and Major civil works like creating holes in the walls, grouting of all bolts, fixing of steel members, indicators, button boxes etc.
- IV. Supplying, fabricating and installation of all kinds of steel works required installing and commissioning the elevators including machine rooms
- V. Providing and fixing necessary electrical works, wiring etc for elevators, hoist way and machine room.
- VI. Supply and erection of shaft reducer steel channels, if necessary.
- VII. All necessary approval from government authorities.
- VIII. All inclusive maintenance and breakdown service from the date of handing

over.

4. DESIGN AND CONSTRUCTIONAL FEATURES:

Supplying, Erecting, Testing & Commissioning the passenger/Fire lift having following main features:

- [1] GEAR LESS LIFT DRIVE comprising of High Starting torque Lift duty 3 phase 440 V A. C. Permanent magnetic synchronous motor of proper rating with high efficiency shall be used.
- [2] Micro processor based / PLC, ACVVVF, vector control drive with encoder feedback closed loop system shall be used for lift car and door operation which shall be full collective selective operation hall call demand response, UP/DOWN hall stops, Main, Up/ Down Contactor with overload and phase reversal relay and safety controls.
- [3] Car with M S platform with bracings of adequate size and to sustain the impact load cabin + passenger with safety factor of fire for steel and side panels of Stainless steel of sheet of grade 304 duty. Car ceiling will be S.S. finishes with aesthetic appearance with LED ceiling lights. Car flooring shall be of anti skid PVC with choice of colour of engineer in charge. Car doors shall be of stainless steel grade 304, hairline finish with centre opening / telescopic automatic doors. Car panel will also be S.S. 304 finished with emergency stop device, mechanical door safety device, facility of auto/ attended mode. All car panel buttons and all floor switches must be with brail language as per lift act.
- [4] All landing doors shall be fully automatic centre opening/ telescopic opening made of hairline finish steel grade of 304 with key holes and infrared curtains with Unlocking facility from outside.
- [5] Appropriate battery operated emergency light in the car along with alarm switch shall be provided.

[6] Digital scrolling indicator system for up-down arrow along with floor position indicator shall be provided inside the car and at all floors.

[7] Full height infra red curtain with multiple criss / crossing light beams shall be provided.

[8] Automatic Rescue Device (ARD) shall be provided accordingly of passenger capacity.

[9] Audio visual indication in the lift car showing over loading shall be provided such that doors kept open till excess load is removed.

[10] As per statutory requirement of Got. Of Gujarat lift & escalator act 2000, lift agency has to provide

- Car top safety barricade
- Push & talk communication system.
- Fireman's switch operation at Ground Floor

#### 5. DETAILED SCOPE OF WORKS:

1. Design, manufacture, supply, erection, testing and commissioning of Passenger/Fire lift as specified.

2. Schedule of Materials

1 The contractor shall be responsible for unloading, storage, safe custody, accountability, testing etc.

2 The quantity for measurement will be actual and invisible loss; wastage etc shall not be paid or billed.

I) The contractor shall bear all incidental charges for the storage and safe custody of the materials at site at his own responsibility.

II) The contractor shall make arrangement at the site to protect from damage by rain, dampness, fire, theft etc.

III) In case any materials get damaged the contractor shall replace the same at his own cost.

IV) The contractor shall maintain a day-to-day account of the material supplied by Owner/Contractor in the prescribed Performa and it should be submitted along with RA bills.

6. Clearance of site on completion.

On completion of the works, the contractor shall clear away and remove from the site, all surplus materials, rubbish and temporary works of every kind and leave the whole site and works clean and in workman like condition to the satisfaction of Owner at his own cost. If the contractor fails to clear the site within 15 days after virtual completion/ submission of final bill whichever is earlier, it shall forfeit all his claims and the owner may get the site cleared at contractor's cost..

7. Statuary Approval

The contractor shall obtain necessary statutory approval from relevant government agency / lift inspector / electrical inspector. The statutory fees shall be paid by the contractor initially and same shall be reimbursed by SMC on submission of supporting document.

8. Submission of the license or Commissioning certificate by TPI shall be treated as the final completion date , whichever is later.

9. Submission of the preliminary and final layout drawings and technical details

The contractor shall submit the preliminary layout and technical details based on the Surat Municipal Corporation drawings for approval and shall submit the final layouts incorporating all comments.

Execution will be allowed only after approval of the drawings. Prior approval from Surat Municipal Corporation shall be required for installation of each elements / accessories going to be installed inside CAR i.e. light fitting, floor mat, hand rail etc.

Drawing, Document to be submitted, in general:

- Outline dimensional drawing showing general arrangement, space requirements
- Bill of Materials.
- Typical installation plan.
- Technical leaflets on & complete specifications & OEM address for bought out items.

- QAP
- Any other details furnished by manufacturer

10. Supervision

The work shall have to be carried out in best workman like manner and supervised by competent erection engineers having adequate experience in the similar kind of work.

11. Insurance & Indemnification

The contractor shall take adequate insurance cover for his equipment, material, installation and personnel for transport and storage, till the completion of the project;

and indemnify the Surat Municipal Corporation against any claims or liabilities that may arise due to any cause whatsoever. The indemnification shall cover, but not be limited to, accidents, injuries, loss, theft, etc. of items, properties and human beings.

12. Free Maintenance

The contractor shall provide free maintenance service for the period of 12 months from the date of handing over. Contractor shall supply the electrical cable, with necessary protective switch gears for the elevator as per requirement

13. Necessary Steel Channels for reduction of shaft (if required) shall also be in scope of the bidder. No extra payment shall be made for this to bidder.

14. Testing and commissioning:

The installation, testing and commissioning of the equipment AT SITE shall be carried out in accordance with IS: 14665.

Quality Assurance Plan shall be got approved. The safety gear equipment and other parts as per approved QAP shall be tested as per relevant IS specifications AT THE MANUFACTURERS FACILITY in the presence of authorized representative of TPI and Surat Municipal Corporation, prior to dispatch for site. All the expenses incurred for the same shall be borne by the contractor. At least 15 days prior notice should be given to TPI and Surat Municipal Corporation so as to enable them to depute a representative for the work. The above testing procedure does not relieve the contractor from his commitment/ contractual obligation / guarantee etc.

15. Operation and maintenance manual:

Operation and maintenance manual and drawings IN SOFT COPY AND HARD COPY (IN TRIPLICATE) shall be submitted.

16. Announcing System :

Lift Announcing solid state system in the Passenger/ Stretcher lifts having AC2/ACVV/ACVF drives & automatic doors only. The system comprising following features & facilities.

- (i) Announcing floor message, message to close period
- (ii) Announcing 'Emergency Message' when lift is stuck between floors due to power failure or any other reason.
- (iii) Instrumental Music between floor announcing.
- (iv) Announcement in English / Hindi & Gujarati Languages..
- (v) Flexible to accommodate special pre-programmed message such as name of the building /office.
- (vi) Volume adjustment control

17. Overload Protection



Providing & erecting approved make overload non-start feature & overload warning Indicator system in the lift with making use of sound isolated floating platform & micro switches on SI frame to get sensation of live load inside lift cage at any given moment, with provides new fixtures of overload warning inside lift cage with new relay in the existing control panel to activate 'Overload Non-Start Function' with carrying out additional wiring including laying of new travelling cable, include minor civil work & without changing the existing capacity speed stops, travel & operation of the desired lift

18. ARD (Automatic Rescue Device):

Supplying and erecting approved make, solid stat inbuilt emergency rescue Device, for

automatically rescues Passengers trapped in the lift car in between floors in the event of power failure having following features.

- (i) Automatic operation & immediate action in the event of mains failure capable to move the lift to the nearest landing, opens the automatic doors of the lift car & floor.
- (ii) Sealed, maintenance free battery back-up of suitable size with automatic charging unit & auto change over device on mains failure.
- (iii) RESCUE OPERA'TION' message indicator in the lift car
- (iv) Applicable to Passanger, Goods cum Passenger, Stretcher cum Passenger lifts with AC2, ACVV, ACVVVF drives & automatic doors.

#### 19 GENERAL TERMS AND CONDITIONS:

1. Tenderers are requested to submit necessary documents to prove their eligibility. Surat Municipal Corporation reserves right to accept or reject any offer without giving any reason.
2. Contractor shall furnish the test certificates for Machine, Motor, Motor Generator Set, Ropes, Safeties, Controller, selectors, Governors, Buffers, etc.
3. If there is any deviation, the bidder shall have to submit a deviation sheet along with technical bid only. If there shall not be any deviation sheet along with the technical bid, it shall be presume that bidder is agree with terms, conditions & specifications demanded by Surat Municipal Corporation.
4. Detail technical specifications of all parts of the elevators shall be submitted along with the technical bid of the tender.
5. Make and Manufacturer's name for all major items and parts shall be specified and submitted along with the tender.
6. Finished sizes of all members shall be as per the drawing and should fit with site conditions wherever specified.
7. Unless otherwise specified, all metal surfaces shall be treated with zinc chromate primer.
8. The rates are inclusive of necessary scaffolding, tools and tackles, taxes, duties, levies, transportation etc. No other payment shall be made other than rates quoted in the price bid.
9. Electricity & water required for executing this work shall be in scope of contractor.
10. The rates shall be firm and not subject to exchange variations, labour conditions, fluctuations in railway freights or any conditions whatsoever. It shall also include for sales tax, VAT, excise duty, octroi and any other taxes/duty or other levy levied by the Central or State Governments or local authorities, sales tax on works contract if applicable. No claim in respect to the above mentioned shall be entertained by the Surat Municipal Corporation except the statutory taxes. If there is an upward revision of statutory taxes, Corporation will reimburse the additional expenses on providing of necessary proof/receipts. Similarly, if there is a downward revision, Corporation will deduct the amount equivalent to the difference from the bills submitted for payment.
11. During defect liability period, if any fault occurs in the lift, the contractor shall have to attend the lift within 2 hours from intimation and clear the fault at earliest.
12. The corporation shall not be responsible to any accident/injury to the staff of the contractor during work. No compensation shall be paid in such incidences by SMC. The contractor is responsible for the safety of his staff members working at corporation's site.

**DATASHEETFORPROPOSEDPASSENGER/FIRELIFT**

<b>DUCTSIZEMUSTBE</b>		<b>ASPERIS14665</b>
<b>SR. NO</b>	<b>DESCRIPTION</b>	<b>AsperTenderSpecification</b>
A	Standard Applicable	IS14665
B	Passengers/Load	6/420 Kg&8/ 544Kg(ForFire)
C	Speed	1.0mpsup to 8 floors. 1.5 mtr above8 floors.
D	LevelingAccuracy	+/-10mmtto15mm
E	EntrancePosition	All on one side
F	Power Supply	AC 400/440V, 3P/1P, 50Hrtz
G	Operation/Control	Simplex full collective with advanced microprocessortechonology
H	Type	Passengerlifttobeusedinresidentialcomplex.
I	CarSize	Suitable
J	CarEntrance	Min.800mm(W)xMin.2000mm(H).Exact dimensions to be decided during detailed engineering.
K	Car Operating Panel and LandingOperating Panel	FullHeightSSwithSquare/Roundbuttonswith allcontrolbuttons.Biddermayoffertouch sensitive panel instead.
L	CarDoorOperation	FullyAutomaticwith Center opening.
M	CarWall	SSHairlinefinish
N	Flooring	AntiskidFlooring/GraniteFlooringtobedecided duringdetailed engineering.
O	CarDoorProtection	Multi-BeamFullHeightInfra-Red Detector
P	Position indicators	Tobeprovidedatall floors
Q	Directionindicatoronfloor	Tobeprovidedatall floors
R	Lighting	LED Lighting
S	TypeofVentilation	Tobesuggestedbysupplier.Tobedecideddduring detailedengineering.
T	Otherfeatures	Alarm,EmergencyLight, Overload Indicator, Telephone,ARD,HandRails

SPECIAL NOTE: Contractor has to refer & implement - Gujarat Lifts and escalator act (2001) , Chapter III -Lifts, Clause No 37 – Lift Cars, Sub Clause – 19 (a) (with latest amendments, if any),for provision of Fire Lift in case of building heights more than 24 Mtr.

## SR NO 13. SPECIFICATIONS FOR MEDIUM AND HIGH VOLTAGE CABLES AND ACCESSORIES

### 1.0 SCOPE

This specification along with data sheets covers requirements for design, manufacture, testing at works and supply of Flame Retardant PVC/XLPE cables and cable jointing / terminating accessories for medium and high voltage systems.

### 2.0 STANDARDS

The cables and cables jointing & terminating accessories shall comply with the latest edition of the following standards as applicable:

IS: 1554	PVCinsulated(heavyduty)electriccables.
IS: 7098	Cross-linkedpolyethyleneinsulatedPVCsheathed.
IS: 8130	Conductorsforinsulatedelectric cablesandflexible cords.
IS: 5831	PVCinsulationandsheathofelectriccables.
IS: 3975	Mildsteelwires, stripsand tapesforarmouringofcables.
10810(Part41)	Methodsoftest forcables: Mass of zinc coatingon steel armour.
IS:209	Specificationfor zinc.
IS:3961(Pt-2)	Recommendedcurrentratingsforcables:Part-2PVC InsulatedandPVC sheathedheavy-duty-cables.
IS:10418	Drumsforelectriccables.
IS:10462(Pt-I)	Fictitious calculation method for determination of Dimensionsofprotectivecoveringsofcables:Part-I Electrometricandthermoplasticinsulatedcables.
IS:10810(Pt-58)	OxygenIndextest.
IS:10810(Pt61)	FlameRetardanttest.
IS:10810(Pt62)	Fire-resistancetest forbunched cables.
IS:13573	Jointsandterminationsforpolymericcablesforworking Voltagesfrom6.6 KVuptoand including33 KV.
IEC:60332-3	Testsonelectriccablesunderfireconditions.
IEC: 60502	Extruded solid dielectric insulated power cables for rated Voltages from 1 KV. up to 30 KV.

IEC: 60540 & 60540A	Test methods for insulation and sheaths of electric Cables.
ASTM: D2863	Standard method of test for flammability of plastics using oxygen index method.
ICEAS-61-402 NEMA-WC5	Thermoplastic insulated wire and cable for transmission and distribution of electrical energy.
ICEA S-66-524 NEMA-WC7	Cross-linked thermosetting polyethylene insulated wire and cable for transmission and distribution of electrical energy.

2.2 The cables and accessories shall also conform to the provisions of Indian Electricity Rules and other statutory regulations, as applicable.

2.3 In case of any contradiction between various referred standard/ specification/data sheet and statutory regulations, the following order of priority shall govern:

Statutory Regulations, Data Sheets, Job Specifications This Specification Codes and Standards

### 3.0 GENERAL CONSTRUCTION

3.1 The cables shall be suitable for laying in trays, trenches, ducts, and conduits and for underground-buried installation with uncontrolled backfill and possibility of flooding by water and chemicals.

3.2 Outer sheath of all PVC and XLPE cables shall be black in colour and the minimum value of oxygen index shall be 29 at  $27 + 2^{\circ}$  C. In addition suitable chemicals shall be added into the PVC compound of the outer sheath to protect the cable against rodent and termite attack.

3.3 All cables covered in this specification shall be flame retardant (FR) unless specified otherwise in the data sheet. The outer sheath of PVC and XLPE cables shall possess flame propagation properties meeting requirements as per IS-10810 (Part-62) category AF.

3.4 Sequential marking of the length of the cable in meters shall be provided on the outer sheath at every one meter. The embossing /engraving shall be legible and indelible.

3.5 The overall diameter of the cables shall be strictly as per the values declared by the manufacturer in the technical information subject to a maximum tolerance of  $\pm 2$  mm up to overall diameter of 60mm and  $\pm 3$ mm for beyond 60mm.

3.6 PVC / Rubber end caps shall be supplied free of cost for each drum with a minimum of eight per thousand meter length. In addition, ends of the cables shall be properly sealed with caps

to avoid ingress of water during transportation and storage.

### 3.7 PVC cables

3.7.1 All power/control cables for use on medium voltage systems shall be heavy-duty type, 650/1100 V grade with aluminium / copper conductor, PVC insulated, inner-sheathed, armoured and overall PVC sheathed unless specified otherwise in data sheet.

3.7.2 The conductors shall be solid for conductor of nominal area up to and including 6mm<sup>2</sup> and stranded beyond 6mm<sup>2</sup>. Conductors of nominal area less than 16 mm<sup>2</sup> shall be circular only. Conductors of nominal area 16 mm<sup>2</sup> and above may be circular or shaped as per IS 8130. Cables with reduced neutral conductor shall have sizes as per Table 1 of IS 1554 (Part-1).

3.7.3 The core insulation shall be with PVC compound applied over the conductor by extrusion and shall conform to the requirements of type 'A' compound as per IS: 5831. The thickness of insulation and the tolerance on thickness of insulation shall be as per Table 2 of IS: 1554 (Part-1). Control cables having 6 cores and above shall be identified with prominent and indelible Arabic numerals on the outer surface of the insulation. Colour of the numbers shall contrast with the colour of insulation with a spacing of maximum 50 mm between two consecutive numbers. Colour coding for cables up to 5 cores shall be as per Indian standard.

3.7.4 The inner sheath shall be applied over the laid-up cores by extrusion and shall be of PVC conforming to the requirements of Type ST-1 PVC compound as per IS: 5831. The minimum thickness of inner sheath shall be as per IS: 1554 (Part-1). Single core cables shall have no inner sheath.

3.7.5 If armouring is specified for multicore cables in the data sheet, the same shall be by single round galvanized steel wires where the calculated diameter below armouring does not exceed 13 mm and by galvanized steel strips where this dimension is greater than 13 mm. Requirement and methods of tests for armour material and uniformity of galvanization shall be as per IS - 3975 and IS -10810 (Part 41). The dimensions of Armour shall be as per method (b) of IS - 1554 (Part -1). If armouring is specified for single core cables in the data sheet, the same shall be with H4 grade hard drawn aluminium round wire of 2.5 mm diameter. For mining cables, the size and type of armour shall be such that the combined conductance of armour shall be equivalent to 75 percent of the conductance of the largest conductor of the cable.

3.7.6 The outer sheath for the cables shall be applied by extrusion and shall be of PVC compound conforming to the requirements of type ST-1 compound as per IS: 5831. The minimum and average thickness of outer sheath for un armoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 1554 (Part -1).

3.7.7 If heat resisting PVC cables are specified in the data sheet, the following shall be the requirements:

It shall be possible to continuously operate the cable at a maximum conductor temperature of 85 ° C. PVC compounds used for HR PVC cables shall be as follows:

- a. Conductor insulation - Type C
- b. Inner sheath - Type ST 2
- c. Outer sheath - Type ST 2

### 3.8 XLPE Cables

3.8.1 Power cables for 3.3 KV up to and including 33 KV systems shall be Aluminium/copper conductor, XLPE insulated, sheathed, armoured and overall PVC sheathed.

3.8.2 The conductors shall be stranded and compacted circular for all cables.

3.8.3 All cables rated 3.8 / 6.6 kV and above shall be provided with both conductor screening and insulation screening. The conductors shall be provided with non-metallic extruded semi conducting screen.

3.8.4 The core insulation shall be with cross linked polyethylene insulating compound dry cured, applied by extrusion. It shall be free from voids and shall withstand all mechanical and thermal stresses under steady state and transient operating conditions. It shall conform to the properties given in Table-1 of IS: 7098 (Part -2).

3.8.5 The insulation screen shall consist of non-metallic extruded semi-conducting compound in combination with a non-magnetic metallic copper screen. Unless specified otherwise, the copper screen for all the three cores together shall be capable of carrying the single line to ground fault current value and the duration specified in the data sheet.

3.8.6 The conductor screen, XLPE insulation and insulation screen shall all be extruded in one operation by 'Triple Extrusion' process to ensure perfect bonding between the layers. The core identification shall be by coloured strips or by printed numerals.

3.8.7 The inner sheath shall be applied over the laid up cores by extrusion and shall conform to the requirements of type ST 2 compound of IS: 5831. The extruded inner sheath shall be of uniform thickness. In case of single core cables, there shall be extruded inner sheath between insulation metallic screen and armouring.

3.8.8 For multicore cables, the armouring shall be by galvanized steel strips as per method (b) of IS-7098 (Part-2). If armouring is specified for single core cables in the data sheet, the same shall be with H4 grade hard drawn aluminium round wire of 2.5 mm diameter.

3.8.9 The outer sheath of the cables shall be applied by extrusion over the armouring and shall be of PVC compound conforming to the requirements of Type ST 2 compound of IS: 5831. The minimum and average thickness of outer sheath for unarmoured cables and minimum thickness of outer sheath for armoured cables shall be as per IS: 7098 (Part-2)

3.8.10 The thickness of the insulation, inner sheath shall be governed by values given in IS: 7098 (Part-2).

3.8.11 Where specified, 1100V grade power cables shall also be XLPE insulated and shall meet the requirement specified in IS-7098 (Part-1).

#### 4.0 CABLE ACCESSORIES

4.1 The termination and straight through jointing kits for use on the systems shall be suitable for the type of cables offered as per this specification.

4.2 The accessories shall be supplied in kit form. Each component of the kit shall carry the manufacturer's mark of origin.

4.3 The kit shall include all stress grading, insulating and sealing materials apart from conductor fittings and consumable items. An installation instruction sheet shall also be included in each kit.

4.4 The contents of the accessories kit including all consumable shall be suitable for storage without deterioration at a temperature of 45° C, with shelf life extending to more than 5 years.

#### 4.5 Terminating kits

The terminating kits shall be suitable for termination of the cables to an indoor switchgear or to a weatherproof cable box of an outdoor mounted transformer / motor. For outdoor terminations, weather shields / sealing ends and any other accessories required shall also form part of the kit. The terminating kits shall be from one of the makes / types mentioned in the data sheet.

#### 4.6 Jointing kits

The straight through jointing kits shall be suitable for installation on overhead trays, concrete lined trenches, and ducts and for underground burial with uncontrolled backfill and possibility of flooding by water and chemicals. These shall have protection against any mechanical damage and suitably designed to be protected against rodent and termite attack. The inner sheath similar to that provided for cables shall be provided as part of straight through joint. The jointing kits shall be from one of the makes / types mentioned in the data sheet.

#### 5.0 INSPECTION, TESTING AND ACCEPTANCE

The cables shall be tested and inspected at the manufacturer's works. All the materials employed in the manufacture of the cable shall be subjected, both before

and after manufacture, to examination, testing and approval by SRE / owner. Manufacturer shall furnish all necessary information concerning the supply to SRE / owner's inspectors. The inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture in all its stages and he will have the power to reject any material, which appears to him to be of unsuitable description or of unsatisfactory quality. The vendor shall give at least 2 weeks advance notice to the purchaser, regarding the date of testing to enable him or his representative to witness the tests.

#### 5.1 Cables

5.1.1 After completion of manufacture of cables and prior to dispatch, the cables shall be subjected to type, routine, acceptance and special tests as detailed below. SRE/ Owner reserves the right to witness all tests with sufficient advance notice from vendor. The test reports for all cables shall be got approved from the Engineer before dispatch of the cables.

5.1.2 All routine tests, acceptance tests, type tests and additional type tests for improved fire performance shall be carried out as listed in IS: 1554 (Part-1), and IS: 7098 (Part- 2) on PVC and XLPE insulated cables respectively.

5.1.3 The test requirements for PVC insulation and sheath of cables shall be as per latest revision of IS: 5831.

5.1.4 Test for Resistance to Ultra Violet Radiation: This test shall be carried out as per DIN 53387 or ASTM-G-53 on outer sheath. The retention value of tensile strength and ultimate elongation after the test shall be minimum 60 % of tensile strength and ultimate elongation before the test. Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided outer sheath remains same.

5.1.5 Acceptance tests as per IS-1554 (Part-1) and IS-7098 (Part-2) and the following special tests to be performed on the cables as per sampling plan. These tests are required to be witnessed by SRE/owner before dispatch of cables.

5.1.6 Accelerated water absorption test for insulation as per NEMA - WC - 5. (For PVC insulated cables) and as per NEMA WC - 7 (for XLPE insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly once for each order, provided type of insulation remains same.

5.1.7 Dielectric Retention Test: The dielectric strength of the cable insulation tested in accordance with NEMA WC - 5 at  $75 \pm 1^\circ \text{C}$  shall not be less than 50 % of the original dielectric strength. (For PVC insulated cables). Test certificates with respect to this test (not older than one year) from recognized testing laboratory to be furnished for review by SRE before dispatch clearance of cables. In case test certificates are not available, test is to be conducted by vendor at his own cost in any recognized test laboratory or in house testing laboratory, before dispatch clearance of cables. Sampling for this test is to be done randomly and once for each order.

5.1.8 Oxygen Index Test: The test shall be carried out as per ASTM D2863 or applicable Indian Standard specifications. Sampling to be done for every offered lot/size as per sampling plan.

5.1.9 Flammability Test: The test shall be carried out on finished cable as per IS – 10810 (part 61 & 62). Sampling for these tests is to be done randomly once for each order, provided outer sheath remains same. The acceptance criteria for tests conducted shall be as under:

Part-61-The cable meets the requirement if there is no visible damage on the test specimen within 300 mm from its upper end

Part-62-The maximum extent of the charred portion measured on the test sample should not have reached a height exceeding 2.5 m above the bottom edge of the burner at the front of the ladder.

5.1.10 Test for rodent and termite repulsion property: The vendors shall furnish the test details to analyze the property by chemical method. Sampling to be done for every offered lot / size as per sampling plan.

## 5.2 Cable Accessories

Type tests should have been carried out to prove the general qualities and design of a given type of termination / jointing system as per IS-13573. The type test certificates from independent testing laboratory shall be submitted before dispatch.

## 6.0 PACKING AND DESPATCH

6.1 Cables shall be dispatched in non-returnable wooden or steel drums of suitable barrel diameter, securely battened, with the take-off end fully protected against mechanical damage. The wood used for construction of the drum shall be properly seasoned, sound and free from defects. Wood preservatives shall be applied to the entire drum. Ferrous parts used shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

6.2 On the flange of the drum, necessary information such as project title, manufacturer's name, type size, voltage grade of cable, length of cable in metres, drum no., cable code, and BIS certification mark, gross weight etc. shall be printed. An arrow shall be printed on the drum with suitable instructions to show the direction of rotation of the drum.

6.3 Unless otherwise specified, Cables shall be supplied in drum.

A tolerance of plus or minus 3 % shall be permissible for each drum. However overall tolerance on each size of cable shall be limited to  $\pm 2\%$ . Offers with short / non-standard lengths are liable for rejection. If non-standard drum lengths are specified in the data sheet, the same shall be supplied.

## 7.0 CABLE LAYING

### 7.1 General

7.1.1 Cable installation shall include power, control, lighting, fire alarm, telephone and communication cables. These shall be laid in trenches/ cable trays /Duct as detailed in the cable layout drawings. Cable routing given on the cable layout drawings shall be checked in the field so as to avoid interference with structures, heat sources, drains, piping, air- conditioning duct etc. Any change in routing shall be done to suit the field conditions wherever deemed necessary, after obtaining approval of Engineer-in-charge.

High voltage, medium voltage power and control cables shall be separated from each other by adequate spacing or by running through independent pipes, trenches or

cables trays, as shown on layout drawings/installation standards. Details of cable routes and cable spacing not shown in detail on these drawing shall be determined by the contractor and approved by the engineer- In-charge.

When single core cables are laid in flat formation, the individual cable fixing clamps and spacers shall be of non-magnetic material. As a general practice, the sheath of single core cables shall be earthed at one point to keep sheath at earth potential unless otherwise stated. Single core cables, when laid in trefoil formation shall be braced by suitable clamps at a distance, not exceeding 3 meters along the cable routing.

If straight through joints are required to be provided on single core cables, armour shall be broken at joints as per manufacturer's recommendations. For single core cables, armour shall be earthed at one end for the cable run length as per manufacturer's recommendation.

The Telephone, Communication and Fire alarm cables shall run on instrument trays/ducts/ trenches in the units. Wherever these are not available, cables shall be taken in a separate trench/tray with a minimum spacing of 300 mm from power and control cables

Telephone, fire alarm and plant communication cables shall be directly buried in road berm area, (unless otherwise specified in cable layout drawings). These cables shall cross power cables preferably at right angles. Street lighting cables shall be laid on the other side of road berm area

7.1.2 The lengths indicated in the cables schedule are only approximate. The contractor shall ascertain the exact length of cable for a particular feeder by measuring at site. All cable routes shall be carefully measured. Before the start of cable laying, the contractor shall prepare cable drum schedule and get that approved by Engineer-in-charge to minimize/avoid straight through joints and then the cables cut to the required lengths, leaving sufficient lengths for the terminations of the cable at both ends. The various cable lengths cut from the cable reels shall be carefully selected to prevent undue wastage of cables. Extra loop length shall be given for feeder cables where required as per the directions of Engineer-in-charge to meet contingencies



Cables shall be laid in directly buried trench or in RCC trench (underground trench) or in cable tray along pipe sleepers or in over head trays as shown on cable layout drawings.

Overhead trays shall be installed 2700 mm (minimum) above grade level and 300mm above FGL in case cable trays are installed along with pipe sleepers. At road crossings overhead trays shall be installed at 7000 mm (minimum) above grade level or cables shall be routed cable tray culvert/ Electrical road crossings as per layout drawings.

Sufficient care shall be taken while laying cables to avoid formation of twist, sharp bend etc. in order to avoid mechanical injuries to cables. Rollers shall be used for pulling of cables.

Cable installation shall provide minimum cable bending radii as recommended by cable manufacturer.

7.1.3 Cables shall be neatly arranged in the trenches / trays in such a manner that criss-crossing is avoided and final take off to the motor / switchgear is facilitated. Arrangement of cables within the trenches / trays shall be in line with cable layout drawings. Cable routing between cable trench and equipment/motors shall be taken through GI pipe sleeves of adequate size. Pipe sleeves shall be laid at an angle of maximum 45 to the trench wall. Bending radii of pipes shall not be less than 8D. It is to be ensured that both the ends of GI pipe sleeves shall be sealed with approved weather proof sealing plastic compound after cabling. In places where it is not possible, cables shall be laid in smaller branch trenches. Different rows of cable trays in cable cellar below the cutout shall be fixed so that the trays don't obstruct cable entry to the panels.

7.1.4 All cables shall be identified close to their termination point by cable tag numbers as per cable schedule. Cable tag numbers shall be punched on aluminium /Lead straps (2mm thick, 20 mm wide and of enough length) securely fastened to the cable and wrapped around it.

Each underground cable shall be provided with cable tags of lead /Aluminium securely fastened every 30 m of its underground length with at least one tag at each end before the cable enters/leaves the ground. In unpaved areas, cable trenches shall be identified by means of cable markers as per installation drawing. These cable markers shall be placed at location of changes in the direction of cables and at intervals of not more than 30 m and also at cable straight through joint locations.

7.1.5 All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation. For this purpose, ends of cables shall be taped with an approved PVC end cap or rubber insulating tape.

7.1.6 Each row of cables shall be laid in place and before covering with sand. All wall

openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water inside building/lined trench. Every cable shall be given an insulation test in presence of Engineer-in-charge/Owner before filling the cable trench with sand Any cable which is found defective shall be replaced.

7.1.7 Where cables pass through foundation walls, the necessary openings shall be provided in advance for the same by another agency. However, should it become necessary to cut holes in existing structures for example floor slab etc., the electrical contractor shall determine their location and obtain approval of the Engineer-in-charge before carrying out the same.

7.1.8 Cables for road crossings shall be taken through ERC (Electrical Road Crossing) as shown in the cable layout drawings.

At road crossing and other places where cables enter pipe sleeves adequate bed of sand shall be given so that the cables do not slack and get damaged by pipe ends.

7.1.9 Wherever cable trench crosses storm water, waste water channel/drain, cables shall be taken through PVC/RCC pipes. Where cables are required to cross drains of depth more than 1200 mm, cables shall be taken over the drain on cable trays supported suitably using ISMC 150/200 sections.

7.1.10 Ends of cables leaving trench shall be coiled and capped and provided with protective cover till such time the final termination to the equipment is completed.

## 7.2 Cables Laid Direct in Ground

Cables shall be laid underground in excavated cable trenches where specified in cable layout drawings. Trenches shall be of sufficient depth and width for accommodation of all cables. Cables shall be properly spaced as per installation standards. Maximum number of cable layers in trench shall be preferably limited to 6 layers.

Minimum depth of directly cable trench shall be 750 mm, for medium voltage and 900 mm for HV Cables. The depth and the width of the trench shall vary depending upon the number of layers of cables as per SRE installation Standards. The depth and the width of the trench shall vary depending upon the number of layers of cables as per SRE installation Standards

Cables shall be laid in buried trenches at depth as shown in the cable layout drawings. It is to be ensured by the contractor that the bottom of buried trenches shall be cleared of all rocks, stones and sharp objects before cables are placed. The trench

bottom shall be filled with a layer of sand or stone dust. This sand /stone dust shall be leveled and cables laid over it. These cables shall be covered with 150 mm of sand on top of the largest diameter cable and sand shall be lightly compacted. A flat protective covering of 75 mm thick second class red bricks or concrete tiles as per specification shall then be laid and the remainder of the trench shall then be back - filled with soil, rammed and leveled.

#### 7.3 Cables Laid in Concrete Trench

Cables shall be laid in 5 or 6 tiers in concrete trench as shown on layout drawings. Concrete cables trenches shall be filled with sand /stone dust in hazardous area to avoid accumulation of hazardous gases and oil. RCC covers of trenches shall be effectively sealed to avoid ingress of chemical and oil in process area. Removal of concrete covers where required for the purpose of cable laying and reinstating them in their proper position after cables are laid shall be done by electrical contractor. Minimum depth of RCC cable trench shall be 500mm for all voltage grades with 300mm clearance between the bottoms of the trench cover and top of the cable. The depth and the width of the trench shall vary depending upon the number of layers of cables and bending radius required for cables as per SRE installation Standards

All wall openings/pipe sleeves shall be effectively sealed after installation of cables to avoid seepage of water

#### 7.4 Above Ground Cables

7.4.1 Cables installed above grade shall be run in cable trays, clamped on walls, ceiling or structures and shall be run parallel or at right angles to beams, walls or columns. Cable routing shall be planned to be away from heat sources such as hot piping, gas, water, oil drainage piping, air-conditioning duct etc. Each cable tray shall contain only one layer of cables as far as possible for power cables. However control cables may be laid in double layer in the cable trays.

7.4.2 Individual cable or small group of cables (up to 3 cables) which run along structures / walls etc. shall be clamped by means of 16 SWG GI saddles on 25 x 6 mm saddle bars. Alternatively small group of cables can be taken through 60/100/150 mm slotted channel tray or channel ISMC-75/100. Cables shall be supported so as to prevent Sagging. In general, distance between supports shall be approximately 300 mm for cables up to 25 mm diameter and maximum 450 mm for cables larger than 25 mm dia. to prevent the Sagging of cables.

#### 7.4.3 Cable laid on supporting angle in cable trenches, structures, columns and vertical run of

cable trays shall be suitably clamped by means of GI saddles / clamps, whereas cables in horizontal run of cable trays shall be tied by means of nylon cords. Distance between supporting angles shall not exceed 600 mm. All cable trays (other than galvanized trays) and supporting steel structures shall be painted before laying of cables. The under surfaces shall be properly degreased, derusted, descaled and cleaned. The painting shall be done with one coat of red oxide zinc chromate primer. Final painting shall be done with two coats of approved bituminous aluminium paint unless otherwise specified.

7.4.4 Where cables rise from trench to motor, lighting panel, control station, junction box etc., they shall be taken in GI pipe for mechanical protection up to a minimum of 300 mm above grade for outdoor area. Cable ends shall be carefully pulled through conduit to prevent damage to cable.

7.4.5 AH GI Pipes shall be laid as per layout drawings and site conditions. Before fabrication of various profiles of pipes by hydraulically operated bending machine (which is to be arranged by the contractor) all the burrs from the pipes shall be removed. GI Pipes having bends shall be buried in soil / concrete in such a way that the bend shall be totally concealed. For G.I. pipes buried in soil, bitumen coating shall be applied on the buried lengths, Installation of G.I. pipes shall be undertaken well before paving is completed and necessary co ordination with paving agency shall be the responsibility of Electrical Contractor.

Following guide shall be used for sizing of GI. pipe.

- a) 1 cable in a pipe -53% of pipe cross-sectional area occupied by cables.
- b) 2 cables in a pipe -31% of pipe cross-sectional area occupied by cables.
- c) 3 cables in a pipe - 43% of pipe cross-sectional area occupied by cables.
- d) 4 & above cables in a pipe - 40% of pipe cross-sectional area occupied by cables.

7.4.6 After the cables are installed and all testing is complete, conduit ends above grade shall be plugged with a suitable weatherproof plastic compound/bitumen/suitable sealing compound.

Alternatively rubber bushes shall be employed for the purpose of sealing.

7.4.7 Fire proofing of end of power cables at least 1 meter at each end as per OISD norms for the refinery and Petroleum industry, shall be carried out as per the recommendation of the paint supplier .Rates for the fire proofing of cables shall be included in the cable installation and no separate payment shall be made for the painting.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Mtr.

SR NO 12. Solderless crimping type Aluminium lugs

Solderless crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.

(F) 70 Sq.mm.

(H) 120 Sq.mm.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

SR NO 13. Heavy duty flange type brass cable gland

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables.

(B) 3 & 1/2 core 35/50 Sq. mm

(C) 3 & 1/2 core 70 Sq. mm

(E) 3 & 1/2 core 120 Sq. mm

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

SR NO 14. TIMER & CONTACTOR

#### 14.1 Programmable Timer Unit General

Timer input voltage shall be powered by AC 100 - 240 Volts AC (+10% / -15%, 50 hertz), conforms to:

Noise Immunity: IEC 6100-4-4, 2kV

(Power supply line) Ambient operating temperature: 0°C to 55°C

Humidity: 10% - 90%

The Timer shall have the following programmable features:

- (a) Programmable: With 3 inputs and 1 output conditions per line.
- (b) Basic CPU Input / Output: Minimum 6 inputs and 4 outputs.

All outputs should have a relay switching capacity of 8 Amps at 250 Volts AC with independent common.

The Timer Central Processing Unit (CPU) shall be provided with built-in real-time clock and calendar functions. The real time clock should have an accuracy of  $\pm 15$  sec per month. The data of real time clock, calendar, holding bits, holding timers and counter present value shall be held by a non-battery system for a minimum of 48 hours for prolonged power interruptions.

The timer program and system setting data shall be stored in internal EEPROM to prevent loss of setting / program during power failure.

The Timer shall have the following features and functions:

- (a) Front panel LCD display with backlight. Backlight can be automatically cut-off through adjustable settings to save the life span of backlight.
- (b) Input filters settings to prevent noise-related malfunctions such as false triggering of inputs.
- (c) Password protection function to prevent unauthorised modification of Timer programs and settings.

Timer shall incorporate a communication port or infrared port for downloading of program and setting.

Timer shall support communications to host devices such as computers and Personal Digital Assistant (PDA).

The Timer system shall be equipped with the Windows Based software programming tools and drivers for the set-up of communication between Timer and host devices.

The Timer shall be provided with an application software tool running on Windows CE powered PDAs to allow setting of programs and the download / upload of the settings.

All Timer technical details and full communication protocols shall be provided.

The Timer shall have self-diagnostic functions and shall be displayed on the CPU LCD. All errors shall be able to communicate back to host communication port or infrared port.

The timer shall have minimum 16 programmable On / Off period within a year. Weekly timings and minimum 16 programmable calendar timings.

ELECTRIFICATION WORKS – TECHNICAL SPECIFICATION

The On / Off switching timing of the timer shall be programmed based on the local sunrise and sunset time. It shall be programmed with at least eight (8) different segments of switching timing as follows:

S/No	From	To	TimeOn	TimeOff
1	10-Jan	31-Mar	1910	0721
2	01-Apr	17-Jun	1903	0708
3	18-Jun	28-Aug	1907	0711
4	29-Aug	15-Sep	1859	0706
5	16-Sep	07-Oct	1853	0701
6	08-Oct	06-Dec	1847	0658
7	07-Dec	23-Dec	1855	0707
8	24-Dec	09-Jan	1903	0715

The timer shall have a Mean Time Between Failure (MTBF) of at least 300,000 hours and a stored programmed calendar year/month/day of equivalent length of time.

The timer shall be protected with an enclosure and a micro surge suppressor to prevent external adverse conditions such as high humidity, pests’ infestation or frequent sudden power surges from the incoming power supply.

The size of the timer enclosure box shall measure 125mm(W) x 125mm(L) x 100mm(D) in dimension and rated at IP 66. The temperature rating is -40°C to 80°C of the box. The material used shall be Acrylonitrile Butadiene Styrene (ABS) for body, clear PolyCarbonate (PC) for cover.

The micro surge suppressor shall comply fully with the Transient Immunity EMC requirements (Norms EN 61000-4-4 & EN 61000-4-5), while providing effective transient voltage protection to the timer.

The micro surge suppressor shall design and manufactured to the safety standards: CE, UL, VDE, IEC, EN. The housing shall be made of compact plastic according to UL-VO.

V nominal	440Volts,three-phase
Frequency	50 hertz
MaxOperatingVoltage	500Volts(L-L)
MaxSurgeCurrent	4.5KA
EMI/RFInoise rejection	20dB
ResponseTime	1ns

14.2 Electro-Magnetic Contactor

ELECTRIFICATION WORKS – TECHNICAL SPECIFICATION

General

The contactor shall be manufactured in accordance with the latest edition of IEC 60158-1 and BS 5424 Part I. This contactor shall be suitable for use in the tropical climate and it is intended to be mounted in an enclosure. They shall be provided with main contacts capable of at least 105 switching operations and at least two auxiliary contacts for remote control (230 Volts, AC). Contactors for lighting control shall be of Utilisation Category AC2, Class 3.

The rated operating current shall be 60 Amps when used on 400 Volts, 50 hertz (rated operating voltage and frequency) and for uninterrupted duty. It shall be suitable for switching on high intensity discharge Mercury or Sodium Vapour lamps with power factor improvement capacitors connected across the incoming circuits of the lamps.

The contactors shall have at least 900 Amps making capacity and 720 Amps breaking capacity to prevent contact welding during switching on and off.

The rated operating magnetic coil voltage shall be 230 Volts  $\pm$ 6%, 50 hertz  $\pm$ 1%, single-phase. The coil shall be preferably encapsulated type.

Contactor Enclosure Box

The box shall be designed to contain a 60 Amps three-phase contactor. Its size shall be:

LENGTH	WIDTH	DEPTH
190mm - 200mm	190mm - 200mm	130mm - 135mm

The box shall be dust-protected and preferably be constructed of thermoplastic self-extinguishable material. The cover of the box shall be transparent.

Mounting rails or similar attachments shall be provided on the base of the box for easy mounting of a contactor.

The box shall be provided with eight (8) nos. holes on the top side for entry of 16mm<sup>2</sup> single-core and three (3) holes on the bottom side for entry of 35mm<sup>2</sup> single-core (box mounted in a vertical position). 11 nos. of entry seals (grommets) are to be provided for the entry holes.

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One No.

ELECTRIFICATION WORKS – TECHNICAL SPECIFICATION

SR NO 15. CAT-6 CABLE

1.	<b>Category 6 UTP Cable</b>
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- Cable should meet or exceeds Category 6/Class E attenuation.
- Should meet Cat6/Class E NEXT requirements in ISO/IEC 11801 and TIA/EIA 568B. ➤ Should be UL verified as Category 6.
- Should have Star filler (No bisection tape) cable construction for improved performance. ➤ Insulation material should be polyethylene.
- Performance guaranteed to meet or exceed Category 6/Class E Channel Specifications to 250 MHz.
- Category 6/Class E NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT and return loss extrapolated to 250 MHz.
- Cable should be capable of delivering potentially in excess of 1 Gbps to the workstation in accordance with application standards.
- Should support IEEE 802.3 1000BASE-T, TIA-854-A 1000BASE-TX, plus other legacy LANs and applications as well as Video also.

Electrical/Mechanical Specification:	
Conductor DC resistance @ 20°C (max):	9.38Ω/100m
DC resistance Unbalance (max):	5%
Mutual Capacitance @ 20°C (max):	5.6nF/100m
Nominal Velocity of Propagation:	70%
Attenuation at 250 MHz:	32.8dB
Return Loss at 250MHz:	17.3dB
ACR at 250MHz:	5.5dB
PSACR at 250MHz:	3.5dB
NEXT at 250MHz:	38.3dB
PSNEXT at 250MHz:	36.3dB
ELFEXT at 250MHz:	19.8dB
PSELFEXT at 250MHz:	16.8dB
Minimum Bending Radius: During Installation (50mm) & After Installation (25mm)	
Maximum Pulling Tension:	108 N (11 Kg)
Operating Temperature:	-15°C to 70°C
Gauge:	24AWG

MODE OF MEASUREMENT: AS PER MENTIONED IN SCHEDULE – B

Description

Mode of Payment: The rate shall be for a Unit of One Mtr.

### ELECTRIFICATION WORKS – TECHNICAL SPECIFICATION

#### SPECIAL CONDITION

- (1) Point wiring shall be from the distribution box or fuse board, No sub main shall be measured.
- (2) Samples of materials shall be given to Engineer-in-charge and approval should be taken in writing before its use.
- (3) Fabrication drawing should be get approved from the Engineer-in -charge prior to Manufacturer.

- (4) Pipe laying lay out shall be as per consultants drawings.
- (5) There shall be no junction in wiring out let box shall be used after bond.
- (6) Electrical contractor shall make good the civil work if chased or damaged.
- (7) Electrical Engineer-in-charge opinion shall be final and binding on contractor.
- (8) Qualified labor and supervisors shall work at site.
- (9) Electrical Contractor shall not permit unqualified labor contractor to work at site. He shall observe Govt. rules regarding control of labor. He shall submit test report and carry out tests as required and furnish detailed drawings on completion of work. The responsible authorized person by the contractor should be available at site daily when work is in progress.
- (10) The work shall be carried out during working days between 8.00 A.M. to 6.00 P.M. only. The cable trench should not remain open for more than 24 hours after excavation. If contractor intends to work on holiday or outside working hours specified, he shall take prior permission from the Engineer-in-charge. In that case overtime to the staff shall have to be paid by the Contractor. The Electrical appliance-materials shall bear the ISI mark or declaration indicating manufacturer's names and appliances material used having been manufactured in accordance with the manufacturer's certificate issued by the Government of Gujarat and confirming to the standard specified by the I.S.I. shall be given by the contractor.
- (11) Cost of all test should be borne by contractor/ Tenderer, carried out for Electrical related equipment in presence of TPI/PMC/SDCB's representative.

#### ELECTRIFICATION WORKS – TECHNICAL SPECIFICATION

The conditions laid down under House Hold Electrical Appliances (Quality Control Act 1981) shall be followed.

I/We agree to carry out the above work at rates indicated above at \_\_\_\_\_ percentage above/below the rates indicated above i.e. I/We agree to carry out the above work at a total cost of

Rs. \_\_\_\_\_.

The Contractor shall provide test report and get the installation approved from Govt.

Elect. Authority is required.

CONTRACTORS STAMP AND SIGNATURE.



## 16 – TRANSFORMER DETAILED TECHNICAL SPECIFICATIONS.

3-Phase Distribution Transformers 11 or 33 kV/415-240V

1. SCOPE:

i) This specification covers engineering, manufacture, assembly, stage testing, inspection and testing before supply and delivery at site of oil immersed, naturally cooled 3-phase 11 kV/433 - 250 V and 33 kV/433-250 V distribution transformers for indoor/outdoor use.

ii) The equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.

iii) The transformer and accessories shall be designed to facilitate operation, inspection, maintenance and repairs. The design shall incorporate every precaution and provision for the safety of equipment as well as staff engaged in operation and maintenance of equipment.

iv) All indoor/outdoor apparatus, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

2 STANDARD RATINGS:

The standard ratings shall be 16, 25, 63, 100,160, 200, 250, 315, 400, 500, 630, 1000, 1250, 1600, 2000, 2500 kVA for 11 kV distribution transformers and 100, 160, 200, 315, 400, 500, 630, 1000, 1250, 1600, 2000, 2500 kVA for 33 kV distribution transformers.

3 STANDARDS:

3.1 The major materials used in the transformer shall conform in all respects to the relevant/specified Indian Standards and international Standards with latest amendments thereof as on bid opening date, unless otherwise specified herein. Some of the applicable Indian Standards are listed as hereunder:

3.2

Indian Standards	Title	International Standards
IS-2026	Specification for Power Transformers	IEC76
IS1180(Part-I): 2014	indoor/Outdoor Type Oil Immersed Distribution Transformers upto and including 2500kVA, 33kV-Specification	
IS 12444	Specification for Copper wire rod	ASTM B-49
IS-335	Specification for Transformer/Mineral Oil	IEC Pub 296
IS-5	Specification for colors for ready mixed paints	
IS-104	Ready mixed paint, brushing zinc chromate, priming	
IS-2099	Specification for high voltage porcelain bushing	
IS-649	Testing for steel sheets and strips and magnetic circuits	
IS-3024	Cold rolled grain oriented electrical sheets and strips	
IS-4257	Dimensions for clamping arrangements for bushings	
IS-7421	Specification for Low Voltage bushings	
IS-3347	Specification for indoor/Outdoor Bushings	DIN 42531 to 33
IS-5484	Specification for Al Wire rods	ASTM B-233

IS-9335	SpecificationforInsulatingKraftPaper	IEC554
IS-1576	SpecificationforInsulatingPressBoard	IEC641
IS-6600	GuideforloadingofoilImmersedTransformers	IEC76
IS- 2362	Determinationofwatercontentinoilfor porcelain bushingof transformer	
IS- 6162	PapercoveredAluminium conductor	
IS- 6160	RectangularElectrical conductor forelectrical machines	
IS- 5561	Electrical power connector	
IS- 6103	Testingofspecificresistanceofelectricalinsulating liquids	
IS- 6262	Methodofestforpowerfactoranddielectricconstantof electrical insulating liquids	
IS- 6792	Determinationofelectricalstrengthofinsulating oil	
IS- 10028	Installationandmaintenanceof transformers.	

#### 4 SERVICE CONDITIONS:

4.1 The Distribution Transformers to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following climatic conditions as per IS 2026 (Part - I).

i) Location : At various locations in the country

ii) Maximum ambient air temperature (0C) : 50

iii)

Minimum ambient air temperature (0C) :

-5

iv)

Maximum average daily ambient air temperature (0C):

40

v)

Maximum yearly weighted average : ambient temperature(0C)

32

vi) Maximum altitude above sea level (Meters) : To be specified by the user

Note:

1. The climatic conditions specified above are indicative and can be changed by the user as per requirements.

2. The equipment shall generally be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth unless otherwise specified.

#### 5 PRINCIPAL PARAMETERS:

5.1 The transformers shall be suitable for indoor/outdoor installation with three phase, 50 Hz, 11 kV or 33 kV system in which the neutral is effectively earthed and they should be suitable for service with fluctuations in supply voltage upto plus 12.5% to minus 12.5%.

(i) The transformers shall conform to the following specific parameters :

Sl.No.	Item	11kVDistribution Transformers	33kVDistribution Transformers
1	Systemvoltage(Max.)	12kV	36kV
2	RatedVoltage(HV)	11kV	33kV
3	RatedVoltage(LV)	433-250V*	433-250V*
4	Frequency	50Hz+/-5%*	50Hz+/-5%
5	No.ofPhases	Three	Three
6	Connection HV	Delta	Delta
7	Connection LV	Star(Neutral brought out)	Star(Neutral brought out)
8	Vector group	Dyn-11	Dyn-11
9	Typeof cooling	ONAN	ONAN

\*The voltage level can be specified as 433/415-250 volts as per the requirements of the purchaser. Audible sound levels (decibels) at rated voltage and frequency for liquid immersed distribution transformers shall be as below (NEMA Standards):

kVArating	Audiblesoundlevels(decibels)
0-50	48
51-100	51
101-300	55
301-500	56
750	57
1000	58
1500	60
2000	61
2500	62

## 6. TECHNICAL REQUIREMENTS:

### 6.1.1 CORE MATERIAL

6.1.2.1 The core shall be stack / wound type of high grade Cold Rolled Grain Oriented or Amorphous Core annealed steel lamination having low loss and good grain properties, coated with hot oil proof insulation, bolted together and to the frames firmly to prevent vibration or noise. The core shall be stress relieved by annealing under inert atmosphere if required. The

complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer.

6.1.2.2 The bidder should offer the core for inspection and approval by the purchaser during manufacturing stage. CRGO steel for core shall be purchased only from the approved vendors, list of which is available at <http://apps.powergridindia.com/ims/ComponentList/Power-former%20upto%20420%20kV-CM%20List.pdf>

6.1.2.3 The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) up to 12.5% without injurious heating at full load conditions and shall not get saturated. The bidder shall furnish necessary design data in support of this situation.

6.1.2.4 No-load current up to 200kVA shall not exceed 3% of full load current and will be measured by energising the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no-load current by 6% of full load current.

or

No-load current above 200kVA and upto 2500kVA shall not exceed 2% of full load current and will be measured by energising the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no-load current by 5% of full load current.

6.1.2.5 Please refer to “Check-list for Inspection of Prime quality CRGO for Transformers” attached at Annexure-A. It is mandatory to follow the procedure given in this Annexure.

## 7 WINDINGS:

### (i) Material:

7.1.1 HV and LV windings shall be wound from Super Enamel covered /Double Paper covered Aluminum / Electrolytic Copper conductor.

7.1.2 LV winding shall be such that neutral formation will be at top.

7.1.3 The winding construction of single HV coil wound over LV coil is preferable.

7.1.4 Inter layer insulation shall be Nomex /Epoxy dotted Kraft Paper.

7.1.5 Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted.

7.1.6 Dimensions of winding coils are very critical. Dimensional tolerances for winding coils shall be within limits as specified in Guaranteed Technical Particulars (GTP Schedule I).

7.1.7 The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.

7.1.8 Joints in the winding shall be avoided. However, if jointing is necessary the joints shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. In case of foil windings, welding of leads to foil can be done within the winding.

**8 TAPPING RANGES AND METHODS:**

- 8.1.1 No tapping shall be provided for distribution transformers up to 100 kVA rating.
- 8.1.2 For ratings above 100 kVA and up to 500 kVA, tappings shall be provided, if required by the purchaser, on the higher voltage winding for variation of HV voltage within range of (+) 5.0 % to (-) 10% in steps of 2.5%.
- 8.1.3 For ratings greater than 500 kVA, tapping shall be provided on the higher voltage winding for variation of HV voltage within range of (+) 2.5% to (-) 5.0 % in steps of 2.5%.
- 8.1.4 Tap changing shall be carried out by means of an externally operated self-position switch and when the transformer is in de-energised condition. Switch position No.1 shall correspond to the maximum plus tapping. Each tap change shall result in variation of 2.5% in voltage. Arrangement for pad locking shall be provided. Suitable aluminum anodized plate shall be fixed for tap changing switch to know the position number of tap.

**9 OIL:**

- 9.1 The insulating oil shall comply with the requirements of IS 335. Use of recycled oil is not acceptable. The specific resistance of the oil shall not be less than 35 X10<sup>12</sup> ohm-cm at 27oC when tested as per IS 6103.
- 9.2 Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling.
- 9.3 The oil shall be filled under vacuum.
- 9.4 The design and all materials and processes used in the manufacture of the transformer, shall be such as to reduce to a minimum the risk of the development of acidity in the oil.

**10 INSULATION LEVELS:**

Sl. No.	Voltage (kV)	Impulse Voltage (kVPeak)	PowerFrequency Voltage(kV)
1	0.433	-	3
2	11	75	28
3	33	170	70

**11 LOSSES:**

- 11.1 The transformer of HV voltage up to 11kV, the total losses(no-load + load losses at 75 0C) at 50% of rated load and total losses at 100% of rated load shall not exceed the maximum total loss values given in Table-3 upto 200kVA & Table-6 for ratings above 200kVA of IS 1180(Part-1):2014.
- 11.2 The maximum allowable losses at rated voltage and rated frequency permitted at 75 0C for 11/0.433 kV transformers can be chosen by the utility as per Table-3 upto 200kVA and Table-6 for ratings above 200kVA as per Energy Efficiency Level-2 specified in IS 1180 (Part-1):2014 for all kVA ratings of distribution transformers.
- 11.3 The above losses are maximum allowable and there would not be any positive tolerance. Bids with higher losses than the above specified values would be treated as non-responsive. However, the manufacturer can offer losses less than above stated values. The utility

can evaluate offers with losses lower than the maximum allowable losses on total owning cost basis in accordance with methodology given in Annex-I.

12 TOLERANCES:

12.1 No positive tolerance shall be allowed on the maximum losses displayed on the label for both 50% and 100% loading values.

13 PERCENTAGE IMPEDANCE:

The percentage impedance of transformers at 75 0C for different ratings upto 200 kVA shall be as per Table 3 and for ratings beyond 200 kVA shall be as per Table 6 of IS 1180(Part-1):2014.

14 Temperature rise: The temperature rise over ambient shall not exceed the limits given below:

14.1 Top oil temperature rise measured by thermometer :35 0C

14.2 Winding temperature rise measured by resistance method :40 0C

14.3 The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. Bidder shall submit the calculation sheet in this regard.

15 PENALTY FOR NON PERFORMANCE:

15.1 During testing at supplier's works if it is found that the actual measured losses are more than the values quoted by the bidder, the purchaser shall reject the transformer and he shall also have the right to reject the complete lot.

15.2 Purchaser shall reject the entire lot during the test at supplier's works, if the temperature rise exceeds the specified values.

15.3 Purchaser shall reject any transformer during the test at supplier's works, if the impedance values differ from the guaranteed values including tolerance.

16 INSULATION MATERIAL:

16.1 Electrical grade insulation epoxy dotted Kraft Paper/Nomex and pressboard of standard make or any other superior material subject to approval of the purchaser shall be used.

16.2 All spacers, axial wedges / runners used in windings shall be made of pre-compressed Pressboard-solid, conforming to type B 3.1 of IEC 641-3-2. In case of cross-over coil winding of HV all spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges / runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, cutting, milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations.

17.1 TANK:

- Transformer tank construction shall conform in all respect to clause 15 of IS 1180(Part-1):2014.
- The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings.
- All joints of tank and fittings shall be oil tight and no bulging should occur during service.

- Inside of tank shall be painted with varnish/hot oil resistant paint.
- The top cover of the tank shall be slightly sloping to drain rain water.
- The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle.
- Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure and welder performance qualification certificates to the customer.

i) PLAIN TANK:

17.2.1 The transformer tank shall be of robust construction rectangular/octagonal/round/elliptical in shape and shall be built up of electrically tested welded mild steel plates of thickness of 3.15 mm for the bottom and top and not less than 2.5 mm for the sides for distribution transformers upto and including 25 kVA, 5.0 mm and 3.15 mm respectively for transformers of more than 25 kVA and up to and including 100 kVA and 6 mm and 4 mm respectively above 100 kVA. Tolerances as per IS1852 shall be applicable.

17.2.2 In case of rectangular tanks above 100 kVA the corners shall be fully welded at the corners from inside and outside of the tank to withstand a pressure of 0.8 kg/cm<sup>2</sup> for 30 minutes. In case of transformers of 100 kVA and below, there shall be no joints at corners and there shall not be more than 2 joints in total.

17.2.3 Under operating conditions the pressure generated inside the tank should not exceed 0.4 kg/ sq. cm positive or negative. There must be sufficient space from the core to the top cover to take care of oil expansion. The space above oil level in the tank shall be filled with dry air or nitrogen conforming to commercial grade of IS 1747.

(i) The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank.

(ii) Permanent deflection: The permanent deflection, when the tank without oil is subjected to a vacuum of 525 mm of mercury for rectangular tank and 760 mm of mercury for round tank, shall not be more than the values as given below:

(All figures are in mm)

Horizontallengthofflatplate	Permanentdeflection
Uptoandincluding 750	5.0
751to1250	6.5
1251to 1750	8.0
1751to2000and above	9.0

17.2.4 The tank shall further be capable of withstanding a pressure of 0.8kg/sq.cm and a vacuum of 0.7 kg/sq.cm (g) without any deformation.

17.2.5 The radiators can be tube type or fin type or pressed steel type to achieve the desired cooling to limit the specified temperature rise.

17.3 CORRUGATED TANK:

17.3.1 The bidder may offer corrugated tanks for transformers of all ratings.



17.3.2 The transformer tank shall be of robust construction corrugated in shape and shall be built up of tested sheets.

17.3.3 Corrugation panel shall be used for cooling. The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. Bidder shall submit the calculation sheet in this regard.

17.3.4 Tanks with corrugations shall be tested for leakage test at a pressure of 0.25kg/ sq cm measured at the top of the tank.

17.3.5 The transformers with corrugation should be provided with a pallet for transportation, the dimensions of which should be more than the length and width of the transformer tank with corrugations.

#### 18 CONSERVATOR:

(i) Transformers of rating 63 kVA and above with plain tank construction, the provision of conservator is mandatory. For corrugated tank and sealed type transformers with or without inert gas cushion, conservator is not required.

(ii) When a conservator is provided, oil gauge and the plain or dehydrating breathing device shall be fitted to the conservator which shall also be provided with a drain plug and a filling hole [32 mm (1¼")] normal size thread with cover. In addition, the cover of the main tank shall be provided with an air release plug.

(iii) The dehydrating agent shall be silica gel. The moisture absorption shall be indicated by a change in the colour of the silica gel crystals which should be easily visible from a distance. Volume of breather shall be suitable for 500g of silica gel conforming to IS 3401 for transformers upto 200 kVA and 1 kg for transformers above 200 kVA .

(iv) The capacity of a conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain 10% quantity of the oil. Normally 3% quantity the oil shall be contained in the conservator.

(v) The cover of main tank shall be provided with an air release plug to enable air trapped within to be released, unless the conservator is so located as to eliminate the possibility of air being trapped within the main tank.

(vi) The inside diameter of the pipe connecting the conservator to the main tank should be within 20 to 50 mm and it should be projected into the conservator so that its end is approximately 20 mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level (corresponding to -5 0C) should be above the sump level.

#### 19 SURFACE PREPARATION AND PAINTING:

##### (i) GENERAL

19.1.1 All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

19.1.2 All primers shall be well marked into the surface, particularly in areas where painting is evident and the first priming coat shall be applied as soon as possible after cleaning. The paint

shall be applied by airless spray according to manufacturer's recommendations. However, where ever airless spray is not possible, conventional spray be used with prior approval of purchaser.

19.2 CLEANING AND SURFACE PREPARATION:

- a) After all machining, forming and welding has been completed, all steel work surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.
- b) Steel surfaces shall be prepared by shot blast cleaning (IS9954) to grade Sq. 2.5 of ISO 8501-1 or chemical cleaning including phosphating of the appropriate quality (IS 3618).
- c) Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale. These methods shall only be used where blast cleaning is impractical. Manufacturer to clearly explain such areas in his technical offer.

19.3 PROTECTIVE COATING:

19.3.1 As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anti-corrosion protection.

19.4 PAINT MATERIAL:

- i) Following are the types of paint which may be suitably used for the items to be painted at shop and supply of matching paint to site:  
Heat resistant paint (Hot oil proof) for inside surface
- ii) For external surfaces one coat of thermo setting powder paint or one coat of epoxy primer followed by two coats of synthetic enamel/polyurethane base paint. These paints can be either air drying or stoving.
- iii) For highly polluted areas, chemical atmosphere or for places very near to the sea coast, paint as above with one coat of high build Micaceous iron oxide (MIO) as an intermediate coat may be used.

19.5 PAINTING PROCEDURE:

- i) All prepared steel surfaces should be primed before visible re-rusting occurs or within 4 hours, whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is still warm.
- ii) Where the quality of film is impaired by excess film thickness (wrinkling, mud cracking or general softness) the supplier shall remove the unsatisfactory paint coating and apply another coating. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%.

19.6 DAMAGED PAINTWORK:

- (i) Any damage occurring to any part of a painting scheme shall be made good to the same standard of corrosion protection and appearance as that was originally applied.
- (ii) Any damaged paint work shall be made good as follows:

19.6.2.1 The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal.

19.6.2.2 A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.

19.6.2.3 The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

19.7 DRY FILM THICKNESS:

19.7.1 To the maximum extent practicable the coats shall be applied as a continuous film of uniform thickness and free of pores. Overspray, skips, runs, sags and drips should be avoided. The different coats may or may not be of the same colour.

19.7.2 Each coat of paint shall be allowed to harden before the next is applied as per manufacturer's recommendation.

19.7.3 Particular attention must be paid to full film thickness at the edges.

19.7.4 The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as given below:

Sl. No.	Painttype	Areato be painted	No.of coats	Totaldryfilm thickness (min.)(microns)
1.	Thermosettingpowder paint	inside outside	01 01	30 60
2.	<b>Liquidpaint</b>			
	a) Epoxy(primer)	outside	01	30
	b) P.U.Paint (Finishcoat)	outside	02	25each
	c) Hotoilpaint/Varnish	inside	01	35/10

19.8 TESTS FOR PAINTED SURFACE:

19.8.1 The painted surface shall be tested for paint thickness.

19.8.2 The painted surface shall pass the cross hatch adhesion test and impact test as acceptance tests and Salt spray test and Hardness test as type test as per the relevant ASTM standards.

Note: Supplier shall guarantee the painting performance requirement for a period of not less than 5 years.

20 BUSHINGS:

20.1 The bushings shall conform to the relevant standards specified and shall be of indoor/outdoor type. The bushing rods and nuts shall be made of brass material 12 mm diameter for both HT and LT bushings. The bushings shall be fixed to the transformers on side with straight pockets and in the same plane or the top cover for transformers above 100 kVA. For transformers of 100 kVA and below the bushing can be mounted on pipes. The tests as per latest IS 2099 and IS 7421 shall be conducted on the transformer bushings.

20.2 For 33 kV, 52 kV class bushings shall be used for transformers of ratings 500 kVA and above. And for transformers below 500 KVA, 33 kV class bushings, for 11 kV, 17.5 kV class bushings and for 0.433 kV, 1.1 kV class bushings shall be used.

20.3 Bushing can be of porcelain/epoxy material. Polymer insulator bushings conforming with relevant IEC can also be used.

20.4 Bushings of plain shades as per IS 3347 shall be mounted on the side of the Tank and not on top cover.

20.5 Dimensions of the bushings of the voltage class shall conform to the Standards specified and dimension of clamping arrangement shall be as per IS 4257

20.6 Minimum external phase to phase and phase to earth clearances of bushing terminals shall be as follows:

Voltage	Clearance	
	Phasetophase	Phasetoearth
33kV	350mm	320mm
11kV	255mm	140mm
LV	75mm	40mm

Theclearancesincaseofcableboxshallbeasbelow:

Voltage	Clearance	
	Phasetophase	Phasetoearth
33kV	350mm	220mm
11kV	130mm	80mm
LV	25mm	20mm

20.7 Arcing horns shall be provided on HV bushings.

20.8 Brazing of all inter connections, jumpers from winding to bushing shall have cross section larger than the winding conductor. All the Brazes shall be qualified as per ASME, section – IX.

20.9 The bushings shall be of reputed make supplied by those manufacturers who are having manufacturing and testing facilities for insulators.

20.10 The terminal arrangement shall not require a separate oil chamber not connected to oil in the main tank.

21 TERMINAL CONNECTORS:

21.1 The LV and HV bushing stems shall be provided with suitable terminal connectors as per IS 5082 so as to connect the jumper without disturbing the bushing stem. Connectors shall be with eye bolts so as to receive conductor for HV. Terminal connectors shall be type tested as per IS 5561.

22 LIGHTNING ARRESTORS:

22.1 9 kV, 5 kA metal oxide lightning arrestors of reputed make conforming to IS 3070 Part-III, one number per phase shall be provided. (To be mounted on pole or to be fitted under the HV bushing with GI earth strip 25x4 mm connected to the body of the transformer with necessary clamping arrangement as per requirement of purchaser.) Lightning arrestors with polymer insulators in conformance with relevant IEC can also be used.

23 CABLE BOXES:

23.1 In case HV/LV terminations are to be made through cables the transformer shall be fitted with suitable cable box on 11 kV side to terminate one 11kV/ 3 core aluminium conductor cable up to 240 sq. mm. (Size as per requirement).

The bidder shall ensure the arrangement of HT Cable box so as to prevent the ingress of moisture into the box due to rain water directly falling on the box. The cable box on HT side shall be of the split type with faces plain and machined and fitted with Neo-k-Tex or similar

quality gasket and complete with brass wiping gland to be mounted on separate split type gland plate with nut-bolt arrangement and MS earthing clamp. The bushings of the cable box shall be fitted with nuts and stem to take the cable cores without bending them. The stem shall be of copper with copper nuts. The cross section of the connecting rods shall be stated and shall be adequate for carrying the rated currents. On the HV side the terminal rod shall have a diameter

of not less than 12 mm. The material of connecting rod shall be copper. HT Cable support clamp should be provided to avoid tension due to cable weight.

23.2 The transformer shall be fitted with suitable LV cable box having non-magnetic material gland plate with appropriate sized single compression brass glands on LV side to terminate 1.1 kV/single core XLPE armoured cable (Size as per requirement).

24 TERMINAL MARKINGS:

High voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1U, 1V, 1W and low voltage winding for the same phase marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n. Neutral terminal is to be brought out and connected to local grounding terminal by an earthing strip.

25 CURRENT TRANSFORMERS:

25.1 CT's shall be provided for transformers of rating 63 kVA and above and if required by purchaser for ratings below 63 kVA on secondary side.

- 25.2 Current transformer shall be mounted inside the tank or outside with suitable marshalling box on LV side of the transformer.
- 25.3 The current transformers shall comply with IS 2705.
- 25.4 All secondary leads of bushing mounted CT's shall be brought to a terminal box near each bushing.
- 25.5 The CT terminals shall have shorting facility.
- 25.6 CT should not get saturated upto 200% of rated current.
- 25.7 CT shall have the following parameters

Parameter	Value
Accuracyclass	0.5
Burden	20VA
Application	Metering
ISF	5

ISF 5

26.1 The following standard fittings shall be provided :

- i. Rating and terminal marking plates, non-detachable.
- ii. Earthing terminals with lugs - 2 Nos.
- iii. Lifting lugs for main tank and top cover
- iv. Terminal connectors on the HV/LV bushings (For bare terminations only).
- v. Thermometer pocket with cap - 1 No.
- vi. Air release device
- vii. HV bushings - 3 Nos.
- viii. LV bushings - 4 Nos.
- ix. Pulling lugs
- x. Stiffener
- xi. Radiators - No. and length may be mentioned (as per heat dissipation calculations)/ corrugations.
- xii. Arcing horns or 9 kV, 5 kA lightning arrestors on HT side - 3 No.
- xiii. Prismatic oil level gauge.
- xiv. Drain cum sampling valve.
- xv. Top filter valve
- xvi. Oil filling hole having p. 1- ¼ ,” thread with plug and drain plug on the conservator.
- xvii. Silicagel breather
- xviii. Base channel 75x40 mm for up to 100 kVA and 100 mmx50 mm above 100 kVA, 460 mm long with holes to make them suitable for fixing on a platform or plinth.
- xix. 4 No. rollers for transformers of 200 kVA and above.
- xx. Pressure relief device or explosion vent.

## 27 FASTENERS:

27.1 All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent.

27.2 Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals.

27.3 All nuts and pins shall be adequately locked.

27.4 Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position.

27.5 All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanising, except high tensile steel bolts and spring washers which shall be electro-galvanised/plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals.

27.6 Each bolt or stud shall project at least one thread but not more than three threads through the nut, except when otherwise approved for terminal board studs or relay stems. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.

27.7 The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

27.8 Taper washers shall be provided where necessary.

27.9 Protective washers of suitable material shall be provided front and back of the securing screws.

## 28 OVERLOAD CAPACITY:

28.1 The transformers shall be suitable for loading as per IS 6600.

## 29 LIGHTNING ARRESTORS:

29.1 9 kV, 5 kA metal oxide lightning arrestors Distribution class type of reputed make as per relevant standard , one number per phase shall be provided to be fitted under the HV bushing with GI earth strip 25x4 mm connected to the body of the transformer with necessary clamping arrangement

## 30 TESTS:

30.1 All the equipment offered shall be fully type tested by the bidder or his collaborator as per the relevant standards including the additional type tests. The type test must have been conducted on a transformer of same design during the last five years at the time of bidding. The bidder shall furnish four sets of type test reports along with the offer. In case, the offered transformer is not type tested, the bidder will conduct the type test as per the relevant standards including the additional type tests at his own cost in CPRI/ NABL accredited laboratory in the presence of employers representative(s) without any financial liability to employer in the event of order placed on him.

30.2 Special tests other than type and routine tests, as agreed between purchaser and bidder shall also be carried out as per the relevant standards.

30.3 The requirements of site tests are also given in this clause.

30.4 The test certificates for all routine and type tests for the transformers and also for the bushings and transformer oil shall be submitted with the bid.

30.5 The procedure for testing shall be in accordance with IS1180 (Part-1) :2014 /2026 as the case may be except for temperature rise test.

30.6 Before dispatch each of the completely assembled transformers shall be subjected to the routine tests at the manufacturer's works.

### 31 ROUTINE TESTS:

31.1 Ratio, polarity, phase sequence and vector group.

31.2 No Load current and losses at service voltage and normal frequency.

31.3 Load losses at rated current and normal frequency.

31.4 Impedance voltage test.

31.5 Resistance of windings at each tap, cold (at or near the test bed temperature).

31.6 Insulation resistance.

31.7 Induced over voltage withstand test.

31.8 Separate source voltage withstand test.

31.9 Neutral current measurement-The value of zero sequence current in the neutral of the star winding shall not be more than 2% of the full load current.

31.10 Oil samples (one sample per lot) to comply with IS 1866.

31.11 Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 110% rated voltage.

31.12 Pressure and vacuum test for checking the deflection.

### 32 TYPE TESTS TO BE CONDUCTED ON ONE UNIT:

In addition to the tests mentioned in clause 30 and 31 following tests shall be conducted:

32.1 Temperature rise test for determining the maximum temperature rise after continuous full load run. The ambient temperature and time of test should be stated in the test certificate.

32.2 Impulse voltage test: with chopped wave of IS 2026 part-III. BIL for 11 kV shall be 75 kV peak.

32.3 Short circuit withstand test: Thermal and dynamic ability.

32.4 Air Pressure Test: As per IS – 1180 (Part-1):2014.

32.5 Magnetic Balance Test.



32.6 Un-balanced current test: The value of unbalanced current indicated by the ammeter shall not be more than 2% of the full load current.

32.7 Noise-level measurement.

32.8 Measurement of zero-phase sequence impedance.

32.9 Measurement of Harmonics of no-load current.

32.10 Transformer tank shall be subjected to specified vacuum. The tank designed for vacuum shall be tested at an internal pressure of 0.35 kg per sq cm absolute (250 mm of Hg) for one hour. The permanent deflection of flat plates after the vacuum has been released shall not exceed the values specified below:

Horizontallengthofflatplate(inmm)	Permanentdeflection(inmm)
Uptoandincloding 750	5.0
751to1250	6.5
1251to1750	8.0
1751to2000andabove	9.0

32.11 Transformer tank together with its radiator and other fittings shall be subjected to pressure corresponding to twice the normal pressure or 0.35 kg / sq.cm whichever is lower, measured at the base of the tank and maintained for an hour. The permanent deflection of the flat plates after the excess pressure has been released, shall not exceed the figures for vacuum test.

32.12 Pressure relief device test: The pressure relief device shall be subject to increasing fluid pressure. It shall operate before reaching the test pressure as specified in the above class. The operating pressure shall be recorded. The device shall seal-off after the excess pressure has been released.

32.13 Short Circuit Test and Impulse Voltage Withstand Tests: The purchaser intends to procure transformers designed and successfully tested for short circuit and impulse test. In case the transformers proposed for supply against the order are not exactly as per the tested design, the supplier shall be required to carry out the short circuit test and impulse voltage withstand test at their own cost in the presence of the representative of the purchaser.

32.13.1 The supply shall be accepted only after such test is done successfully, as it confirms on successful withstand of short circuit and healthiness of the active parts thereafter on un-tanking after a short circuit test.

32.13.2 Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations.

32.13.3 It may also be noted that the purchaser reserves the right to conduct short circuit test and impulse voltage withstand test in accordance with the IS, afresh on each ordered rating at purchaser cost, even if the transformers of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by the purchaser either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies

already made to purchaser's stores. The findings and conclusions of these tests shall be binding on the supplier.

32.13.4 Type test certificates for the tests carried out on prototype of same specifications shall be submitted along with the bid. The purchaser may select the transformer for type tests randomly.

### 33 ACCEPTANCE TESTS:

33.1 At least 10% transformers of the offered lot (minimum of one) shall be subjected to the following routine/ acceptance test in presence of purchaser's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS:1180 (Part-1): 2014 and IS:2026.

33.2 Checking of weights, dimensions, fitting and accessories, tank sheet thickness, oil quality, material, finish and workmanship as per GTP and contract drawings.

33.3 Physical verification of core coil assembly and measurement of flux density of one unit of each rating, in every inspection with reference to short circuit test report

33.4 Temperature rise test on one unit of the total ordered quantity

### 34 TESTS AT SITE:

The purchaser reserves the right to conduct all tests on transformer after arrival at site and the manufacturer shall guarantee test certificate figures under actual service conditions.

### 35 INSPECTION:

35.1 In respect of raw material such as core stampings, winding conductors, insulating paper and oil, supplier shall use materials manufactured/supplied by standard manufacturers and furnish the manufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the purchaser. The bidder shall furnish following documents along with their offer in respect of the raw materials:

- i. Invoice of supplier.
- ii. Mill's certificate.
- iii. Packing list.
- iv. Bill of landing.
- v. Bill of entry certificate by custom.

Please refer to "Check-list for Inspection of Prime quality CRGO for Transformers" attached at Annexure-A. It is mandatory to follow the procedure given in this Annexure.

### 36 INSPECTION AND TESTING OF TRANSFORMER OIL:

36.1 To ascertain the quality of the transformer oil, the original manufacturer's tests report should be submitted at the time of inspection. Arrangements should also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of purchaser's representative.

36.2 To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages:-

36.2.1 Online anytime during receipt of raw material and manufacture/ assembly whenever the purchaser desires.

36.2.2 At finished stage i.e. transformers are fully assembled and are ready for dispatch.

36.3 The stage inspection shall be carried out in accordance with Annexure-II.

36.4 After the main raw-material i.e. core and coil material and tanks are arranged and transformers are taken for production on shop floor and a few assembly have been

completed, the firm shall intimate the purchaser in this regard, so that an officer for carrying out such inspection could be deputed, as far as possible within seven days from the date of intimation. During the stage inspection a few assembled core shall be dismantled to ensure that the laminations used are of good quality. Further, as and when the transformers are ready for despatch, an offer intimating about the readiness of transformers, for final inspection for carrying out tests as per relevant IS shall be sent by the firm along with Routine Test Certificates. The inspection shall normally be arranged by the purchaser at the earliest after receipt of offer for pre-delivery inspection. The proforma for pre delivery inspection of Distribution transformers is placed at Annex- III.

36.5 In case of any defect/defective workmanship observed at any stage by the purchaser's Inspecting Officer, the same shall be pointed out to the firm in writing for taking remedial measures. Further processing should only be done after clearance from the Inspecting Officer/ purchaser.

36.6 All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the Inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Part Inspection during Acceptance Tests.

36.7 The manufacturer shall provide all services to establish and maintain quality of workman ship in his works and that of his sub-contractors to ensure the mechanical /electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.

36.8 Purchaser shall have every right to appoint a third party inspection to carry out the inspection process.

36.9 The purchaser has the right to have the test carried out at his own cost by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test 1% of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser have every right to reject the entire lot or penalize the manufacturer, which may lead to blacklisting, among other things.

37 QUALITY ASSURANCE PLAN:

37.1 The bidder shall invariably furnish following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

37.2 Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in the presence of bidder's representative, copies of test certificates.

37.3 Information and copies of test certificates as above in respect of bought out accessories.

37.4 List of manufacturing facilities available.

37.5 Level of automation achieved and list of areas where manual processing exists.

37.6 List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection.

37.7 List of testing equipment available with the bidder for final testing of equipment along with valid calibration reports. These shall be furnished with the bid. Manufacturer shall possess 0.1 accuracy class instruments for measurement of losses.

37.8 Quality Assurance Plan (QAP) withhold points for purchaser's inspection.

37.9 The successful bidder shall within 30 days of placement of order, submit following information to the purchaser :

37.9.1 List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.

37.9.2 Type test certificates of the raw materials and bought out accessories.

37.9.3 The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

38 DOCUMENTATION:

38.1 The bidder shall furnish along with the bid the dimensional drawings of the items offered indicating all the fittings.

38.2 Dimensional tolerances.

38.3 Weight of individual components and total weight.

38.4 An outline drawing front (both primary and secondary sides) and end-elevation and plan of the tank and terminal gear, wherein the principal dimensions shall be given.

38.5 Typical general arrangement drawings of the windings with the details of the insulation at each point and core construction of transformer.

38.6 Typical general arrangement drawing showing both primary and secondary sides and end- elevation and plan of the transformer.

39 PACKING AND FORWARDING:

39.1 The packing shall be done as per the manufacturer's standard practice. However, it should be ensured that the packing is such that, the material would not get damaged during transit by Rail / Road / Sea.

39.2 The marking on each package shall be as per the relevant IS.

40 GUARANTEE

41.1 The manufacturers of the transformer shall provide a guarantee of 24 months from the date of receipt at the stores of the Utility or 18 months from the date of commissioning, whichever is earlier. In case the distribution transformer fails within the guarantee period the purchaser will immediately inform the supplier who shall take back the failed DT within 15 days from the date of the intimation at his own cost and replace/repair the transformer within forty five days of date of intimation with a roll over guarantee.

41.2 The outage period i.e. period from the date of failure till unit is repaired/ replaced shall not be counted for arriving at the guarantee period.

41.3 In the event of the supplier's inability to adhere to the aforesaid provisions, suitable penal action will be taken against the supplier which may inter alia include blacklisting of the firm for future business with the purchaser for a certain period.

41 SCHEDULES:

42.1 The bidder shall fill in the following schedule which will be part of the offer. If the schedule are not submitted duly filled in with the offer, the offer shall be liable for rejection.

Schedule-A : Guaranteed Technical Particulars

Schedule-B : Schedule of Deviations

42 DEVIATIONS :

43.1 The bidders are not allowed to deviate from the principal requirements of the Specifications. However, the bidder is required to submit with his bid in the relevant schedule a detailed list of all deviations without any ambiguity. In the absence of a deviation list in the deviation schedules, it is understood that such bid conforms to the bid specifications and no post-bid

negotiations shall take place in this regard.

43.2 The discrepancies, if any, between the specification and the catalogues and / or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard shall not be entertained.

43.3 If it is observed that there are deviations in the offer in guaranteed technical particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

43.4 All the schedules shall be prepared by vendor and are to be enclosed with the bid.

Annex-I

METHODOLOGY FOR COMPUTING TOTAL OWNING COST

<b>TOC=IC+(A×Wi)+(B×Wc);LossesinKW</b>	
Where,	
TOC	= TotalOwningCost
IC	= Initialcostincluding taxes of transformer as quoted by the manufacturer
Afactor	= Costofnoloadlossesin Rs/KW (A=288239)
Bfactor	= CostofloadlossesinRs/KW (B=93678)
Wi	= NoloadlossesquotedbythemanufacturerinKW
Wc	= LoadlossesquotedbythemanufacturerinKW

PROFORMA FOR STAGE INSPECTION OF DISTRIBUTION TRANSFORMERS

(A) GENERAL INFORMATION:

1. Name of firm : M/s.
2. Order No. and Date :
3. Rating-wise quantity offered :
4. Details of offer
  - a) Rating
  - b) Quantity
  - c) Serial Numbers
5. Details of last stage inspected lot:
  - a) Total quantity inspected
  - b) Serial Numbers
  - c) Date of stage inspection
  - d) Quantity offered for final inspection of
    - (a) above with date

(B) Availability of material for offered quantity :

Details to be filled in

(C) Position of manufacturing stage of the offered quantity :

- a) Complete tanked assembly
- b) Core and coil assembly ready
- c) Core assembled
- d) Coils ready for assembly
  - (i) HV Coils
  - (ii) LV Coils

Note: (i) A quantity of more than 100 Nos. shall not be entertained for stage inspection.

(ii) The stage inspection shall be carried out in case :-

- (a) At least 25% quantity offered has been tanked and
- (b) core coil assembly of further at least 30% of the quantity offered has been completed.

(iii) Quantity offered for stage inspection should be offered for final Inspection within 15 days from the date of issuance of clearance for stage inspection, otherwise stage inspection already cleared shall be liable for cancellation.

Sl. No	Particulars	As offered	As observed	Deviation and Remarks
(D)	<b>Inspection of Core:</b>			
	(I) <b>Core Material</b>			
	(1) Manufacturer's Characteristic Certificate in respect of grade of lamination used. (Please furnish test certificate)			
	(2) Remarks regarding Rusting and smoothness of core.			
	(3) Whether laminations used for top and bottom yoke are in one piece.			
	(II) <b>Core Construction:</b>			
	(1) No. of Steps			
	(2) Dimension of Steps			
	Step No.            1        2        3        4        5        6        7        8        9        10        11        12			
	<b>As offered:</b>			
	Wmm			
	Tmm			
	<b>As found:</b>			
	Wmm			
	Tmm			
	(3) Core Dia (mm)			
	(4) Total cross section area of core			
	(5) Effective cross sectional area of core			
	(6) Clamping arrangement			
	(i) Channel Size			
	(ii) Bolt size and No.			
	(iii) Tie Rod size and No.			
	(iv) <b>Painting</b>			
	(a) Channels			

	(b) TieRods			
	(c) Bolts			
	(7) Whether top yoke is cut for LV connection.			
	(8) If yes, at 7 above, whether Reinforcement is done.			
	(9) Size of Support Channels provided for Core base and bottom yoke (Single piece of channels are only acceptable)			
	(10) Thickness of insulation provided between core base and support channel.			
	(11) core length (leg center to leg center)			
	(12) Window height			
	(13) Core height			
	(14) Core weight only (without channels etc.)			
(E)	INSPECTION OF WINDING			
	(I) Winding material			
	(1) Material used for			
	(a) HV winding			
	(b) LV winding			
	(2) Grade of material for			
	(a) HV winding			
	(b) LV winding			
	3) Test certificate of manufacturer (enclose copy) for winding material of:			
	(a) HV			
	(b) LV			
	(II) CONSTRUCTIONAL DETAILS			
	(1) Size of Cross Sectional area of conductor for :			
	(a) HV winding			



	(b) LV winding			
	(2) Type of insulation for conductor of :			
	a) HV winding			
	(b) LV winding			
	(3) Diameter of wire used for delta formation (mm)			
	(4) Diameter of coils in:			
	a) LV winding			
	i) Internal dia (mm)			
	ii) Outer dia (mm)			
	b) HV winding			
	i) Internal dia (mm)			
	ii) Outer dia (mm)			
	(5) Current density of winding material used for :			
	(a) HV			
	(b) LV			
	(6) Whether neutral formation on top.			
	(7) HV Coils/ Phase			
	a) Number			
	b) Turns/ coil			
	c) Total turns			
	(8) LV Coils/ Phase			
	a) Number			

	b) Turns/ coil			
	c)Total turns			
	(9) MethodofHVCoil Joints			
	(10) Totalweightofcoils of			
	a) LVwinding (kg)			
	b) HVwinding (kg)			
(F)	INSULATION MATERIALS :			
	(I) MATERIAL :			
	1) Craft paper			
	a) Make			
	b) Thickness (mm)			
	c) Test Certificate of manufacturer (enclose copy).			
	2) Press Board			
	a) Make			
	b) Thickness (mm)			
	c) Test Certificate of manufacturer (enclose copy).			
	3) Material used for top and bottomyokeandinsulation			

	(II) Type and thickness of material used : (mm)			
	a) Between core and LV			
	b) Spacers			
	c) Inter layer			
	d) Between HV and LV winding			
	e) Between phases			
	f) End insulation			
(G)	CLEARANCES : (mm)			
	(I) Related to core and windings			
	1) LV to Core (Radial) 2) Between HV and LV (Radial)			
	3) (i) Phase to phase between HV Conductor			
	(ii) Whether two Nos. Press Board each of minimum 1 mm thick provided to cover the tie rods.			
	4) Thickness of flocking spacers between LV coils (mm)			
	5) Axial wedges between HV and LV coils/phase (Nos.)			
	6) No. of radial spacers per phase between HV coils			
	7) Size of duct between LV and HV winding (mm)			

	(II) Between core - coil assembly and tank : (mm)			
	1) Between winding and body:			
	a) Tank lengthwise			
	b) Tank Breadth wise			
	2) Clearance between top cover and top yoke upto 100 kVA and between top cover and top most live part of tap changing switch for 200 kVA and above.			
(H)	<p><b>TANK :</b></p> <p>(I) Constructional details :</p> <p>1) Rectangular shape</p> <p>2) Thickness of sidewall (mm)</p> <p>3) Thickness of top and bottom plate (mm)</p> <p>4) Provision of slopping top cover towards HV bushing.</p> <p>5) Tank internal dimensions (mm)</p> <p>a) Length</p> <p>b) Breadth</p> <p>c) Height</p> <p>(i) On LV side</p> <p>(ii) On LV side</p> <p>(II) <b>General details:</b></p> <p>1) Inside painted by varnish/ oil corrosion resistant paint</p> <p>2) Gasket between top cover and tank</p> <p>i) Material</p> <p>ii) Thickness (mm)</p> <p>iii) Jointing over laps (mm)</p> <p>3). Reinforcement of welded angle (specify size and No. of angle side walls of tank.</p> <p>4) Provision of lifting lugs:</p> <p>b) Whether lugs of 8 mm thick MS Plate provided</p>			

Volume- I, (Part-2), Item wise Specifications

	<p>c) Whether reinforced by welded plates edge wise below the lug upto re- enforcing angle of the</p> <p>5) Pulling lug of MS Plate</p> <p>a) Nos.</p> <p>b) Thickness (mm)</p> <p>c) Whether provided on breadth side or length side</p> <p>6) Provision of air release plug</p> <p>7) Provision of galvanized GI Nuts Bolts with 1 No. Plain and 1 No. spring washer.</p> <p>8) Deformation of length wise side wall of tank when subject to:</p> <p>a) Vacuum of (-) 0.7 kg/sq cm for 30 minutes.</p>			
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Sl. No	Particulars	As offered	As observed	Deviation and Remarks
	b) Pressure of 0.8 kg/sq cm for 30 minutes.			
<b>(I)</b>	<b>RAIDATORS:</b>			
	1. Fin Radiator of 1.25 mm thick sheet			
	a) Dimension of each fin (LxBxT)			
	b) Fins per radiator			
	c) Total No. of radiators			
	2. Verification of manufacturer's test certificate regarding Heat dissipation (excluding Top and Bottom) in w/sq m			
	3. Verification of position of radiator with respect to bushing.			
<b>(J)</b>	<b>CONSERVATOR:</b>			
	1. Dimensions (LxD) (in mm)			
	2. Volume (m <sup>3</sup> )			
	3. Inside dia of Conservator tank pipe (mm)			

	4. Whether conservator outlet pipe is projected approx. 20mm inside the conservator tank.			
	5. Whether arrangement made so that oil does not fall on the active parts.			
	6. Whether die cast metal oil level gauge indicator having three positions at (- 5°C, 30 °C and 98°C) is provided.			
	7. Whether drain plug and filling hole with cover is provided.			
	8. Inner side of the conservator Tank painted with-			
<b>(K)</b>	<b>BREATHER:</b>			
	1. Whether Diecast Aluminium body breather for silica gel provided.			
	2. Make			
	3. Capacity			
	Particulars	As offered	As observed	Deviation and Remarks
	<b>TERMINALS :</b>			
	1. Material whether of Brass Rods/ Tinned Copper.			
	a) HV			
	b) LV			
	2. Size (dia in mm)			
	a) HV			
	b) LV			
	3. Method of Star connection formed on LV side of 6mm thick (Should use Al./Cu. Flat bolted/ brazed with crimped lugs on winding alternatively for 63 and 100 kVA ratings brazing is done covered with tubular sleeve duly crimped). - Please state dimensions of Al/ Cu flat or tubular sleeve used. (mm)			
	4. Method of Connection of LV winding to LV Bushing (end of winding should be crimped with lugs (Al/Cu) and bolted with bushing stud).			
	5. Method of Connection of HV winding to HV bushing (Copper joint should be done by using silver brazing alloy and for Aluminium, brazing rod or with tubular connector crimped at three spots).			
	6. Whether SRB Ptube/insulated paper used for formation of Delta on HV.			

7. Whether Empire sleeves used on the portion of HV winding joining to HV bushing.			
8. Whether neutral formation is covered with cotton tape			
BUSHINGS :			
1. Whether HV bushings mounted on side walls. Whether sheet metal			
2. pocket used for mounting bushing (pipe are not acceptable)			
a) H V			
b) L V			
Whether arrangement for studs for fitting of HV Bushing are in diamond shape (so 3. that Arcing Horns are placed vertically).			
4. Position of mounting of LV bushings.			
5. Bushing Clearance: (mm)			
a) LV to Earth			
b) HV to Earth			
c) Between LV Bushings			
d) Between HV Bushings			
TANK BASE CHANNEL /			
ROLLERS :			
1. Size of channel (mm)			
2. Whether channels welded across the length of the tank			
3. Size and type of roller (mm)			

OIL :			
1. Name of supplier			
2. Break down voltage of oil: (kV)			
i) Filled in tanked transformer			
ii) In storage tank (to be tested by Inspecting Officer).			
3. Supplier's test certificate(enclose copy)			
ENGRAVING :			
1. Engraving of Sl. No. and name of firm.			
i) On bottom of clamping channel of core-coil assembly.			
ii) On side wall and top cover of tank along with date of despatch.			
i) MS plate of size 125x125 mm welded on width side of stiffner			
ii) Following details engraved (as per approved GTP):			
(a) Serial Number			
(b) Name of firm			
(c) Order No. and Date			
(d) Rating			
(e) Name of Inspecting Officer			
(f) Designation			
(g) Date of dispatch			
NAME PLATE DETAILS :			
Whether Name Plate is as per approved drawing			
Colour of Transformer			



1. Tank body with dark Green colour			
2. Conservator with white colour			
CHECKING OF TESTING FACILITIES:			
(Calibration certificate also to be checked for its validity)			
TESTS :			
1. No Load Current			
2. No Load Loss			
3. % Impedance			
4. Load Losses			
5. Insulation Resistance Test			
6. Vector Group Test (phase relationship)			
7. Ratio and Polarity test relationship			
8. Transformer Oil Test (Break Down Voltage)			
9. Magnetic Balance			
10. Measurement of winding resistance (HV and LV both)			
11. Induced over voltage withstand test (Double voltage and Double frequency)			
12. Separate source power frequency withstandtest at 28 kVfor HV and 3 kV for LV (one minute).			
13. Air pressure/ Oil leakage Test			
14. Vacuum test			
15. Unbalanced current test			
16. Temperature rise (Heat Run) test.			
We have specifically checked the following and found the same as per G.T.P./deviations observed as mentioned against each:			
i) Rustlessness of CRGO laminations used			
ii) Core steps			

iii) Core area			
iv) Core weight			
v) Winding cross sectional area			
a) LV			
b) HV			
vi) Weight of windings			
vii) Clearance between winding and wall of tank (mm)			
a) Length-wise			
b) Breadth-wise			
viii) Clearance between top of yoke/ top most live part of tap changer to tank cover.			
ix) Details of Neutral formation			
x) Connections to bushings:			
a) LV			
b) HV			
xi) Slope of tank top			
xii) Position of mounting of bushings			

## Annexure-A

### Check-listforInspectionofPrimequalityCRGOforTransformers

DuringinspectionofPRIMECRGO,thefollowingpointsneedstobecheckedbytheTransformermanufactur er. Utility’s inspector shall verify all these points during inspection:-

A) In case PRIME CRGO cutting is at works of Transformer Manufacturer:

1 Review of documents:

- Purchase Order (unpriced) to PRIME CRGO supplier/Authorised Agency
- Manufacturer’s test certificate
- Invoice of the Supplier
- Packing List
- Bill of Lading
- Bill of Entry Certificate by Customs Deptt.
- Reconciliation Statement as per format below
- Certificate of Origin
- BIS Certification

Format for Reconciliation/Traceability records

Packing List No./date /Quantity of PRIME CRGO received Name of Manufacturer

Manufacturer test certificate No./date

Serial No.	Detailsof Package/Job	Drawing Reference	Quantity involved	Cumulative Quantity Consumed	Balance inStock

2 .1 Inspection of PRIME CRGO Coils:

- a. PRIME CRGO-Manufacturer’s Identification Slip on PRIME CRGO Coils
- b. Visual Inspection of PRIME CRGO Coils offered as per packing list ( for verification of coil details as per Test certificate & healthiness of packaging).

c. Unique numbering inside of each sample of PRIME CRGO coil and verification of records to be maintained in the register for consumption of CRGO coil.

d. ISI logo sticker on packed mother coil and ISI logo in Material TC.

2.2. During inspection of PRIME CRGO, surveillance testing of sample shall be carried out for Stacking Factor, Permeability, Specific watt loss at 1.5 Tesla and/or 1.7 Tesla depending on the grade of PRIME CRGO and aging test etc. applicable as per relevant IS/ IEC standard, Tech. Spec., MQP and Transformer manufacturer plant standard.

Inspection Clearance Report would be issued after this inspection

3 Inspection of PRIME CRGO laminations: Transformer manufacturer will maintain records for traceability of laminations to prime CRGO coils and burr/bow on laminations shall be measured. Utility can review these records on surveillance basis.

4. Inspection at the time of core building:

Visual Inspection of PRIME CRGO laminations. In case of suspected mix-up/ rusting/decoloration, samples may be taken for testing on surveillance basis for tests mentioned in A.2.2 above.

Above tests shall be witnessed by Utility. In case testing facilities are not available at Manufacturer's work, the sample(s) sealed by Utility to be sent to approved labs for testing.

Inspection Clearance Report would be issued after this inspection

B) In case PRIME CRGO cutting is at Sub-vendor of Transformer Manufacturer:

1 Review of documents:

- Purchase Order (unpriced) to PRIME CRGO supplier/ Authorised Agency
- Purchase Order (unpriced) to Core Cutter
- Manufacturer test certificate
- Invoice of the Supplier
- Packing List
- Bill of Lading
- Bill of Entry Certificate by Customs Deptt.
- Reconciliation Statement as per format below
- Certificate of origin
- BIS Certification

Format for Traceability records as below:-

Packing List No./date /Quantity of PRIME CRGO received Name of Manufacturer

Manufacturer test certificate No./date

Serial No.	Name of Customer	Details of Package/Job	Drawing Reference	Quantity involved	Cumulative Quantity Consumed	Balance in Stock	Dispatch details

2 .1 Inspection of PRIME CRGO Coils:

- a. PRIME CRGO-Manufacturer's Identification Slip on PRIME CRGO Coils
- b. Visual Inspection of PRIME CRGO Coils offered as per packing list ( for verification of coil details as per Test certificate & healthiness of packaging).
- c. Unique numbering inside of each sample of PRIME CRGO coil and verification of records to be maintained in the register for consumption of CRGO coil.
- d. ISI logo sticker on packed mother coil and ISI logo in Material TC.

2.2. During inspection of PRIME CRGO, surveillance testing of sample shall be carried out for Stacking Factor, Permeability, Specific watt loss at 1.5 Tesla and/or 1.7 Tesla, thickness depending on the grade of PRIME CRGO and aging test etc. applicable as per relevant IS/ IEC standard, Tech. Spec., MQP and Transformer manufacturer plant standard.

Inspection Clearance Report would be issued after this inspection

3 Inspection of PRIME CRGO laminations:

Transformer manufacturer representative will inspect laminations and issue their internal

Inspection Clearance Report. Inspection will comprise of review of traceability to prime CRGO coils, visual Inspection of PRIME CRGO laminations and record of burr/bow. After clearance given by transformer manufacturer, Utility will issue an Inspection Clearance Report after record review. If so desired by Utility, their representative may also join transformer manufacturer representative during this inspection.

Inspection Clearance Report would be issued after this inspection

4 Inspection at the time of core building:

Visual Inspection of PRIME CRGO laminations. In case of suspected mix- up/rusting/decoloration, samples may be taken for testing on surveillance basis for tests mentioned in B.2.2.

Inspection Clearance Report would be issued after this inspection

NOTE :-

- a) Transformer Manufacturer to ensure that PRIME CRGO is procured from POWERGRID approved vendors and CRGO manufacturer should have valid BIS Certificate for respective offered Grade.
- b) Transformer Manufacturer should also involve themselves for ensuring the quality of CRGO laminations at their Core Cutter's works. They should visit the works of their Core cutter and carry out necessary checks.

C) General

If a surveillance sample is drawn and sent to TPL (if testing facility not available with the manufacturer), the Transformer manufacturer can continue manufacturing at their own risk and cost pending TPL test report on PRIME CRGO sample drawn. Decision for acceptance of PRIME CRGO shall be based upon report of the sample drawn.

These checks shall be read in-conjunction with approved Quality Plan, specification as a whole and conditions of contract.

Sampling Plan (PRIME CRGO)

33 / 11 kV -1st transformer and subsequently at random 10% of

Transformers (min. 1) offered for inspection.

DTs and other ratings -1st transformer and subsequently at random 2% of

Transformers (min. 1) offered for inspection.

**BHAVNAGAR MUNICIPAL CORPORATION****Name of Work :- CITY e-BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)****Specification Index**

Item No	Item Description	Unit	Specification No as per General technical Specification Booklet
1	Excavation for foundation upto 1.5 m depth including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	it no 0,it code 04001A General Technical Specification Booklet
2	Excavation for foundation for depth from 1.5 m to 3.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	it no 0,it code 04002A General Technical Specification Booklet
3	Excavation for foundation for depth from 3.0 m to 5.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	it no 0,it code 04003A General Technical Specification Booklet
4	Box cutting the road surface to proper slope & camber for making a base for road work including removing the excavated stuff, and depositing on the road side slopes as directed up to 50 Mt. Lead	Cum.	separate sheet attached
5	Boring holes 3.5 m deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 Meter for following diameter of pipes.(ii) 250 mm	Each	it no4.27,it code 04010A + it no 4.28 it code 04011A General Technical Specification Booklet
6	Boring holes 2.1 m deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 Meter for following diameterof pipes.(ii) 250 mm	Each	it no4.27,it code 04010A + it no 4.28 it code 04011A General Technical Specification Booklet
7	Providing and laying cement concrete 1:4:8 (1-Cement : 4- coarse sand : 8- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	Cum.	it no 0,it code 05003A General Technical Specification Booklet but use 1:4:8 instead of 1:3:6
8	Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, Footings	Cum.	it no5.8.3,it code 05024AA + it no 9.1 it code 09001AA General Technical Specification Booklet

9	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work upto floor two level in. : (C ) Ground Beam	Cum.	it no5.8.3,it code 05024AA + it no 9.1 it code 09001G1A General Technical Specification Booklet
10	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work upto floor two level : (D) Column	Cum.	it no5.8.3,it code 05024AA+ it no 9.1 it code 09001G1 General Technical Specification Booklet
11	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work in : (C ) Coping	Cum.	Item no5.8.3,Item code 05024AA+ Item no 9.1, Item code 09001H1 General Technical Specification Booklet
12	Providing and laying controlled cement concrete M.250 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, footings, Base of columns and Mass concrete.	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001AA General Technical Specification Booklet
13	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in (A) Foundation footing base of columns and mass concrete.	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001AA General Technical Specification Booklet
14	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Column upto Plinth Level.	Cum.	it no5.8.3,it code 05025+ it no 9.1 it code 09001G1 General Technical Specification Booklet
15	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from work but excluding cost of Reinforcement for RCC work in Beam. .GB/PB	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001G1A General Technical Specification Booklet
16	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)(B) Conventional	Cum.	it no 6.13 ,it code 06002BA General Technical Specification Booklet
17	Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each disposed layer by ramming and watering.	Cum.	it no 4.12,it code4006 General Technical Specification Booklet
18	Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.	Cum.	it no 0.0,it code 4008 General Technical Specification Booklet



19	Filling in plinth with sand under floors including watering ramming, consolidating and dressing complete.	Cum.	it no 4.24,it code4007 General Technical Specification Booklet
20	Rolling and Consolidating of soling including filling in depression which occurs during the process with power roller 8 tonne to 12 tonne. and compacting the bed as per specifications to core test 97% compacting complete in all respects to the entire satisfaction of the Engineer-in -charge.	Sq.Mt.	separate sheet attached
21	Providing and laying cement concrete 1:2:4 (1-Cement : 2- Coarse sand : 4- graded stone aggregates 20 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	Cum.	it no 5.3.13 ,it code 05010BA General Technical Specification Booklet
22	Providing Rubble Pitching with hard stone of approved quality in cement mortar 1:6 (1 Cement : 6 Coarse sand) including leveling up ,Curing etc. complete excluding pointing	Cum.	it no 7.6 ,it code 07001AA General Technical Specification Booklet
23	Applying general insecticide pest control treatment to floors, cupboards etc including labour material etc. complete. Using Heptachloride 20 EC. As Per 6113_pests Concentration Weight 0.50 percent is recommended one litre chemical emulsion dillute with 39 liter of water will give. Total dillute concentration will be 40 litre inclusive of one litre chemical emulsion appication 0.5 Litre chemical / Sqm of surface is recommended as per I.S	Sqm.	it no 0 it code22007 General Technical Specifications Booklet
24	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from work but excluding cost of Reinforcement for RCC work in Column (G.F.)	Cum.	it no5.8.3,it code 05025+ it no 9.1 it code 09001G1 General Technical Specification Booklet
25	Providing and laying controlled cement concrete M.250 work with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for RCC work in Column (F.F.)	Cum.	it no5.8.3,it code 05025+ it no 9.1 it code 09001G1 General Technical Specification Booklet
26	Providing and laying controlled cement concrete M.250 work with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for RCC work in Column (S.F.)	Cum.	it no5.8.3,it code 05025+ it no 9.1 it code 09001G1 General Technical Specification Booklet
27	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (G.F.)	Cum.	Item no5.8.3,Item code 05025AA+ Item no 9.1, Item code 09001H1 General Technical Specification Booklet

28	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (F.F.)	Cum.	Item no5.8.3,Item code 05025AA+ Item no 9.1, Item code 09001H1 General Technical Specification Booklet
29	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (S.F.)	Cum.	Item no5.8.3,Item code 05025AA+ Item no 9.1, Item code 09001H1 General Technical Specification Booklet
30	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (G.F.)	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001G1A General Technical Specification Booklet
31	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (F.F.)	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001G1A General Technical Specification Booklet
32	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (S.F.)	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001G1A General Technical Specification Booklet
33	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (G.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet
34	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (F.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet
35	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (S.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet
36	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (G.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet
37	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (F.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet
38	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (S.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet

39	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Staircase (G.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001MA General Technical Specification Booklet
40	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Staircase (F.F.)	Cum.	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001MA General Technical Specification Booklet
41	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Pardi (G.F.)	Cum.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001CA General Technical Specification Booklet
42	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (G.F.)	Kg.	separate sheet attached
43	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (F.F.)	Kg.	separate sheet attached
44	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (S.F.)	Kg.	separate sheet attached
45	Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. (G.F.)	Cum.	it no 6.13 ,it code 06002BA General Technical Specification Booklet
46	Brick work using common burnt clay Building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. for F.F.	Cum.	it no 6.13 ,it code 06002BA General Technical Specification Booklet
47	Brick work using common burnt clay Building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. for S.F.	Cum.	it no 6.13 ,it code 06002BA General Technical Specification Booklet
48	Half brick masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in Cement mortar 1:4 (1-Cement : 4 -coarse sand ) in foundation and plinth (B) Conventional (upto 10 ton) (for GF)	Sqm.	it no 6.3 ,it code 06008A2 General Technical Specification Booklet

49	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 ) in foundation and plinth (B) Conventional (upto 10 ton) (for FF)	Sqm.	it no 6.3 ,it code 06008A2 + it no 6.33 it code 06011BA General Technical Specification Booklet
50	Providing and Fixing of Mild Steel Hollow Profile Section of 1.25 mm thick for Door Frames of size 125 mm x 65 mm with Heavy Stainless Steel 4' Long Hinges (4 no Each Side). The Frame Should be of Approved Shape, Single Rabate or double rebate as per site Requirement and as per instruction of Engineer incharge the Frame Sections of Doors should be fixed with heavy hold fasts and with Necessary Cement Mortar (1:3;6) Filling inside hollow portion and also include two coat of Oil paint including red lead primer etc complete After Fixing of Frame .	Rmt	separate sheet attached
51	Providing & fixing in position partly fixed and partly openable standard extruded Aluminium door with color anodized hollow section frame of approved shade & pivoted double shutter fabricated from aluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt) and door styles and top rail of aluminium section size 47.5mm x 44.5 mm (of app. Wt. 1.05 kg/ Rmt) Bottom rail & lockrail for door of size 114mm x 44.5mm (of app. Wt Kg./Rmt) and providing rubber gasket and glazing chips around the glass all over including providing heavy handle, heavy lock, bracket, stoppers, Aldrop (Color anodised) 5 mm th. transparent float glass of copper tint (Structural Glass) fixed with rubber gasket and 19 x 17 mm size Glazing Clip same in Bottom Portion with providing 9 mm thick decorative water proof Both side pre-laminated pressed wood based board with fixing Glazing clips 19 X 17 mm including all required materials labours and equipments as per detailed drwg. as directed.	Sqm.	separate sheet attached

52	<p>Providing &amp; fixing in position standard extruded Aluminium Partition with Colour anodized hollow section frame of approved shade &amp; pivoted without shutter fabricated from alluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt.) and using Glasing Clips of weight of 0.15 kg per running meter and providing rubber gasket around the glass allover including providing 5 mm th. transparent float glass of copper/ gray tint (Structural Glass) fixed with transparent silicon gasket and in bottom panel 12 mm thick prelaminated bothside partial board including all required materials labours and equipments as per detailed drwg. as directed.</p>	Sqm.	separate sheet attached
53	<p>Providing and fixing flush door both side laminated shutter fabricated from 35 mm thick solid core malemine faced three layered pre laminated flat pressed wood based exterior grade bonded BWP/BWR synthetic resin having stemped IS 12823 grade I type II including three coats of lacquer polishing to exposed wooden surfaces and Stainless steel decorative type designs fixtures/fastning etc. including I.T.W. triangular batten patti of size 30 mmX30 mm etc as per architectural detailed drawing and as directed by engineer in charge.</p>	Sqm.	separate sheet attached
54	<p>Providing and fixing FRP frame size 100x50 mm and 28mm thick FRP depress panel shutter having extra reinforcement on sides &amp; edges in Gel coat finish. The core of the shutter &amp; frame is to be filed up with injected fire retardant grade polyurethane foam done in situ alongwith embedded wooden pieces for stiffening &amp; also taking hinges &amp; fintures. The whole FRP frame &amp; shutter is to be water proof weather proof, termite proof &amp; resistance to mild acid/alkali. Rates are to be inclusive of S.S hinges with necessary screws &amp; alluminium fixtures &amp; fastenings &amp; fastener sleeve</p>	Sqm.	separate sheet attached

55	<p>Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 95mm x 24mm x 1.17mm @ wt.of 0.738 Kg/mt , horizontal Three track member size 92mm x 31.75mm x 1.30mm,@ Wt.1.07 Kg/mt , vertical member of size 92mm x 31.75mm x 1.50mm @ Wt. 1.06 Kg/mt with sliding shutters of horizontal member size 40 mmx18mm x1.29mm @ wt.of 0.456 Kg/mt, vertical member of size 40mm x 18mm x 1.29 mm @ wt.of 0.456Kg/mt/ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc</p>	Sqm.	separate sheet attached
56	<p>Providing and fixing window having extruded Aluminium colour anodized Section Frame main Outer Size 63.5mm x 38.1mm x 1.95mm( of Jindal Section No. 4605 @ Wt. of 1.094 Kg./Mt.) Horizontal Two track member size 61.85mm x 31.75mm x 1.20mm(of Jindal Section No. 8687, @ Wt. 0.695Kg./Mt.) Vertical Member of size 61.85mm x 31.75mm x 1.30mm (of Jindal Section No. 8758, @ Wt. 0.659 Kg./Mt.) with sliding shutters of Horizontal member size 40mm x 18mm x 1.29mm(of Jindal Section No. 8947 @ Wt. of 0.456 Kg./Mt.) Vertical Member of size 40mm x 15mm x 1.29mm (of Jindal Section No. 8948 @ Wt. of 0.457 Kg./Mt.) with 5mm thick transparent bronze colour tinted float glass with powder coated Aluminium fittings &amp; fixtures &amp; transparent silicon sealant glass fixing to frame as per detail etc. complete.</p>	Sqm.	separate sheet attached
57	<p>Providing and fixing standared extruded of alluminium section of size 63mm x 38.10mm x 1.2mm @ Wt. 0.643 Kg/mt with colour anodized alluminium frame for ventilation with 5 mm thick frosted glass as details etc complete for Ventilation</p>	Sqm.	separate sheet attached
58	<p>Providing and fixing M.S. grills of required pattern to marble/granite frames of window etc. with M.s. flats at required spacing and frames around, square or round bars fixed with round headed bolts and nuts or by screws, including oil painting with one coat of primer of approved quality and brand &amp; two coats of synthetic enamel oil paint etc. complete as per detail drawing and as directed by Engineer in charge.</p>	Kg.	separate sheet attached

59	Providing and fixing 0.75 meter wide and 0.80 meter high sand which type platform including supplying and fixing granite stone 18 mm thick mirror polished stones in top and side position and vertical strip at front over 25 mm thick polished kotah stone platform fixing in top and sides and intermediates supports fixing with cement mortar and adhesive and finishing etc complete.	Sqm.	separate sheet attached
60	P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for light shade	Sqm.	separate sheet attached
61	P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for antiskit	Sqm.	separate sheet attached
62	Providing and laying Vitrified tiles 8 to 10 mm thick , 24" x 24" in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3-coarse sand) and jointed with white cement slurry	Sqm.	separate sheet attached
63	Providing and laying granite slab 18mm thick in flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarsesand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete colour and shed as approved by achitect and engineer in charge.	Sqm.	separate sheet attached
64	Providing and laying polished granite stone slab 18 mm thick in risers of steps, dedo and sill,Jambs of door-window laid on 10 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with gray cement slurry including rubbing & polishing etc. Complete	Sqm.	separate sheet attached

65	Providing and laying polished Kota stone slab flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarse sand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. (A) 25mm thick	Sqm.	Item no:14.43 , it Code 14012AA General Technical Specifications Booklet
66	Providing and laying polished kota stone slab 25mm thick in risers of steps,skirting Dedo and pillars laid on 10mm thick cement mortar 1:3 (1-Cement : 3 coarse sand) and jointed with gray cement slury mixed with pigment to match the shade of slab including rubbing and polishing etc. complete.	Sqm.	Item no:14.44 , it Code 14013A General Technical Specifications Booklet
67	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. Ground floor	Sqm.	Item no:17.58, it Code 17001A + 17.91, it Code 17006 General Technical Specifications Booklet
68	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. First floor	Sqm.	Item no:17.58, it Code 17001A + 17.91, it Code 17006 General Technical Specifications Booklet
69	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. Second floor	Sqm.	Item no:17.58, it Code 17001A + 17.91, it Code 17006 General Technical Specifications Booklet
70	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. Ground Floor	Sqm.	Item No.17.61(II),it Code 17003B General Technical Specifications Booklet Provide 15mm thickness instead of 20mm .
71	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. First Floor	Sqm.	Item No.17.61(II),it Code 17003B General Technical Specifications Booklet Provide 15mm thickness instead of 20mm .
72	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. Second Floor	Sqm.	Item No.17.61(II),it Code 17003B General Technical Specifications Booklet Provide 15mm thickness instead of 20mm .
73	20mm.thick sand faced cement plaster on walls upto height 10 meters above ground level consisting of 12mm. Thick backing coat of CM.1:3 (1-cement:3-sand) and 8mm.thick finishing coat of C.M. 1:1 (1-cement:1-sand) etc. complete.	Sqm.	Item no:17.95, it Code 17009 General Technical Specifications Booklet



74	Providing 20 mm thick water proof cement plaster using water proofing powder 1Kg/1bag of cement for all floors on brick / concrete wall work using water proofing materials in C M 1: 4 ( 1 cement 4 coarsrse sand) including finishing with a floating coat of neat cement slurry etc complete for all floor. and shall be guaranteed for minimum period of 10 years after handing over the completed building by the main contractor to be finished as directed. Stamp paper guarantee 10 years to be furnished before receiving any payment from the client.	Sqm.	it no 17.19 it codee e 17003B + it no 5.7.5 it codee e 5022 General Technical Specifications Book .
75	Providing throating or plaster drip and moulding to R.C.C. Chajja etc.comp	Rmt	it no 0 it code 5.4.18 General Technical Specifications Booklet
76	Prov.20mm deep finished groove etc.comp	Rmt	separate sheet attached
77	Providing and fixing chicken wiremesh jali at R.C.C. masonry joints at any height with all labour & material etc. complete.	Sqm.	separate sheet attached
78	Applying two coats of birla(White cement based) or Asian (acrylic lappy putty) or equivalent two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other matter foreign and sand papered smooth.	Sqm.	separate sheet attached
79	Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.	Sqm.	separate sheet attached
80	Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on ceiling and slopping roofs to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.For All Floors.	Sqm.	separate sheet attached
81	Finishing wall with weather proof exterior emulsion paint (Apex) on wall surface (two coats) to give an required shape even shade and including priming coat and after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete.	Sqm.	separate sheet attached

82	Finising wall with weatherproof exterior emulsion paint on wall surface (two coats) to give and required shape even shade after thoroughly brushing the surface to remove all dirts , and remains of ioose powdered materials etc. complete. two Coats of primer has to be applied.	Sqm.	separate sheet attached
83	Texture paint- Providing and applying textures paint (Apex Duracast Dholpurtex,Spatula/Trowel) as per manufacture's specification including material is first deposited to the surface of using trowel/spayula of 2-2.5 mm thick and getting final finish use plastic trowel and topcoat with antialgal and anti fungal pant (like Asian-Apex ultima) for final touch as per instruction of architect/Engineer in charge.	Sqm.	separate sheet attached
84	Painting two coats (including priming coat ) on new steel & other metal surfaces with enamel paint brushing interior to give an even shade including cleaning the surface of all dirt , dust & other foreign matter.	Sqm.	Item No.19.70, Item code:19002, General Technical Specification Booklet
85	Providing cement vata, 10 cm. x 10 cm. size, quarter round in cement mortar 1:1 including neat cement finishing, watering, etc. complete.	Rmt	it code17015 General Technical Specifications Book .
86	Providing and laying chaina mosaic water proofing treatment on terrace including applying neat cement slurry 2.75 Kg./Sqm. Of cement admixed with water proofing compound after cleaning the surface (b) laying cement concrete usig brick bats 25 to 100 mm size with 50% C.M. 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound over 20 mm thick layer of C.M. 1:5 to required slope including rounding of junction of walls and slabs (a) after two days of proper curing applying a second with 20 mm thick C.M. 1:4 and china mosaic tiling and finally finishing the surface with trowel white cement slurry (e) after finishing the whole terrace shall be flooded with wateweeks.	Sqm.	separate sheet attached
87	Supply & Fixing of Broken Glazed (China Mosaic) tiles size 5-6 mm thick of different size and shade (approved crazy patern) in Cement:Mortar 1:2 and joint filling with White Cement / Coloured Cement with water proofing component including Ramping, Watering, Curing etc. complete (FOR ALL FLOOR)	Sqm.	separate sheet attached

88	Steel work welded in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. [A.] In beams and joists, channels angles tees, flats with connecting plates or angle cleats as in main and cross beams, Hip and jack rafters, purlins connected to common rafters and the like.	Qntl	separate sheet attached
89	Providing and Fixing 90 cm high stainless steel railing made from anticorrosive 304 grade S.S. Staircase Railing modular type welded fitting (S-Rail SR11 Square Type Steel Baluster), Main hand Rail pipe (DASA Pipe) 50mm outer dia 1.6 mm Thickness SS 304 Grade, Balustar steel square type 32X32mm outer dia. 1.6mm thickness ss 304 pipe, 3 pipe below main dasa pipe 16 mm outer dia. 1.6mm thickness ss304 grade as a vertical support fixed in RCC S.S. pipe with steel modular type fitting baluster including all type accessories as per detailed drawing as directed etc. complete for all floors.	Rmt	separate sheet attached
90	The providing & fixing of Fix louvered work. The main frames both verticals and horizontals have to be Aluminium pipes of 100 mm x 50 x 3.0 mm with colour anodized 20 micron (silver) thick all colour anodized of 15 microns. including All hardware, labour, scaffolding, fixtures, fastners transport and all other taxes included etc. complete as per architect's details at all floor levels.	Sqm.	separate sheet attached
91	Providing corrugated G.I. sheet of class-3 roofing fixed with glavanished iron J or L Hooks, Bolts and nuts 8mm diameter with bitumen and G.I. limpet washer or G.I. limpet washer. filled with white lead complete excluding the cost of purlins, Rafters and Trusses.(1) 0.80 mm thick sheet.	Sqm.	it no 15.4 it code15001 General Technical Specifications Book .
92	Providing & fixing 150mm wide 450mm over all semicircular plain G.I. sheet class-3 gutter with iron brackets 40mm x 3mm size bolts, nuts, washers etc. including marking necessary connection with rain water pipes. (i) 0.63mm thick	Sqm.	it no 15.1 it code15005A General Technical Specifications Book .
93	Providing and laying and fixing 50mm thick expansion joint by hydro cell semi rigid UV resistance with high performance laminated closed cell polythene foam joint filler in sheet foam as directed, etc. complete.	Sqm.	separate sheet attached

94	Providing and fixing hot dip Concertina Coil of 610 mm. dia made out of 2.59 mm. (12SWG) hot dip galvanized ( G.I. coating not less than 200 gm / s.m. )th. Wire having 80 nos. of spies and 200 nos. of clips made out of stainless steel (AISI 304) 1.5 mm thick. Dia, G.I. Strips 0.5 mm. ht. (G.I coating not less than 120 gm / s.m. ) weight of one coil should not be less than 15 kg etc. complete, at the top of compound wall fixed with S.S clips and binding wires wherever necessary etc. complete. (Note : Stretching length of one coil should not be more than 9 m.)	Sqm.	separate sheet attached
95	Steel work welded in built up sections,frame work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint :- (A) In beams and joists channels angles, tees, flats with connection plats or angle cleats as in main and cross beams, hip and trussed purlins connected to common ruffers and the like.	QUINTAL	separate sheet attached
96	Providing,fabricating & fixing steel works for M.S. grills of windows of required design/pattern as per drawing including cutting, bending, welding and fixing ,using M.S. flats,angles, square or round bars ,hollow square/rectangular sections & necessary steel sections with fitting in RCC / clamping /screwing ,including applying a primer coat of red lead paint/oxide and two coats of oil painting as per drawing & directed by E.I.C etc complete. at all floors.	Kg.	separate sheet attached
97	Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths interlocked together through their entire length and jointed together at the ends by end locks mounted on specially designed pipe shaft with bracket plates, guide channels and arrangements for inside and outside locking with push-pull operation including the cost of hood cover and spring etc. complete.(A) Shutters having width below 3.5 M.	Sqm.	separate sheet attached
98	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting make or equivalent as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at everytwo meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (i) 15mm dia.	Meter	separate sheet attached

99	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting make or equivalent as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at everytwo meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (ii) 25mm dia.	Meter	separate sheet attached
100	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting of PRINCE/SUPREME/ASTRAL/FINOLEX or equivalent make or as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at everytwo meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (i) 40mm dia.	Meter	separate sheet attached
101	Providing and fixing 15 mm dia brass chromium plated screw down bib taps.	Each	it no 23.92 it code 23028A1 General Technical Specifications Book .
102	Providing and fixing brass Cromiam Plated brass half trun Flush cock of approved quality including fixing in pipe line etc Complete. 25mm dia.	Each	it no 124 it code 23032A to23032C General Technical Specifications Book .
103	Providing & fixing gun metal check or non-return full way wheel valve (A)15 mm dia.	Each	it no 23.99 it code23031A to23031E General Technical Specifications Book .
104	Providing & fixing gun metal check or non-return full way wheel valve (C)25 mm dia	Each	it no 23.99 it code23031A to23031E General Technical Specifications Book .
105	Providing & fixing gun metal check or non-return full way wheel valve (E) 40 mm dia	Each	it no 23.99 it code23031A to23031E General Technical Specifications Book .
106	Providing and fixing 600 x 450 mm bevelled edge mirror of superior glass with mounted on 6mm thick A.C sheet or plywood sheet and fixed to wooden plugs with C.P brass screws and washers.	Each	it no 23.143 it code23024 General Technical Specifications Book .
107	Providing & fixing C.P. Brass towel rails complete with C.P. brass brackets fixed to wooden plugs with C.P. brass screws (B) 600 mm x 20 mm size	Each	it no 23.144 it code23025 General Technical Specifications Book .
108	Providing erecting and fixing double coated Syntex PVC. (ISI) water tank of required capacity each with all necessary fittings and connection etc. complete on terrace.	Liter	separate sheet attached

109	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having national sanitation foundation seal for potable water of following dia. Nominal bore tube fitting and clamps including making good the wall, ceiling and floor etc. complete. : 15 mm dia.	Meter	it no 23.20 it code23001AA to 23001FA General Technical Specifications Book .
110	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having national sanitation foundation seal for potable water of following dia. Nominal bore tube fitting and clamps including making good the wall, ceiling and floor etc. complete. : 25 mm dia.	Meter	it no 23.20 it code23001AA to 23001FA General Technical Specifications Book .
111	P/f SFRC cover for chambers with lockinhg arrangements including frames and fittings in the plaster on top of RCC cover 450x 600mm size	Each	it no 0 it code2303B General Technical Specifications Book .
112	Providing and constructing B.B. masonry in C.M. 1: 6 ( 1. Cement, 6 coarse sand ) and cement concrete 1: 2: 4 ( 1 Cement, 2 sand, 4 graded stone agg. Of 20 mm nominal size B.T. kapachi )SEPTIC TANK of 3 M X 0.9 M X 1.5 M internal dimension with necessary compartment of grit chamber and septic tank with necessary inlet and outlet connection with cement plaster ( 15 mm thick ) in C.M. 1: 4 (1 cement, 4 sand) with water proofing materials 1: 5: 10 ( 1 Cement, 5 Sand, 10Brick bats aggregate 40 mm nominal size ) brick bats concrete bedding R.C.C.1:2:4 top cover slab 12 cm. thick with C.I. Cover of 60cm. X 45 cm. size (light duty ) 75 mm. dia PVC SWR ventilating pipe 2 mtr. Long with cowl vent, 40 mm thick I.P.S. flooring 10 cm. thick cement vata mild steel for slab and finishing to exposed faces in C.M. 1:3 ( 1 Cement, 3 Sand ) curing etc comp. as directed by E.I.C.	Each	separate sheet attached

113	Providing and construction SOAK WELL OF 2.50 M. dia. & 5.00 M. depth clear dimension incl. B. K. masonry solid and honey comb masonry in C.M. 1:6 ( 1 cement, 6 sand ), R.C.C.1:2:4 ( 1 cement, 2 sand, 4 graded stone agg. 20 mm nominal size of B.T. kapachi ) top slab thick with C.I. manhole cover 60 cm. X 45 cm. size ( medium ) 75 mm C.I. ventilating pipe 2 M. long with 75 mm dia. Cowl vent and incl. filling brick bats of required size and depth incl. cost of reinforcement excavation refilling finished top of slab with C.M. 1:3 ( 1 Cement, 3 sand ) curing etc. comp. as directed by E.I.C.	Each	separate sheet attached
114	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 300mm	Rmt	it no 24.22 it codee 24007D General Technical Specifications Book .
115	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 450mm	Rmt	it no 24.22 it codee 24007E General Technical Specifications Book .
116	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 600mm	Rmt	it no 24.22 it codee 24007G General Technical Specifications Book .
117	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 900mm	Rmt	it no 24.22 it codee 24007H General Technical Specifications Book .
118	Providing and fixing to wall, ceiling and floor 10.0 Kg f/cm <sup>2</sup> working pressure polythelene pipes of the following outside dia. high density, complete with special flange compression type fittings wall clamps etc. including making good the wall, ceiling and floor 75mm	Rmt	separate sheet attached
119	Providing and fixing P V C SWR pipes (IS 13592) spigot and socket soil waste and ventilating pipe of the following nominal size 110 mm dia	Rmt	separate sheet attached

120	Providing and fixing P V C SWR pipes (IS 13592) spigot and socket soil waste and ventilating pipe of the following nominal size 160 mm dia	Rmt	separate sheet attached
121	Provdg. & fixing on wall face PVC rain water pipe of Finolex, Supreme, Kishan or Prince brand is used incl. filling the joints with spun yarn soaked in neat cement slurry and cement mortar 1:2 (1 cement : 2 fine sand) . PVC pipe 6 Kg/Sqcm. (ii) 110 mm Dia	Rmt	it no 15.93 it codee 15015B General Technical Specifications Book .
122	Providing and fixing PVC SWR Nahni Trap IS 14735 for drain with jali of the following nominal diameter of self cleansing design with C.I. Sread down or hinged grating including the cost of cutting and making good the walls. (i) 100 mm dia	Each	it no 23.857 it codee 23008 General Technical Specifications Book .
123	Providing & Fixing white or coloured glazed China Veterious China Orissa Pattern water closet squatting (Indian Type)pan size 580 mm. x 440 mm. including providing and fixing vetrrious china 100 mm. size S or P trap including jointing the trap with pan and soil pipe in C.M. 1:1 including all fitting and fixtures.Whitr Colour (Long Pattern )	Each	it no 23.111 it codee 23009 General Technical Specifications Book .
124	Providing & fixing wash down Water closet (European type W.C.Pan of Cera or Hindware brand)with integral 'P' or 'S' trape including jointing the trape with soil pipe in cement mortar 1:1[1-Cement:1-Fine sand], plastic seat and cover for wash down water closet with C.P.Brass hinges and rubber buffers. [A] Vitreous China pattern in white colour.	Each	it no 23.112 it codee 23010 General Technical Specifications Book .
125	provdg. & Fixing urinal of approved quality incl. connection with trap and with integral longitudinal flush pipe. (A) Squating plate pattern white earthenware 550mm x 300mm.	Each	Item No.23.124, Item code: 23034, General Technical Specification Booklet
126	Providing and fixing Veterious China flat back wash basin with single hole for pillar trap with CI or MS brackets painted with including cutting holes and making good the same including all necessary fittings in white colour.including pillar trap15mm Dia & Waste Pipe 32mm Dia	Each	it no 23.127 it codee 23018 General Technical Specifications Book .
127	Providing and fixing ( 600 X 450 X 150 mm) size vitreous china laboratory sink with CI or MS brackets painted white including cutting holes in wall and making good the same 40 mm dia CP waste couplin rails etc. complete.	Each	it no 23.13 it codee 23019 General Technical Specifications Book .
128	Providing and fixing in position cowl vent to pipes : (ii) 75 mm. Dia.	Each	separate sheet attached



129	Providing and fixing in position cowl vent to pipes : (ii) 110 mm. Dia.	Each	separate sheet attached
130	Providing and fixing G.I. Rain water spout of 50mm dia. and 30cm. length.	Each	it no 0 it codee 23039 General Technical Specifications Book .
131	Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight.(i) Square mouth traps. (A) 100mm x 100mm size P type.	Each	it no 24.19 it codee e 24006AA General Technical Specifications Book .
132	Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm <sup>2</sup> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm intenal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slabe with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(i) Inside dimensions 455mmx 610mm and 450mm deep for single pipe line.	Each	Item No.24.44, Item code:24016AA, General Technical Specification Booklet
133	Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber.(ii) for 455mm x 610mm size.	Each	Item No.24.46, Item code:24017CA, General Technical Specification Booklet
134	Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm <sup>2</sup> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm intenal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slabe with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(ii) Inside dimensions 500mm x 700 mm and 450mm deep for pipe line with one or two inlets.	Each	Item No.24.44, Item code:24016BA, General Technical Specification Booklet
135	Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber.(ii) for 500mm x 700mm size.	Each	Item No.24.46, Item code:24017CA, General Technical Specification Booklet

136	Providing and fixing pre- cast concrete kerb stone of gray cement based concrete block 30 cm length, 30 cm height and 15cm thick of 250 grade concret as per approved design and including excavation for fixing in proper line and level, fillig the joint with C: M 1:3 ( 1 Cement : 3 Fine Sand) etc. complete	Rmt.	separate sheet attached
137	Providing, laying, spreading and consolidation graded stone aggregate to wet mix macadam 150mm compacted thick as per MORT & H specifications including premixing the material with water at OMC in mechanical plant carriage of mixed material by tippers to site, laying in uniform layers with paver in sub base/ base course on well prepared surface and compacting with vibratory roller to achieve the desired density	Cu.Mt.	separate sheet attached
138	Providing & laying of specified compacted thickness Granular sub base (GSB) in specified grading in table 400-1 of the specification MORT&H and compactor to the required density with 8 - 10 tonne vibratory roller with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement .( fully saturated having CBR value greater or equal to 30) compacted thickness of 150 mm consisting of Machine crust stone aggregate as per grading 1 in table 400-1 of the specification MORT&H fifth Revision	Cu.Mt.	separate sheet attached
139	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pnumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidlines of IRC : SP 63-2018 etc. Complete.	Sq.Mt.	separate sheet attached

140	Dry Lean Cement Concrete Sub- base (Construction of dry lean cement concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600- 1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.)	Cu.Mt.	separate sheet attached
141	Providing and Laying trimix Controlled cement concrete M-250 finishing smooth with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for obstacle Free Zone For Track work having thickness of 15CM.compaction and finishing of obstacle Free Zone For Track by trimix process surface by using vaccum dewatering, floater surface vibrator etc.Rate are also inclusive of Providing and Mixing Plastisizer of approved make.	Cu.Mt.	separate sheet attached
142	Carring out plinth treatment to post construction / existing structure by spraying chemical solution for termite control treatment including labour and material consistment with I.S.I specification. Using Chlordene and Chiorpurfiles 20 EC. As Per 6131_paret-II Concentration Weight one percent is recommended i.e one litre 20 EC chemical emulsion with 19 liter give 1 % concentration inclusive of one litre chemical emulsion appication at the rate of 5 Litre chemical / Sqm of surface is recommended as per I.S	Sq.Mt.	it no 176 it codee 22007 General Technical Specifications Book .
143	Providing and laying 20 mm thick water proof cement plaster using water proofing powder 1Kg/1bag of cement for all floors on brick / concrete wall work using water proofing materials in C M 1: 4 ( 1 cement 4 coarسة sand) including finishing with a floating coat of neat cement slurry etc complete for all floor.	Sq.Mt.	separate sheet attached
144	Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and oraganic mater and grading as per I.R.C. Code.(iii) 25mm	Cu.Mt.	separate sheet attached

145	Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and organic mater and grading as per I.R.C. Code.(ii) 40mm	Cu.Mt.	separate sheet attached
146	Spreading the stone aggregate including filling the interstices to required camber and gradient (excluding spreading of Blindage)(iii) 25mm to 50mm size crushed stone	Cu.Mt.	separate sheet attached
147	Drilling 300 mm dia pilot bore at above site in all strata by mud flush direct rotary rig/reverse rotary rig. From 0.00 mt to 220 mt .	R.Mt.	Tube well Detail specification Separate sheet attached
148	Reaming of 300 mm dia bore hole including assembling , jointing lowering housing casing strainer pipes and gravel and assemble item with gravel packing and clay packing 500 mm dia hole for 200 mm dia pipe	R.Mt.	Tube well Detail specification Separate sheet attached
149	Supply of clay ball having Size of 25 mm to 50 mm	Cu.Mt.	Tube well Detail specification Separate sheet attached
150	Supply of gravel of Selected Size 4 mm to 10 mm	Cu.Mt.	Tube well Detail specification Separate sheet attached
151	Cement Sealling	Job	Tube well Detail specification Separate sheet attached
152	Lowring of drop line & air line : Lowring 200 mm dia. Dropline (Blind & Slotted pipe) and 32 mm GI air line for devlopment of each water bering zone coming across the full depth of tube well for each zone	R.Mt.	Tube well Detail specification Separate sheet attached
153	Supply and delivery of PVC blind pipe 200 mm dia as per IS: 12818	R.Mt.	Tube well Detail specification Separate sheet attached
154	Supply and delivery of PVC slotted pipe 200 mm dia as per IS: 12818	R.Mt.	Tube well Detail specification Separate sheet attached
155	Supply of (A) M.S. bore clamp -for 300 mm dia. Pipe	No.	Tube well Detail specification Separate sheet attached
156	Supply of (B) M.S. bore Plug-for 250 mm dia. Pipe	No.	Tube well Detail specification Separate sheet attached
157	Supply of (C)M.S. bail plug.-for 300 mm dia. Pipe	No.	Tube well Detail specification Separate sheet attached
158	Supply of (D) Steel bent plats -for 300 mm dia. Pipe size-200 X 150 X 6 mm.	No.	Tube well Detail specification Separate sheet attached
159	Providing, laying and jointing in true line and level 160 diametre U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant.	R.Mt.	separate sheet attached

160	Providing and supplying in standard length ISI mark rigid unplasticised PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material etc. complete. Test Pressure 10 Kg/cm <sup>2</sup> (160mm dia. pipe)	R.Mt.	Tube well Detail specification Separate sheet attached
161	Providing and supplying in standard length ISI mark rigid unplasticised PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material etc. complete. Test Pressure 10 Kg/cm <sup>2</sup> (200mm dia. pipe)	R.Mt.	Tube well Detail specification Separate sheet attached
162	Lowering, laying, fixing and jointing PVC/uPVC/cPVC pipes and specials of following class and diameter including cost of conveyance from stores to site of works including cost of labour, material, cement solvent, giving satisfactory hydraulic testing as per ISI code (160mm dia. pipe)	R.Mt.	Tube well Detail specification Separate sheet attached
163	Lowering, laying, fixing and jointing PVC/uPVC/cPVC pipes and specials of following class and diameter including cost of conveyance from stores to site of works including cost of labour, material, cement solvent, giving satisfactory hydraulic testing as per ISI code (200mm dia. pipe)	R.Mt.	Tube well Detail specification Separate sheet attached
164	Providing and laying white glazed tiles 6mm thick in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand ) finishing with flush pointing in white cement.	Sq.Mt.	separate sheet attached
165	Supplying & fixing C.I man hole cover 0.60mt x 0.45mt size having weight not less than 35 Kg.	Each	it no 0 it code 2303B General Technical Specifications Book .

166	<p>Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35- 2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide liminance coefficinet on cemend road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.</p>	Sq.Mt.	separate sheet attached
167	<p>Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Pardi</p>	Cu.Mt.	it no5.8.3,it code 05025AA + it no 9.1 it code 09001CA General Technical Specification Booklet
168	<p>Providing and Fixing Pre-cast R.C.C. Drain Cover Using controlled cement concrete work M250 and curing complete including the cost of form work and including the cost of reinforcement</p>	Each	it no5.8.3,it code 05025AA+ it no 9.1 it code 09001B1 General Technical Specification Booklet

**TECHNICAL SPECIFICATION  
FOR  
TUBEWELL**

**ITEAM No. :-147,148 ,149, 150,151, 152, ,153, 154, 155, 156, 157,158.**

### **1 General**

The Contractor shall have to furnish in writing to the concerned Chief Engineer, SAG, a programme of drilling of wells within a week of handing over the pin pointed sites to the Contractor.

For the purpose of drilling approach road, water for drilling, crew, camp and other infrastructure, preparation of the site and placing the rig at the site etc, are to be arranged by the drilling contractor at his own cost.

Technical problems during drilling like jamming of drill string, damages to bits/ hammer/ drill rods/ stoppage of work due to unforeseen reasons etc would be the responsibility of the drilling contractor and no compensation of any kind would be paid by the department. In case the well could not be completed and had to be abandoned due to contractor's fault, no payment will be made for that well. In case the well is abandoned due to geological condition such poor discharge, inadequate depth of good quality bearing formation, etc, duly certified by site officer and on approval of concerned authority, payment for executed works will be made. The decision of Chief Engineer will be binding on contractors in deciding whether the well is abandoned due to contractor's fault or due to geological formation.

Drilling Fluid / Bentonite Mud / Drilling Foam required for drilling and for efficient removal of cuttings, to reach the targeted depth and saving borehole from collapsing will be the responsibility of the contractor.

## **2 Scope of Work and Overview**

### **2.1 Scope of Work**

#### **(A) Alluvial Formations:**

The scope involves drilling of pilot hole; collection of samples including water samples for chemical analysis and preparation of litholog; electrical logging; preparation of composite log; design of well assembly; enlargement of hole size by reaming; lowering of well assembly; gravel shrouding; development and testing of exploratory and observation wells.

#### **(B) Hard Rock Formations:**

The scope involves drilling and casing of overburden; drilling in hard rock up to the targeted depth; identification of depth of each fracture; assessment of yield after encountering of each fracture; development and testing of exploratory and observation wells.

The contractor shall be required to carry out all of the following works:

**Exploratory Drilling:** Drilling and construction of exploratory wells/ observation wells as per Tables in Packages, conducting electrical logging, development and conducting preliminary yield of wells, conducting pumping test and data analysis, preparation of basic data reports along with site location map, and submission to SAG in prescribed format (Annexure- II to VIII ) in triplicate along with well diagram with complete details of reaming diameter, well assembly size and depth, gravel packing depth, cement sealing depth, clay packing depth etc.

The details of all the activities to be carried out by the contractor including methodology to be adopted and reporting formats are discussed in section 3.0 to 17.0.

## **3. Construction of Exploratory and Observation Wells**

The sizes of Pilot holes, reaming sizes, assembly designs, are to be strictly as per the actual requirements guided by BOQ. Formation strata samples should be collected after proper washing



adopting standard procedure for sample collection for every 3 m or in the event of change in formation. The bottom of assembly should be provided with bail plug. The depth of blank pipe and slotted pipe with bail plug (well assembly) will be decided by the Engineer-In-Charge according to the formation encountered during drilling. After lowering the well assembly back washing should be carried out, the graded pea gravel of size 2 mm to 3.35 mm should be packed properly in the annular space between the well assembly and borehole up to the ground level. The bill of quantity should contain only the final reamed size of well and its depth and hence rate should be quoted for final reamed size and its depth only i.e. the final reamed rate deemed to cover the intermediate reaming sizes. The reaming with intermediate sizes should not be included in the bill of quantity. In case of higher consumption of gravel due to adverse geological formation like cavern formation, enlargement of reamed hole due to caving, the same should be certified by Engineer-In-Charge and it should be duly approved by authority concerned. A pair of clamps made of 75cm x 15cm MS plate of 9 mm thick should be provided and fixed around the casing with proper nuts and bolts which is finally reinforced in the cement concrete. Pumping tests such as Step Drawdown Test and Aquifer Performance Tests should be carried out using Submersible pump/ VT pump of adequate capacity creating sufficient drawdown. After carrying out test, analysis of data using approximate procedures based on geological formation and aquifer type should be carried for evaluating aquifer parameters such as Specific yield, Transmissivity, Storativity etc. Water sample should be collected during pumping test in 1litre Teflon coated bottles using standard procedures. BDR along with litholog, logging data and report, pumping test data and report etc along with well diagram incorporating all details should be submitted. On completion of well, Mud pit should be filled up and hardened and brought to previous natural condition. The well should be provided with well cap using MS plate of minimum thickness 6mm and protection box made of 16-gauge GI sheet. A concrete platform should be provided around the well as per the specification given in the tender.

In respect of wells in Hard rocks, the Engineer In charge will decide the actual casing length at site based on overburden encountered. Lithologs samples should be collected after proper washing adopting standard procedure for sample collection for every 3m or in the event of change in formation. Also Preliminary Yield Test (PYT) should be conducted as per instruction of site officer on encountering each fracture with substantial discharge. For conducting PYT, 75mm dia M.S Pipe (Education pipe) up to 1m above bottom level of drilling and 25mm dia airline should be lowered inside education pipe up to 1m above bottom level of education pipe. 20mm MS/ PVC pipe should be lowered for measuring water level and using water level sounders, the water level should be measured. Slug test has to be conducted on need based, on instruction of site engineer. Aquifer parameter test with full recovery should be conducted where EW and OW are constructed or as per instruction of site engineer. A pair of clamps made of 75cm x 15cm MS plate of 9 mm thick should be provided and fixed around the casing with proper nuts and bolts which is finally embedded in the cement concrete. In the well with discharge more than 3 litres per sec, pumping tests such Aquifer Performance tests should be carried out. Pumping tests such Step drawn test and Aquifer Performance tests should be carried out using Submersible pump of adequate capacity creating sufficient draw down. After carrying out test, analysis of data using approximate procedures based on geological formation and aquifer type should be carried for evaluating aquifer parameters such as Specific yield, Transmissivity, etc. Water sample should be collected during pumping test and drilling in 1 litre Teflon coated bottles using standard procedures. BDR along with litho log, logging data and report, pumping test data and report etc should be submitted. Also well diagram with details such as overburden drilling dia and its depth, casing pipe lowered and its dia and depth, naked bore dia, depth at which fractures encountered, static water level, V notch discharge on encountering each fractures and depth, position of part assembly and its size and depth clay packing, cement sealing, concrete platform etc should be submitted. The well should be provided with well cap using M.S plate of minimum thickness 6mm and protection box made of 16-gauge GI sheet. A concrete platform should be provided around the well as per the specification given in the tender. Schematic diagram of well is given in Annexure I. On completion of well, the site around the well should be brought to previous natural condition

#### **4 Methodology / Approach**

##### **4.1 Process /Methodology Involved in Construction of Wells In Soft Rock Up To 250 M Depth**

### **Exploratory Wells**

- (i) Site selection and pinpointing of site
- (ii) Shifting of Rig
- (iii) Site preparation
- (iv) Pilot hole drilling (using 8½" RR Bit/ Drag Bit)
- (v) Sample collection & preparation of litholog
- (vi) Bore hole logging (Resistivity/Natural Gamma)
- (vii) Determining size of gravel packing
- (viii) Preparation of Composite log using data of (5) & (6) above
- (ix) Designing of Well assembly
- (x) Reaming of Bore hole ( by using appropriate size of RR bits based on recommended well assembly size, giving a margin for minimum 3" thickness gravel packing )
- (xi) Lowering of well assembly
- (xii) Back washing, shrouding of gravel and Clay packing (cement sealing, if required)
- (xiii) Verticality test of well
- (xiv) Development of well by air compressor/ pumping
- (xv) Pumping Test
  - a. SDT
  - b. APT
  - c. Water sample collection for analysis of Basic & Heavy metals under guidance of site Hydrogeologist/ Chemist.
- (xvi) Construction of platform, well capping and installation of protection box
- (xvii) Preparation of Basic Data Report & submission
- (xviii) Handing over of well

### **Observation Wells**

- (i) Pinpointing of site
- (ii) Shifting of Rig
- (iii) Site preparation
- (iv) Pilot hole drilling (using 8½" RR Bit/ Drag Bit)
- (v) Sample collection & Litholog
- (vi) Bore hole logging (Resistivity/Natural Gamma) (need based)
- (vii) Preparation of Composite log using data of (v) & (vi) above (need based)
- (viii) Designing of Well assembly
- (ix) Reaming of Borehole ( by using appropriate size of RR bits based on recommended well assembly size, giving a margin for minimum 100 mm thickness gravel packing )
- (x) Lowering of well assembly
- (xi) Back washing, shrouding of gravel and clay packing (cement sealing , if required)
- (xii) Development of well by air compressor
- (xiii) Construction platform, well capping and installation of protection box
- (xiv) Preparation of Basic Data Report
- (xv) Handing over of well

## **4.2 Process/ Methodology Involved In Construction Of Wells In Hard Rock Up To 250 M Depth**

### **Exploratory Wells**

- (i) Site selection and pinpointing of site
- (ii) Shifting of Rig
- (iii) Site preparation
- (iv) Overburden drilling (using Button Bit/ RR Bit)
- (v) Installation of casing pipe in the overburden and surface grouting.
- (vi) Telescopic Drilling using DTH method up to targeted depth
- (vii) Measurement of yield using V notch/ volumetric method after encountering each fracture zone and simultaneous water sample collection and quality analysis for individual fracture zone

- (viii) Sample collection and preparation of litholog
- (ix) PYT/ Slug test (need based)
- (x) Development by air compressor
- (xi) Verticality test of well
- (xii) Electrical logging/ calliper logging (need based)
- (xiii) Pumping Test if yield is more than 3 lps
  - a. APT
  - b. Water sample collection
- (xiv) Construction of platform, well capping and installation of protection box
- (xv) Preparation of Basic Data Report
- (xvi) Handing over of well

### **Observation Wells**

- (xvii) Pinpointing of site
- (xviii) Shifting of Rig
- (xix) Site preparation
- (xx) Overburden drilling (using Button Bit/RR Bit)
- (xxi) Installation of casing in the overburden and surface grouting.
- (xxii) Telescopic Drilling using DTH method up to target depth
- (xxiii) Measurement of yield using V notch/volumetric method after encountering each fracture zone and simultaneous water sample collection and quality analysis for individual fracture zone
- (xxiv) Sample collection and preparation of litholog
- (xxv) Development by air compressor
- (xxvi) Verticality test of well
- (xxvii) Pumping Test if yield is more than 3 lps
  - a. APT
  - b. Water sample collection
- (xxviii) Electrical logging/ calliper logging
- (xxix) Construction of platform, well capping and installation of protection box
- (xxx) Preparation of Basic Data Report
- (xxxi) Handing over of well

### **5 Casing**

- (i) M.S Casing pipes/ slotted pipe as specified in above should confirm to the specification given below.
- (ii) BIS marked steel tubes plain ended for water wells of type ERW conforming to Table No 3 of IS: 4270/2001 (third revision).
- (iii) A length of 0.50 m of casing pipe should be left above the ground level.
- (iv) MS Casing pipe should be installed perfectly vertical on the consolidated rock basement in such a manner that there should not be leakage of air during drilling. The annular space between the casing and the borehole wall should be grouted with cement slurry to avoid entry of local foreign material in the borehole in consolidated formations. The annular space above gravel pack may be filled with local clay in case of Soft rock formation.
- (v) Well cap should be securely sealed to the pipe after bore hole is checked by the Engineer-In Charge. The well cap should be fabricated as per the provided specifications by SAG.

### **6 Well Development**

In respect of borehole drilled in hard rock formations, well should be washed/ developed using compressor thoroughly after completion the drilling operation till clear water comes. In respect of tube wells constructed in the soft rock formations, well should be washed/ developed using compressor of minimum pressure of 1034 kPa (150 psi) and discharge of 17 cubic meter per minute (600 cfm) thoroughly after lowering of well assembly and gravel shrouding till clear water comes. hour meter reading of engine calibrated to 1500 rpm. Sufficient length of airline (minimum 25mm dia) should be lowered inside the eduction pipe so that the bottom of airline inside the eduction pipe is minimum 95m below static water level. No payment will be made if hour meter is not working.

### **7 Construction of Platform, Well Cap, Protection Box and Display BOARD**

After the completion of well in all respects described above, the contractor shall fabricate and install well cap using MS plate of minimum thickness 6mm, make platform around well, and install Display Board and Protection Box.

## **8 Data Collection**

Drilling contractor will

- (i) Maintain a drill time log for every meter of drilling for wells drilled in hard rock formation and every 3 m for wells drilled in soft rock formations
- (ii) Measure discharge over 90° V notch plate during drilling on every increase/ decrease of yield at various depths for wells drilled in hard rock formations.
- (iii) Collect formation samples of minimum 500 g mass at an interval of 3m or change of formation during drilling and properly pack in polythene bags and label with date/ depth/ location.
- (iv) Collect 1 litre water sample during the following stages:
  - a. For every water-bearing zone encountered for wells drilled in hard rock formations.
  - b. After development is complete and during test for wells drilled in soft rock formations

Necessary arrangements are to be made for verification by Engineer-In-Charge for checking of depth of borehole, length of casing, static water level, discharge and any other requirement as shall be felt necessary from time to time. A guest tent should be pitched at the site during drilling/ testing and provided with table and chairs for the Engineer-In-Charge.

## **9 Gravel Packing of Tube well**

After the tube well assembly has been placed in position in soft rock formation/ boulder formation, the good quality gravel has to be shrouded in the annular space between the well pipe and the borehole. The gravel size shall be decided by the SAG (depending upon the grain size of formation) and gravel should be of rounded to sub-rounded shape and shall be supplied by the Contractor. Before shrouding, it must be got approved from Engineer-In-Charge. The annular spaces between assembly and bore hole wall shall be gravel packed (up to the designed cement seal, if required). After gravel packing (cement sealing is to be done, if required, and above the cement seal entire annular space shall be filled with local clay/drill cuttings). A check of the verticality of the housing pipe and necessary correction should be made at this stage.

## **10 Verticality Test**

The well assembly shall be placed vertically inside the borehole. Verticality test as per IS: 2800 (Part 2) -1979 must be arranged by the Contractor with standard equipments at his cost. In case of deviation beyond the permissible limit, the well will be treated as vertically out. In that case payment will be restricted to the cost of material used in well construction as per BOQ.

## **11 Successful and Unsuccessful Well**

Success of well will be decided by the Engineer-In-Charge. In case of non-availability of minimum thickness of aquifer capable of yielding expected discharge, the bore hole may be abandoned and payment based on actual work carried out will be made at quoted rates. The tube well abandonment committee will be constituted by concerned personnel from SAG.

## **12 Aquifer Performance Test (APT)**

The contractor has to carry out the APT in order to determine Transmissivity, Specific Yield/ Storativity in wells through pumping test method.

### **12.1 "Blank"**

### **12.2 Methodology/ Approach**

Transmissivity, Storativity may be determined by conducting APT in wells having discharge more than 3 lps.

**Method/Procedure for determining the aquifer parameters:**

Conducting pumping test on existing wells tapping unconfined aquifer

- (i) This method is to be used for conducting test in predominantly unconsolidated and semi consolidated subject to availability of wells for the purpose. The test shall be conducted with main well (pumping well) having one pumping well and at least one observation well at a distance of 5 to 10 m from the pumping well.
- (ii) VT/ Submersible pump of adequate capacity should be lowered to desired depth (in consultation with the Engineer-In-Charge) and should create substantial drawdown.
- (iii) Pre-test trial pumping needs to be carried out to assess the sustainability of wells for long duration pumping (till pumping water level stabilizes or up to 1000 min whichever is earlier).
- (iv) Pre pumping water level is to be measured in the pumping well and all observation well(s)
- (v) The main well is to be pumped at a constant discharge for long duration and water level in both pumping and observation wells are measured periodically (Annexure-III a and III b)
- (vi) Recovery water level is to be recorded as per data sheet (Annexure-III c and III d) after stopping of the pump until the pumped water level reaches static water level or 90% of the static water level.

The data recorded shall be analysed by using suitable methods for unconfined, semi confined and confined aquifers like Jacob’s straight line, Theis’ method and Curve matching method.

**12.3 Technical Specifications**

Area/ Method	Details
For Alluvial/ Sedimentary areas, subject to availability (Pumping test method)	(i) Pre-test trial pumping needs to be carried out to assess the sustainability of wells for long duration pumping. Wells that can sustain long duration pumping should only be selected. Lowering of suitable capacity submersible pump.
	(ii) Water level of nearby dug wells (if available) should be similar to pumping and observation wells.
	(iii) The main well should be pumped at a constant discharge continuously for a long duration till the third segment of type curve is attained or 10000 min whichever is earlier.
	(iv) The test has to be repeated after 24 hrs in the event of any breakdown/ interruption of pumping during test.
	(v) Analysis by suitable method.

**12.4 Submission of reports in the prescribed formats**

The following reports are required to be submitted by the contractor in the format prescribed in relevant Annexure in hard as well as soft copies:

For Alluvial/Sedimentary areas

- (i) Test Site details – (Annexure-VIII)
- (ii) Raw Pumping data sheet in case of Alluvial/Sedimentary areas- (Annexure-III a to IIIId)
- (iii) Processed graph sheet
- (iv) Calculation details and results
- (v) Consolidated statement of test (Annexure IIIa)

For hard rock areas

- (i) Well inventory data in original
- (ii) Processed graph sheet
- (iii) Calculation details and results
- (iv) Consolidated statement of test (Annexure- IVb)

### **13 Preliminary yield Test (PYT)**

The contractor has to carry out the PYT in order to determine aquifer parameter (Transmissivity, Specific capacity) in wells having discharge more than 1 lps and less than 3 lps.

#### **13.1 "Blank"**

#### **13.2 Methodology/ Approach**

Transmissivity may be determined by conducting Preliminary Yield Test in wells having discharge more than 1 lps and less than 3 lps.

Method/ Procedure:

- (i) For conducting PYT, 75mm dia GI/ MS/ PVC Pipe (Eductor pipe) up to 1m above bottom level of drilling and 25mm dia airline should be lowered inside eduction pipe up to 1m above bottom level of eductor pipe. 20 mm GI/ MS/ PVC pipe should be lowered for measuring water level and using water level sounders, the water level should be measured.
- (ii) Pre pumping water level is to be measured in the pumping well.
- (iii) The well is to be pumped at a constant discharge for long duration (100 min) and water level during recuperation (recovery) should be are measured periodically (Annexure-III e). The discharge should be measured using 90° V Notch
- (iv) Recovery water level is to be recorded as per data sheet (Annexure-III e) after stopping the pump until the pumped water level reaches static water level or 90% of the static water level.

The data recorded shall be analysed by using Jacob straight line method.

#### **14 Slug Test**

The contractor shall conduct slug test in existing bore wells/ tube wells

#### **14.1 "Blank"**

#### **14.2 Methodology/ Approach**

Slug tests is to be conducted in low-yielding bore wells/tube wells (having well diameter  $\leq 254\text{mm}$ ), where conventional aquifer performance tests cannot be conducted due to constraints of yield. The contractor shall identify the wells for conducting the slug tests in a grid pattern in consultation with CGWB. In this method, a known volume or Slug of water (maximum 20 litre) is instantaneously

injected into the well and the water level is measured at periodic intervals till the pre-injection water level returns to the pre-injection level or for a pre-determined period, whichever is less.

Procedure for conducting slug test:

- (i) Collect and record all available information (depth, diameter, yield, aquifer type, lithology etc.) about the tube well / bore well to be tested
- (ii) Measure the static water level before the injection of slug.
- (iii) Inject a known volume (slug) of water (not more than 20 litres) into the bore well/tube well.
- (iv) Measure the water level at closely spaced intervals (once every minute up to 10 minutes, once every 2 minutes up to 20 minutes and then on once every 5 minutes till completion).
- (v) Continue recording depth/time measurements until the water level returns to preinjection level or a sufficient Number of Readings have been made to clearly show a trend on a plot of water level recovery versus the logarithm of time.
- (vi) Estimate the value of change in head ( $H_0$ ) in response to injection of slug ( $H_0$ ). Compute also the change in water levels ( $H$ ) for each subsequent measurement.
- (vii) Compute the values of  $H/H_0$  for each measurement.

Analysis of Data

Field data generated need to be analysed using standard methods

- (i) For Unconfined aquifer - Hvorslev method (1951)/Bouwer and Rice method (1976).
- (ii) For confined aquifers - Cooper et al (1967) method

14.3 Technical Specifications

- (i) Slug test is to be conducted in borewells/tubewells (having well diameter  $\leq 254$ mm) in grid pattern.
- (ii) Conducting test with slug injection (20 litres)
- (iii) Slug injected should be of potable water quality.
- (iv) Recording water level data in periodic time steps (minute recording up to 10 min, 2 minute recordings upto 20 minutes and then on 5 minute recordings till completion)

Analysis of data generated using following method for unconfined aquifer by

- (i) Hvorslev method (1951) and
- (ii) Bouwer and Rice method (1976)

For Confined aquifer by - Cooper et al (1967)

Submission of report in prescribed format (Hard and Soft copy) containing

- (i) Site location details – (Annexure-V)
- (ii) raw data sheet - (Annexure-VI)
- (iii) Processed graph sheet
- (iv) Calculation details and results
- (v) Consolidated statement of slug test (Annexure-VII)

15 Mode of Measurement

The Contractor shall be paid on actual measurement of finished work on the basis of quoted rates. The Contractor shall be eligible for payment of full length drilling of bore hole irrespective of the design of tube well assembly provided the more drilling necessitated in search of a suitable aquifer and as per the advice of Engineer- In-Charge.

16 The Surrounding Area After Well Completion

The area surrounding the well site has to be levelled, pits to be filled and the area to be restored to the original condition i.e. as before start of drilling operation.

### 17 Handing Over of Tubewell

The tube well must be properly handed over to the SAG on completion.

### 18 Monitoring and Measurement of Work

18.1 The monitoring and measurement of different activities for exploratory drilling shall be as specified in below table

<b>Sr. No.</b>	<b>Parameter</b>	<b>Monitoring Mechanism / Measurement Criteria</b>
1)	Location of site	site selection report(s) duly signed by the representatives of contractor, and Engineer in charge.
2)	Depth/ Diameter of pilot hole	Sounding should be carried out in the presence of the Engineer-In-Charge
3)	Inspection of assembly pipes, screen pipes, gravel etc. as per specification	Pipes used for assembly, screen pipes, gravel etc. should be pre-inspected and approved by Engineer-In-Charge
4)	Litholog/ Electrical log/ Composite log/ Well Design	Verification/ validation by the SAG
5)	Installation of well assembly and gravel shrouding	Should be carried out in the presence of Engineer-In-Charge
6)	Development of well	Actual measurement of time should be based on engine Hour running/ sand content of water, will be verified by Engineer In-Charge
7)	Testing of well	Actual measurement of time/ water levels should be carried out by the contractor in the presence of Engineer- In-Charge. Analysis and Aquifer parameters evaluation report to be prepared by the contractor and to be validated by the Regional office
8)	Well capping/ construction of platform and installation of protection box	Physical inspection by the Engineer- In-Charge

PS: The contractor will report to the Engineer-In-Charge at specific time of 1100 hours via email/ phone the daily progress at each site and submit status report on weekly basis to Chief Engineer.

### 18.2 Preparation and Submission of BDR

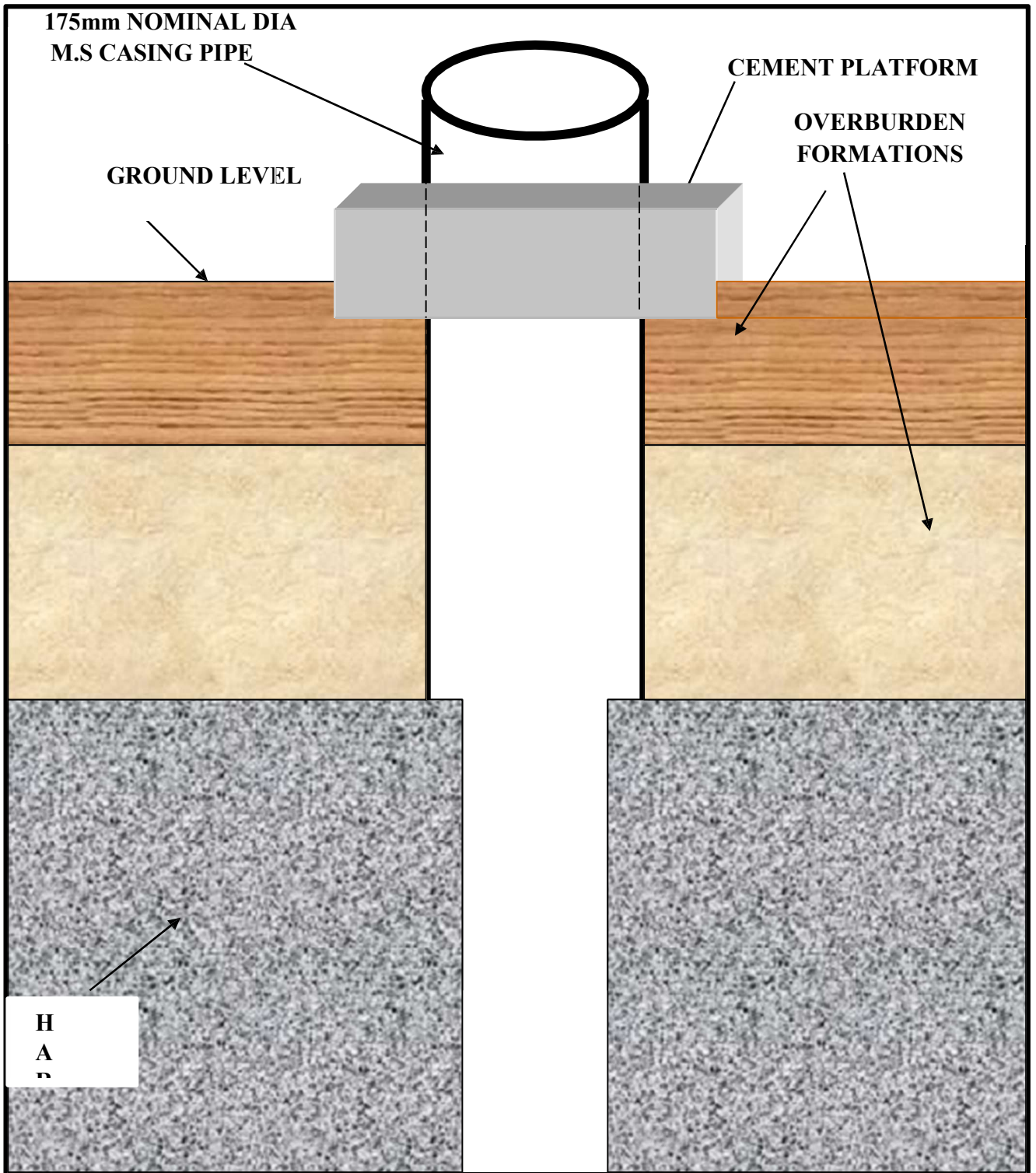
The contractor is required to prepare the basic data report (BDR) for all the wells. The BDR for each of the well shall be submitted to SAG in soft as well as hard copy (in triplicate).

### 18.3 Specification and Drawings

The specifications for drilling and construction of wells shall be as specified in the bill of quantities.



(ANNEXURE I)



**(ANNEXURE II)**

**LOGGING DATA (NATURAL GAMMA LOGGING)**

Unique ID	
Location	
Site plan and RL(m amsl)	
Date/Year	
Depth Drilled (m bgl)	
Depth Logged (m bgl)	
Bore hole dia.	

**Unique ID**

Depth range (m bgl)		Thickness (m)	Natural counts (CPS)	Gamma	Inferred Lithology
From	To				

**Signature and stamp of Authorized signatory**

(ANNEXURE III-A)

PUMPING TEST DATA SHEET – PUMPING WELL

<b>Site name with coordinates</b>						
<b>Location details</b>						
<b>Type of Well Pumping well</b>						
<b>Date of Test &amp; Start time</b>						
<b>Diameter of well (mm)</b>						
<b>Distance from the observation well (m)</b>						
<b>Capacity of the pump</b>						
<b>Discharge (lps)</b>						
<b>Measuring Point (m)</b>						
<b>SWL in m below measuring point</b>						
<b>Clock Time (HH/MM)</b>	<b>Time since pump started (min)</b>	<b>Water level (m bmp)</b>	<b>Drawdown (m)</b>	<b>Remarks</b>		
<b>Interval for Recording of data.</b>						
<b>1 minute interval upto 10 min</b>						
<b>2 minute interval upto 20 min</b>						
<b>5 minute interval upto 50 min</b>						
	<b>1</b>					
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	<b>3</b>					
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	<b>16</b>					
	<b>18</b>					
	<b>20</b>					
	<b>25</b>					
	<b>30</b>					
<b>5 min recording upto 60 min</b>						
<b>10 min recording upto 100 min</b>						
<b>20 min recording upto 200min</b>						
<b>50 min recording until 500 min</b>						
<b>100 min recording until completion of the test.</b>						

(ANNEXURE III-B)

PUMPING TEST DATA SHEET – OBSERVATION WELL

<b>Site name with coordinates</b>						
<b>Location details</b>						
<b>Type of Well Pumping well</b>						
<b>Date of Test &amp; Start time</b>						
<b>Diameter of well (mm)</b>						
<b>Distance from the observation well (m)</b>						
<b>Capacity of the pump</b>						
<b>Discharge (lps)</b>						
<b>Measuring Point (m)</b>						
<b>SWL in m below measuring point</b>						
<b>Clock Time (HH/MM)</b>	<b>Time since pump started (min)</b>	<b>Water level (m bmp)</b>	<b>Drawdown (m)</b>	<b>Remarks</b>		
<b>Interval for Recording of data.</b>						
<b>1 minute interval upto 10 min</b>						
<b>2 minute interval upto 20 min</b>						
<b>5 minute interval upto 50 min</b>						
	<b>1</b>					
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	<b>18</b>					
	<b>20</b>					
	<b>25</b>					
	<b>30</b>					
<b>5 min recording upto 60 min</b>						
<b>10 min recording upto 100 min</b>						
<b>20 min recording upto 200min</b>						
<b>50 min recording until 500 min</b>						
<b>100 min recording until completion of the test.</b>						

(ANNEXURE III-C)

RECOVERY TEST DATA SHEET – PUMPING WELL

<b>Site name with coordinates</b>						
<b>Location details</b>						
<b>Type of Well Pumping well</b>						
<b>Date of Test &amp; Start time</b>						
<b>Diameter of well (mm)</b>						
<b>Distance from the observation well (m)</b>						
<b>Capacity of the pump</b>						
<b>Discharge (lps)</b>						
<b>Measuring Point (m)</b>						
<b>SWL in m below measuring point</b>						
<b>Time since pump started (min)</b>	<b>Time since Stopping of pumping (min) (t')</b>	<b>Water level (m bmp)</b>	<b>Residual Drawdown RDD (m)</b>	<b>t/t'</b>		
<b>Interval for Recording of data.</b>						
<b>1 minute interval upto 10 min</b>						
<b>2 minute interval upto 20 min</b>						
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	<b>20</b>					
	<b>25</b>					
	<b>30</b>					
<b>5 min recording upto 60 min</b>						
<b>10 min recording upto 100 min</b>						
<b>20 min recording upto 200min</b>						
<b>50 min recording until 500 min</b>						
<b>100 min recording until completion of the test.</b>						

(ANNEXURE III-D)

RECOVERY TEST DATA SHEET – OBSERVATION WELL

<b>Site name with coordinates</b>						
<b>Location details</b>						
<b>Type of Well Pumping well</b>						
<b>Date of Test &amp; Start time</b>						
<b>Diameter of well (mm)</b>						
<b>Distance from the observation well (m)</b>						
<b>Capacity of the pump</b>						
<b>Discharge (lps)</b>						
<b>Measuring Point (m)</b>						
<b>SWL in m below measuring point</b>						
<b>Time since pump started (min)</b>	<b>Time since Stopping of pumping (min) (t')</b>	<b>Water level (m bmp)</b>	<b>Residual Drawdown RDD (m)</b>	<b>t/t'</b>		
<b>Interval for Recording of data.</b>						
<b>1 minute interval upto 10 min</b>						
<b>2 minute interval upto 20 min</b>						
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	<b>20</b>					
	<b>25</b>					
	<b>30</b>					
<b>5 min recording upto 60 min</b>						
<b>10 min recording upto 100 min</b>						
<b>20 min recording upto 200min</b>						
<b>50 min recording until 500 min</b>						
<b>100 min recording until completion of the test.</b>						

(ANNEXURE III-E)

RECOVERY TEST DATA SHEET – PRELIMINARY YIELD TEST

<b>Site name with coordinates</b>						
<b>Location details</b>						
<b>Type of Well Pumping well</b>						
<b>Date of Test &amp; Start time</b>						
<b>Diameter of well (mm)</b>						
<b>Distance from the observation well (m)</b>						
<b>Capacity of the pump</b>						
<b>Discharge (lps)</b>						
<b>Measuring Point (m)</b>						
<b>SWL in m below measuring point</b>						
<b>Time since pump started (min)</b>	<b>Time since Stopping of pumping (min) (t')</b>	<b>Water level (m bmp)</b>	<b>Residual Drawdown RDD (m)</b>	<b>t/t'</b>		
<b>Interval for Recording of data.</b>						
<b>1 minute interval upto 10 min</b>						
<b>2 minute interval upto 20 min</b>						
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	<b>20</b>					
	<b>25</b>					
	<b>30</b>					
<b>5 min recording upto 60 min</b>						
<b>10 min recording upto 100 min</b>						
<b>20 min recording upto 200min</b>						
<b>50 min recording until 500 min</b>						
<b>100 min recording until 90% recuperation to static water level.</b>						







**(ANNEXURE V)**

Well no: \_\_\_\_\_ Date of test \_\_\_\_\_

Location:

District: \_\_\_\_\_ State \_\_\_\_\_

Latitude (Degree Decimal): \_\_\_\_\_ Longitude (Degree Decimal): \_\_\_\_\_

**Well Details:**

Type of Well: BW/TW Owner: Govt/Private. Well usage: Irrigation/Domestic Well status: In use/Abandoned

Geologic formation \_\_\_\_\_ Depth of the well: \_\_\_\_\_(m). Diameter of Well : \_\_\_\_\_(mm) Casing length \_\_\_\_\_(m) Reported discharge \_\_\_\_\_lps.

Alluvial area/Hard rock area: Zones tapped/Fractures encountered from \_\_\_\_ to\_\_\_\_(m).

**Test Reading**

Measuring point (MP) \_\_\_\_\_(m) Static WL \_\_\_\_\_(m) Slug Quantity(Injection) \_\_\_\_\_litre.

Time of start of test \_\_\_\_\_ Time of Completion of test \_\_\_\_\_ Length of test \_\_\_\_\_(Minutes)

**Results:**

**Analysis method**

Type of aquifer: Unconfined/Confined. Method used for Analysis:

\_\_\_\_\_

**Aquifer parameters:**

Transmissivity \_\_\_\_\_m<sup>2</sup>/d and Hydraulic Conductivity (K) \_\_\_\_\_m/d.

Name of personnel conducted test

Signature

Date

(ANNEXURE VI)

SLUG TEST DATA SHEET

<b>Site name</b>				
<b>Location details</b>				
<b>Volume of Slug injected (litres)</b>				
<b>Date of Test</b>				
<b>Diameter of well (mm)</b>				
<b>Distance from the observation well (m)</b>				
<b>Height of M.P. (m.agl)</b>				
<b>SWL in m below measuring point</b>				
<b>Time(min)</b>	<b>Time (sec)</b>	<b>Water level (H in m)</b>	<b>Change in Water level (Ho in m)</b>	<b>H/Ho</b>
<b>Interval for Recording of data.</b>				
<b>1 minute interval upto 10 min</b>				
<b>2 minute interval upto 20 min</b>				
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<b>75</b>				
<b>80</b>				
<b>85</b>				
<b>90</b>				
<b>95</b>				
<b>100</b>				

(ANNEXURE VII)

CONSOLIDATED STATEMENT OF SLUG TEST

Sr. No.	Location	Depth of well	Geological formation	K value (m/d)		
				Hvorslev method	Bouwer and rice method	Cooper et al
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

**(ANNEXURE VIII)**

**WELL INVENTORY DATA SHEET**

Well no: \_\_\_\_\_ Date of inventory \_\_\_\_\_

Location:

\_\_\_\_\_  
\_\_\_\_\_

Administrative Block: \_\_\_\_\_ District: \_\_\_\_\_ State \_\_\_\_\_

Name of the Watershed \_\_\_\_\_ Area of the Watershed \_\_\_\_\_ km<sup>2</sup>

Geologic formation \_\_\_\_\_

Type of Well: DW/DCB/BW\* Owner: Govt/Pvt. Well usage: Irrigation/Domestic.

Depth of the well: \_\_\_\_\_(m). Diameter of Well: \_\_\_\_\_(mm)

Casing length/ Curbing depth (m) \_\_\_\_\_(m) Reported discharge \_\_\_\_\_ lps.

Weathering thickness) \_\_\_\_\_ m Fractures encountered from \_\_\_\_ to\_\_\_\_(m).

Measuring point (MP) \_\_\_\_\_(m) Static WL \_\_\_\_\_(m) Type of Pump- Submersible/Centrifuge/JET

Pump Capacity \_\_\_\_\_(HP) Hours of pumping \_\_\_\_\_ hrs/day.

Number of pumping days \_\_\_\_\_ days /year. Total estimated draft  
\_\_\_\_\_ m<sup>3</sup>/year.

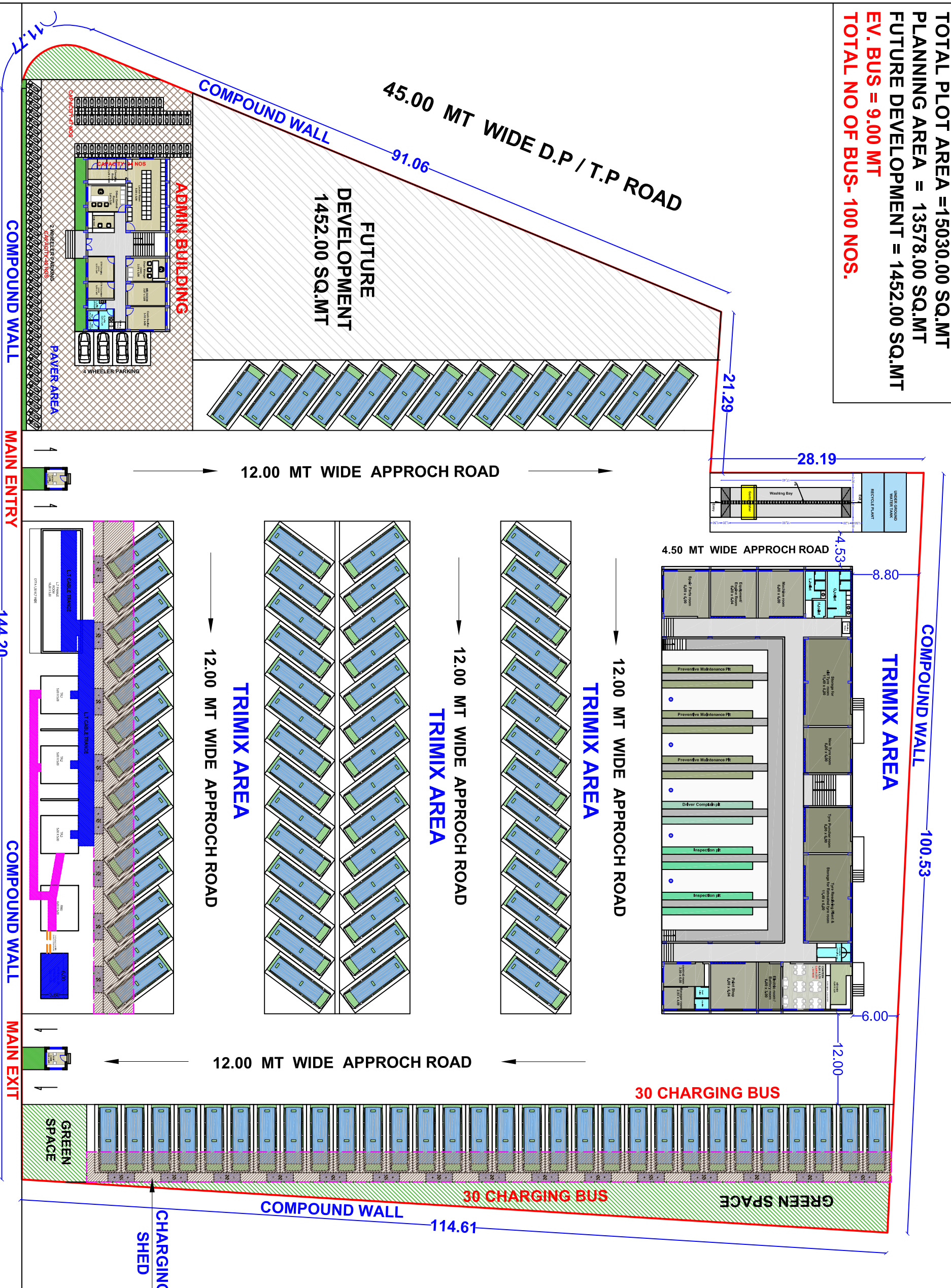
Cropping pattern \_\_\_\_\_

Command area of the well \_\_\_\_\_ ha.

Any other Salient feature: \_\_\_\_\_

Name of officer

**TOTAL PLOT AREA =15030.00 SQ.MT**  
**PLANNING AREA = 13578.00 SQ.MT**  
**FUTURE DEVELOPMENT = 1452.00 SQ.MT**  
**EV. BUS = 9.00 MT**  
**TOTAL NO OF BUS- 100 NOS.**



**COPY FOR ESTIMATE**

CLIENT AGENCY PMCT.P.I.

**PRESENTATION DRAWING**

NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

**LEGEND**

- PAVER BLOCK AREA- 315.00 SQ.MT
- TRIMIX FINISH R.C.C AREA - 11736.00 SQ.MT
- RAIN WATER HARVESTING- 160 DIA - 300 RMT
- RAIN WATER HARVESTING- 200 DIA - 300 RMT
- COMPOUND WALL - 512.00 RMT
- CHARGING SHED AREA - 740.80 SQ.MT
- BUILT UP AREA**
- ADMIN BUILDING - 530.20 SQ.MT
- WORKSHOP - 1485.69 SQ.MT

REVISION DATE:	DATE:
SCALE :- N:1S	NORTH:-

AGENCY:-  
 CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
 F.P. NO.- 39, TPS-11, ADHEVADA,  
 BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
 Planning & Engineering Services Pvt.Ltd  
 DRAWN BY / REVISION BY / CHECK BY / DRG. JNO. / PROJ. NO.  
 VELS1

WORKING DRAWING

NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

SCHEDULE OF DOORS

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL.	1ST.FL.	TER.FL.	SILL	LINTEL LVL.
1.	D	1.50 X 2.45	-	02	-	-	2.45
2.	D1	1.20 X 2.45	01	-	-	-	2.45
3.	D2	1.00 X 2.45	03	-	01	-	2.45
4.	D3	0.90 X 2.45	01	01	-	-	2.45
5.	D4	0.76 X 2.15	03	03	-	-	2.45

SCHEDULE OF WINDOW

1.	W	1.80 X 1.55	08	12	01	0.90	2.45
2.	W1	1.20 X 1.55	03	03	-	0.90	2.45

SCHEDULE OF VENTILATION

1.	V	4.50 X 0.60	02	01	-	-	BEAM BOTTOM
2.	V1	1.80 X 0.60 <td>05</td> <td>01</td> <th>-</th> <th>-</th> <th>BEAM BOTTOM</th>	05	01	-	-	BEAM BOTTOM
3.	V2	0.76 X 0.60	01	01	-	-	BEAM BOTTOM

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

ADMIN BUILDING  
FIRST FLOOR PLAN  
(LVL. +4.250, FL-HT= 3.350)

REVISION DATE:	DATE: 02-12-2023
SCALE :- N.T.S	NORTH:

ADMIN BUILDING -WORKING FLOOR PLAN

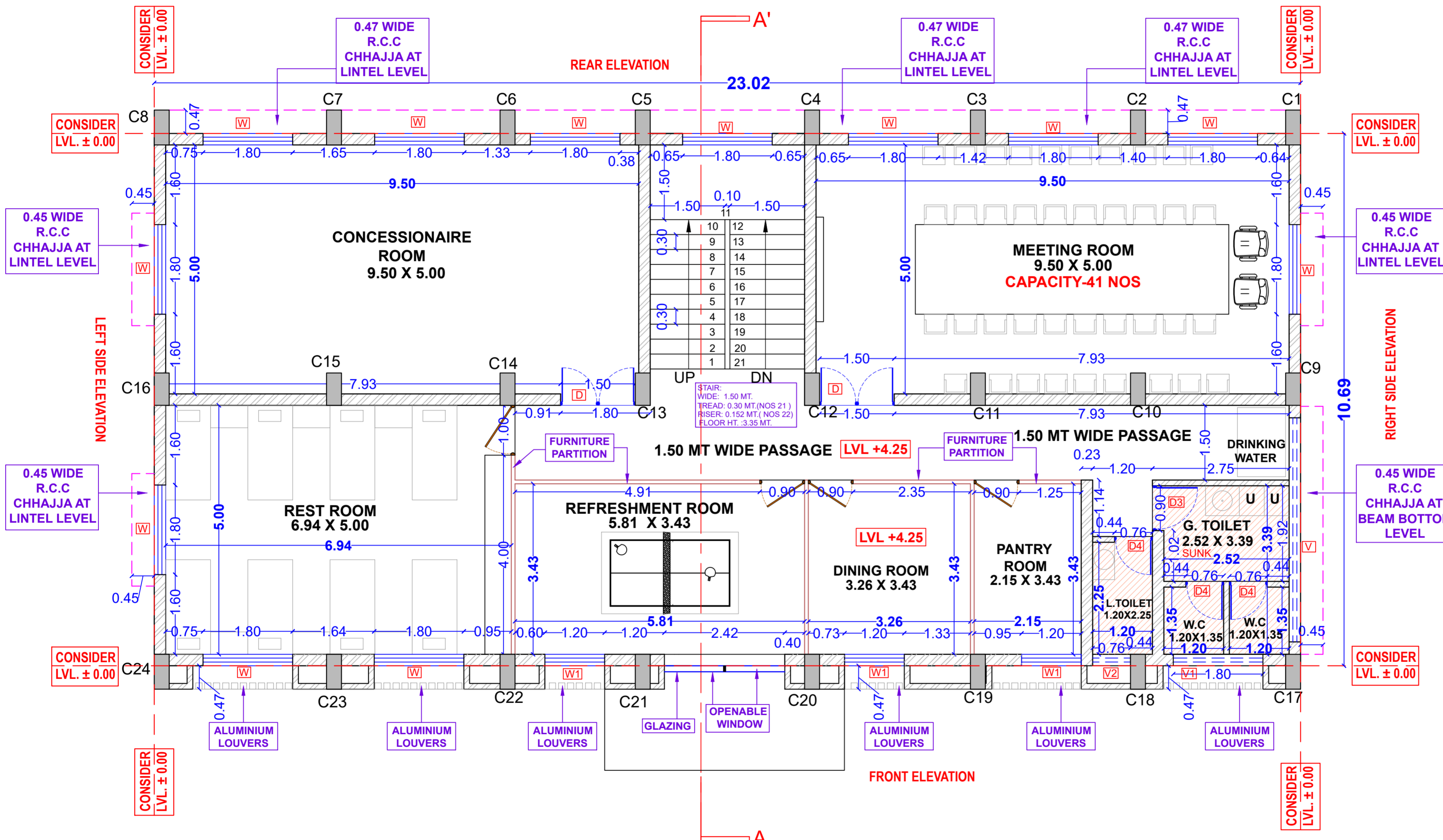
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
Planning & Engineering Services Pvt Ltd

DRAWN BY	REVISED BY	CHECK BY	DRG.NO.	PROJ.NO
VELSI	---	---	---	49Y23

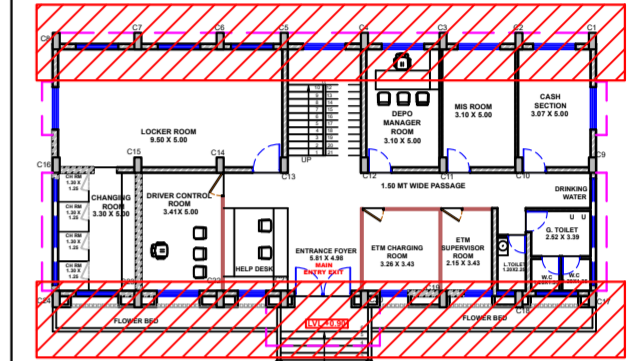


NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.
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KEY-PLAN

REAR ELEVATION



FRONT ELEVATION

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

ADMIN BUILDING  
FRONT AND REAR ELEVATION

REVISION DATE:	DATE: 02-12-2023
----------------	------------------

SCALE :- N.T.S	NORTH:
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ADMIN BUILDING -WORKING ELEVATIONS

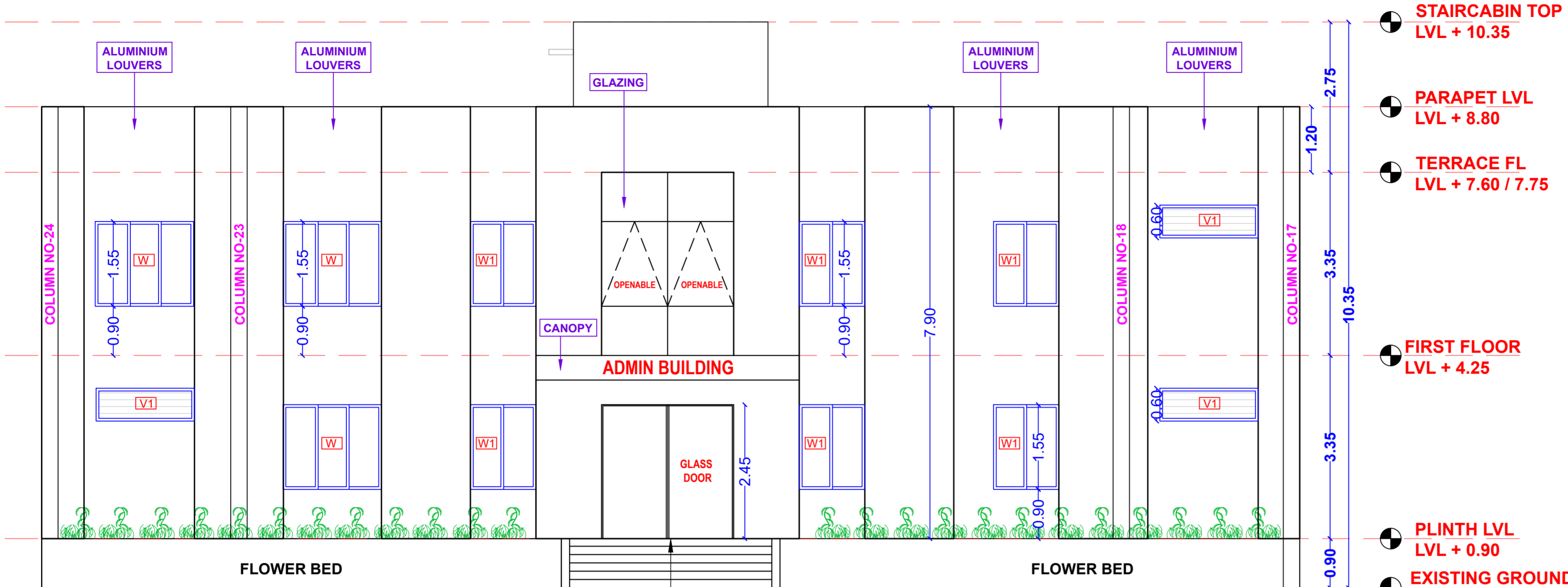
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

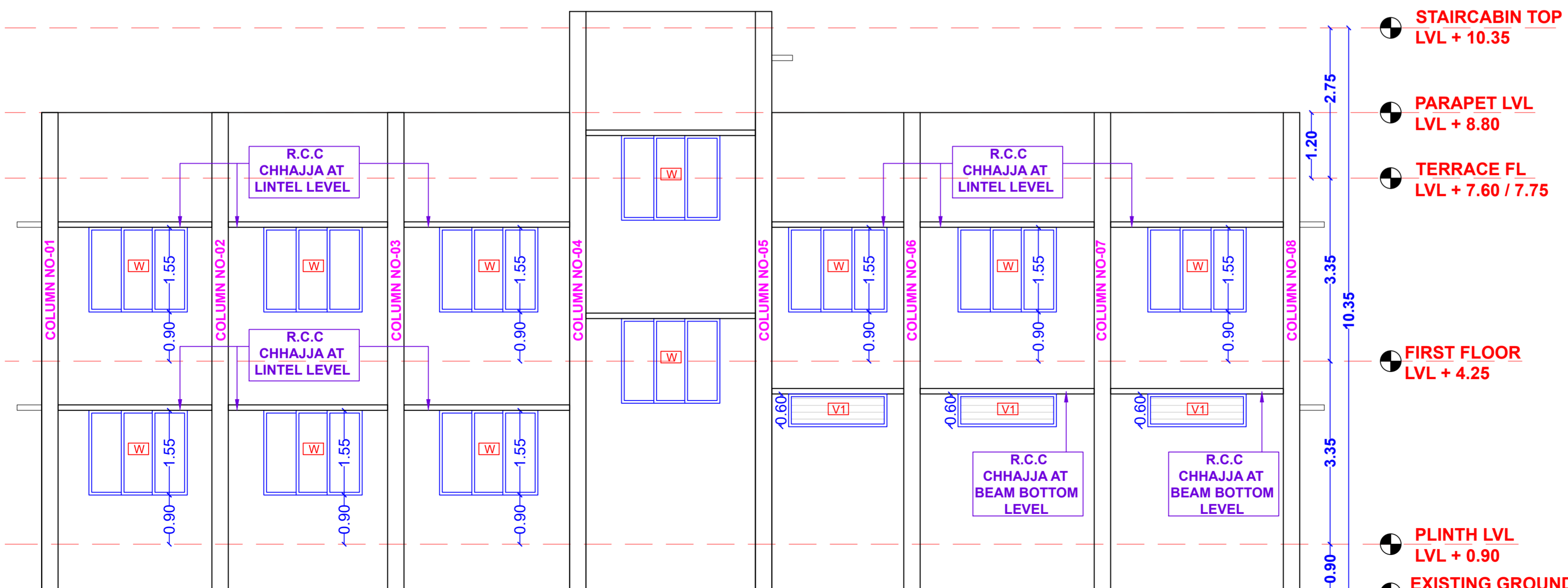
PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
Planning & Engineering Services Pvt Ltd

DRAWN BY VELSI	REVISED BY ---	CHECK BY ---	DRG.NO. ---	PROJ.NO 49V23
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UP  
FRONT ELEVATION



REAR ELEVATION



**BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA ,BHAVNAGAR(B.M.C.)**

**COPY FOR TENDER**

CLIENT	AGENCY	PMC/T.P.I.

**WORKING DRAWING**

**NOTE:**  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

**SCHEDULE OF DOORS**

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL.	1ST.FL.	TER.FL.	SILL	LINTEL LVL.
1.	D	1.50 X 2.45	-	02	-	-	2.45
2.	D1	1.20 X 2.45	01	-	-	-	2.45
3.	D2	1.00 X 2.45	03	-	01	-	2.45
4.	D3	0.90 X 2.45	01	01	-	-	2.45
5.	D4	0.76 X 2.15	03	03	-	-	2.45

**SCHEDULE OF WINDOW**

1.	W	1.80 X 1.55	08	12	01	0.90	2.45
2.	W1	1.20 X 1.55	03	03	-	0.90	2.45

**SCHEDULE OF VENTILATION**

1.	V	4.50 X 0.60	02	01	-	-	BEAM BOTTOM
2.	V1	1.80 X 0.60 <td>05</td> <td>01</td> <th>-</th> <th>-</th> <th>BEAM BOTTOM</th>	05	01	-	-	BEAM BOTTOM
3.	V2	0.76 X 0.60	01	01	-	-	BEAM BOTTOM

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

**ADMIN BUILDING  
GROUND FLOOR PLAN  
( LVL. +0.900,FL-HT= 3.350 )**

REVISION DATE:	DATE: 02-12-2023
SCALE :- N.T.S	NORTH:

**ADMIN BUILDING -WORKING FLOOR PLAN**

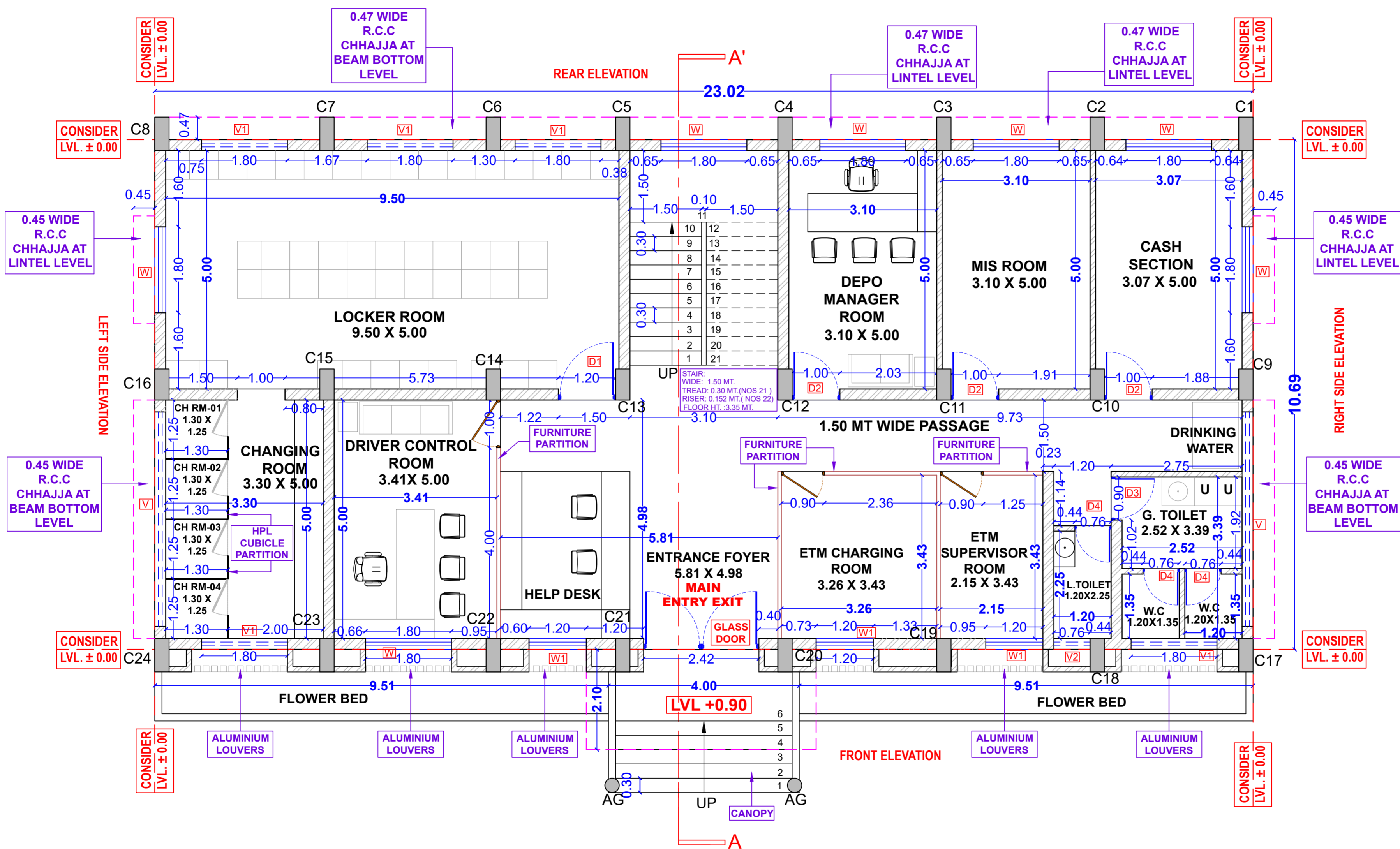
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

**JAYESH A DALAL**  
Planning & Engineering Services Pvt Ltd

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VELSI				49V23



**BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA ,BHAVNAGAR(B.M.C.)**

**COPY FOR TENDER**

CLIENT	AGENCY	PMC/T.P.I.

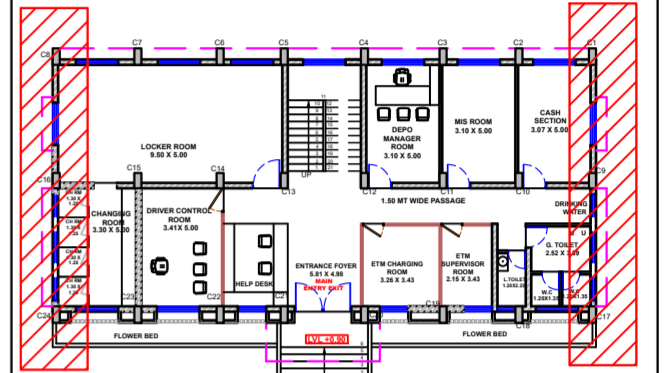
**WORKING DRAWING**

NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

**KEY-PLAN**

**LEFT ELEVATION**



**RIGHT ELEVATION**

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

**ADMIN BUILDING  
LEFT AND RIGHT ELEVATION**

REVISION DATE:	DATE: 02-12-2023
SCALE :- N.T.S	NORTH:

**ADMIN BUILDING -WORKING ELEVATIONS**

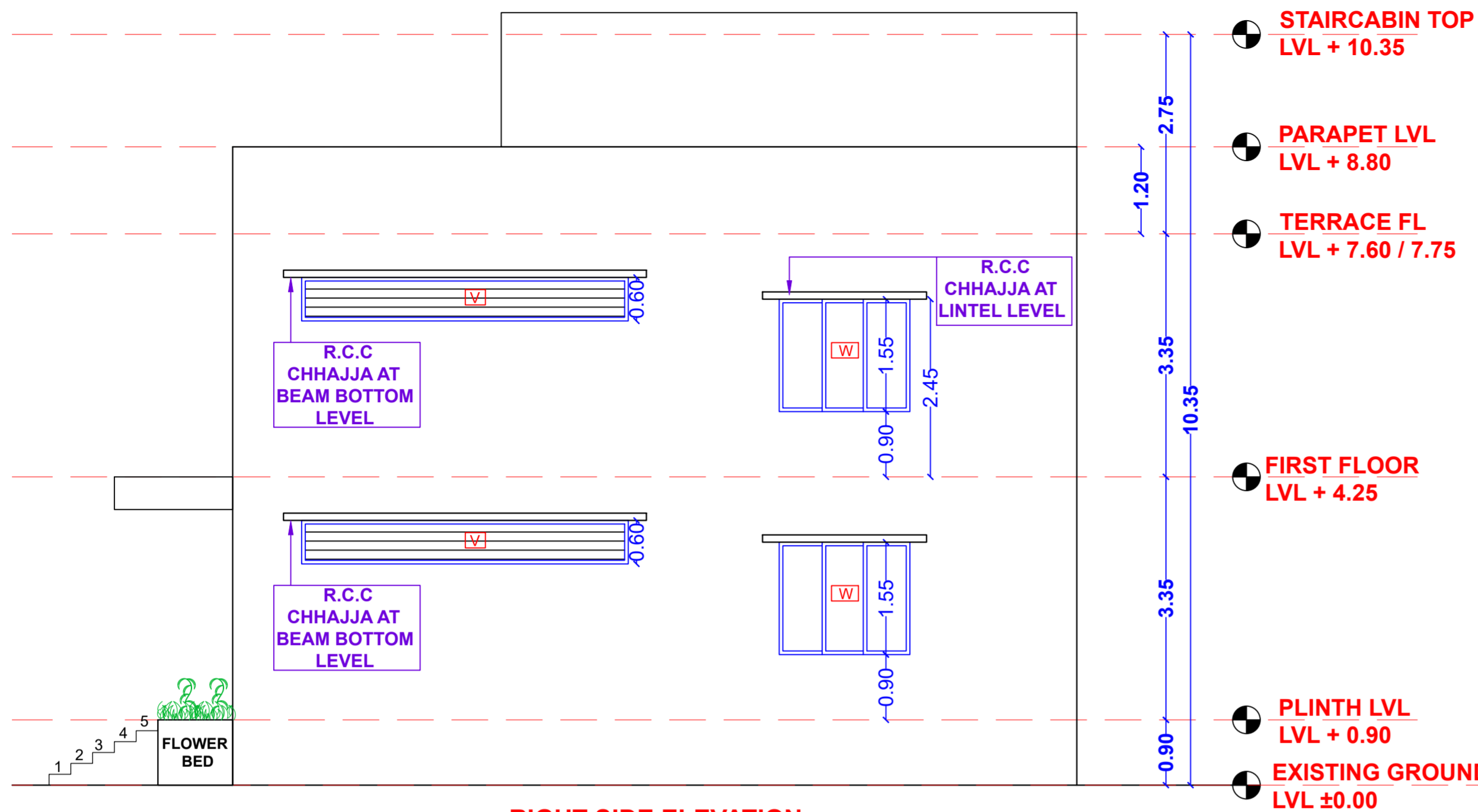
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

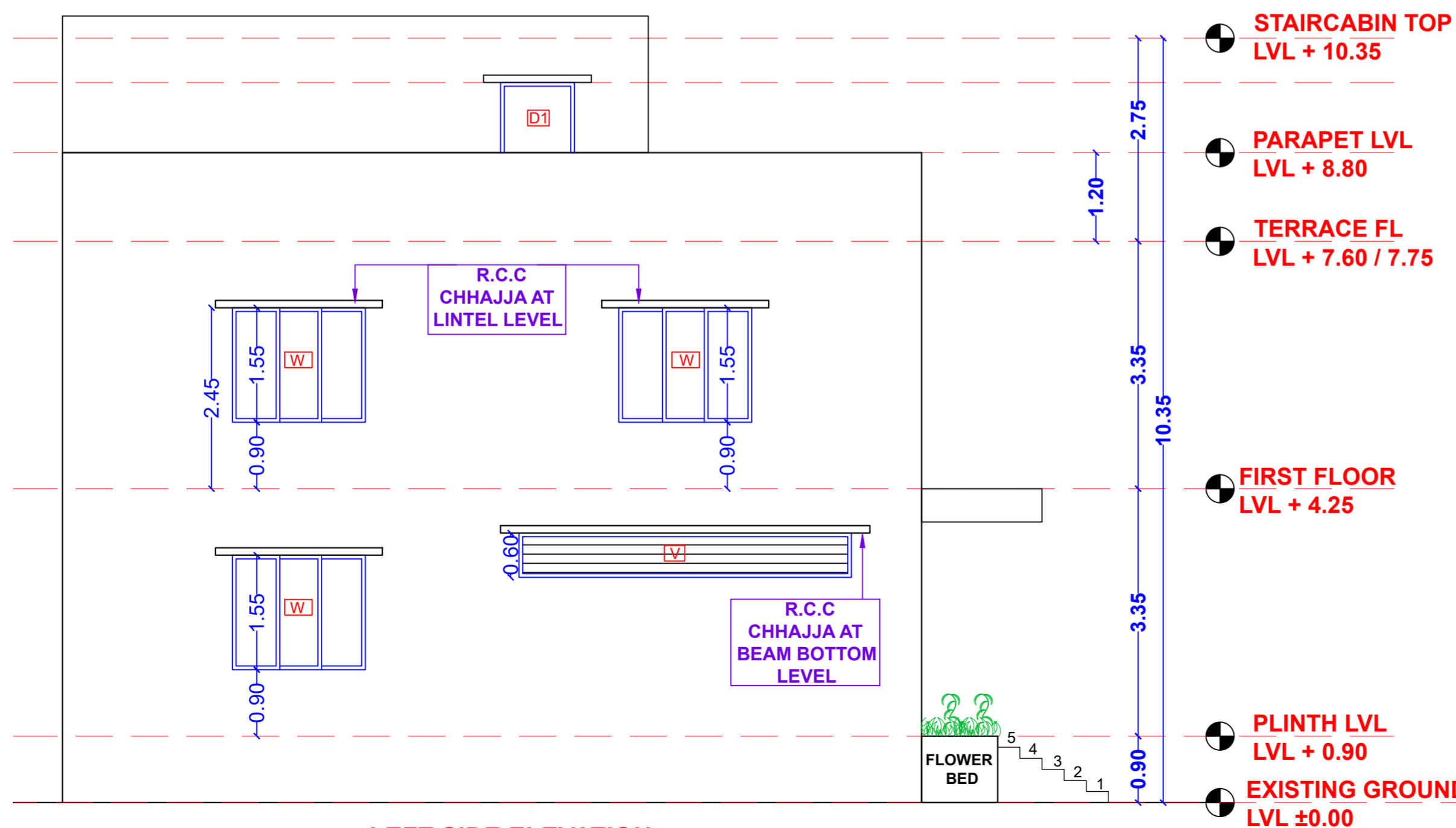
PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

**JAYESH A DALAL**  
Planning & Engineering Services Pvt Ltd  
"JALARAM SHAKTI", BESIDE DHANALGRI APARTMENT, NR LOUR'S CONVENT SCHOOL,ATHWALNES,SURAT.

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VELSI	---	---	---	49Y23



**RIGHT SIDE ELEVATION**



**LEFT SIDE ELEVATION**

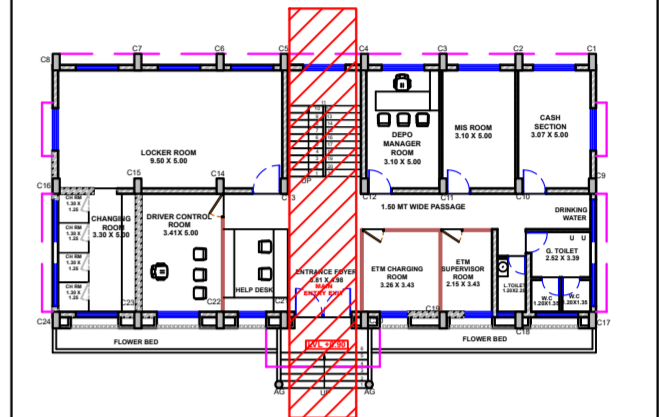
SCHEDULE OF DOORS							
SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL	1ST.FL	TER.FL	SILL.	LINTEL LVL.
1.	D	1.50 X 2.45	-	02	-	-	2.45
2.	D1	1.20 X 2.45	01	-	-	-	2.45
3.	D2	1.00 X 2.45	03	-	01	-	2.45
4.	D3	0.90 X 2.45	01	01	-	-	2.45
5.	D4	0.76 X 2.15	03	03	-	-	2.45

SCHEDULE OF WINDOW							
SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL	1ST.FL	TER.FL	SILL.	LINTEL LVL.
1.	W	1.80 X 1.55	08	12	01	0.90	2.45
2.	W1	1.20 X 1.55	03	03	-	0.90	2.45

SCHEDULE OF VENTILATION							
SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL	1ST.FL	TER.FL	SILL.	LINTEL LVL.
1.	V	4.50 X 0.60	02	01	-	-	BEAM BOTTOM
2.	V1	1.80 X 0.60	05	01	-	-	BEAM BOTTOM
3.	V2	0.76 X 0.60	01	01	-	-	BEAM BOTTOM

NO.	DATE.	REVISION.

KEY-PLAN



SECTION-AA'

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

ADMIN BUILDING  
SECTION-AA'

REVISION DATE:                      DATE: 02-12-2023  
SCALE :- N.T.S                      NORTH:

ADMIN BUILDING -WORKING SECTIONS

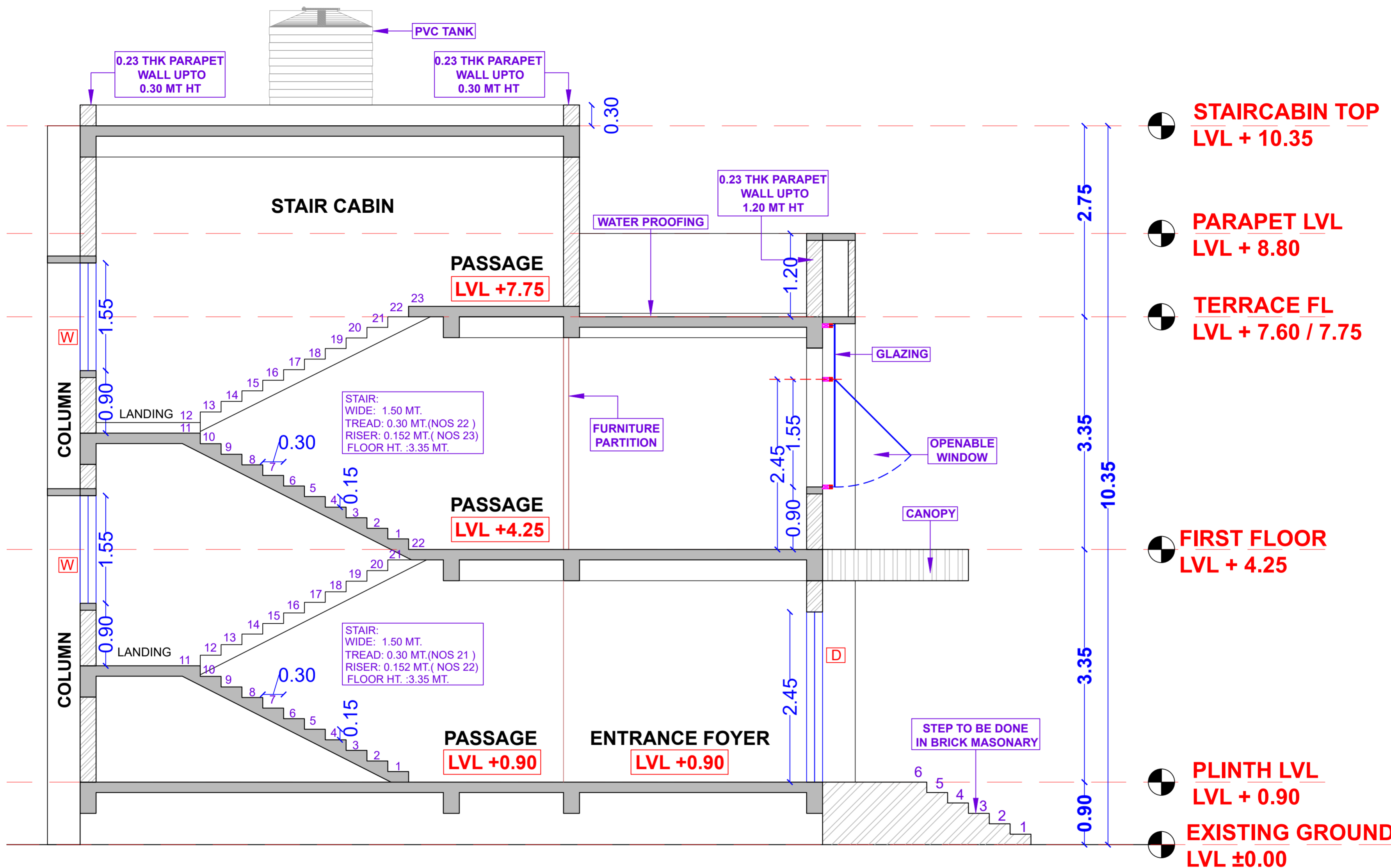
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
Planning & Engineering Services Pvt Ltd  
\*JALARAM SHAKTI\*, BESIDE DHAMALGRI APARTMENT, NR LOURD'S CONVENT SCHOOL,ATHWALINES,SURAT.

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VELSI	---	---	---	49Y23



SECTION-AA'

- STAIRCABIN TOP  
LVL + 10.35
- PARAPET LVL  
LVL + 8.80
- TERRACE FL  
LVL + 7.60 / 7.75
- FIRST FLOOR  
LVL + 4.25
- PLINTH LVL  
LVL + 0.90
- EXISTING GROUND  
LVL ±0.00

SCHEDULE OF DOORS

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL	1ST.FL	TER.FL	SILL.	LINTEL LVL.
1.	D	1.50 X 2.45	-	02	-	-	2.45
2.	D1	1.20 X 2.45	01	-	-	-	2.45
3.	D2	1.00 X 2.45	03	-	01	-	2.45
4.	D3	0.90 X 2.45	01	01	-	-	2.45
5.	D4	0.76 X 2.15	03	03	-	-	2.45

SCHEDULE OF WINDOW

1.	2.	3.	4.	5.	6.
W	W1	08	12	01	0.90
1.80 X 1.55	1.20 X 1.55	03	03	-	0.90
2.45	2.45				

SCHEDULE OF VENTILATION

1.	2.	3.	4.	5.	6.	7.
V	V1	V2	02	01	-	-
4.50 X 0.60	1.80 X 0.60	0.76 X 0.60	05	01	-	-
01	01	-	-	-	-	-
BEAM BOTTOM	BEAM BOTTOM	BEAM BOTTOM				

WORKING DRAWING

NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

SCHEDULE OF DOORS

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL.	1ST.FL.	TER.FL.	SILL.	LINTEL LVL.
1.	D	1.50 X 2.45	-	02	-	-	2.45
2.	D1	1.20 X 2.45	01	-	-	-	2.45
3.	D2	1.00 X 2.45	03	-	01	-	2.45
4.	D3	0.90 X 2.45	01	01	-	-	2.45
5.	D4	0.76 X 2.15	03	03	-	-	2.45

SCHEDULE OF WINDOW

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL.	1ST.FL.	TER.FL.	SILL.	LINTEL LVL.
1.	W	1.80 X 1.55	08	12	01	0.90	2.45
2.	W1	1.20 X 1.55	03	03	-	0.90	2.45

SCHEDULE OF VENTILATION

SR. NO.	SYMBOL	SIZE (OPENING)	GR.FL.	1ST.FL.	TER.FL.	SILL.	LINTEL LVL.	BEAM BOTTOM
1.	V	4.50 X 0.60	02	01	-	-	-	BEAM BOTTOM
2.	V1	1.80 X 0.60	05	01	-	-	-	BEAM BOTTOM
3.	V2	0.76 X 0.60	01	01	-	-	-	BEAM BOTTOM

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

ADMIN BUILDING  
TERRACE FLOOR PLAN  
( LVL. +7.600 / 7.750, FL-HT= 2.750 )

REVISION DATE:                      DATE: 02-12-2023  
SCALE : - N.T.S                      NORTH:

ADMIN BUILDING -WORKING FLOOR PLAN

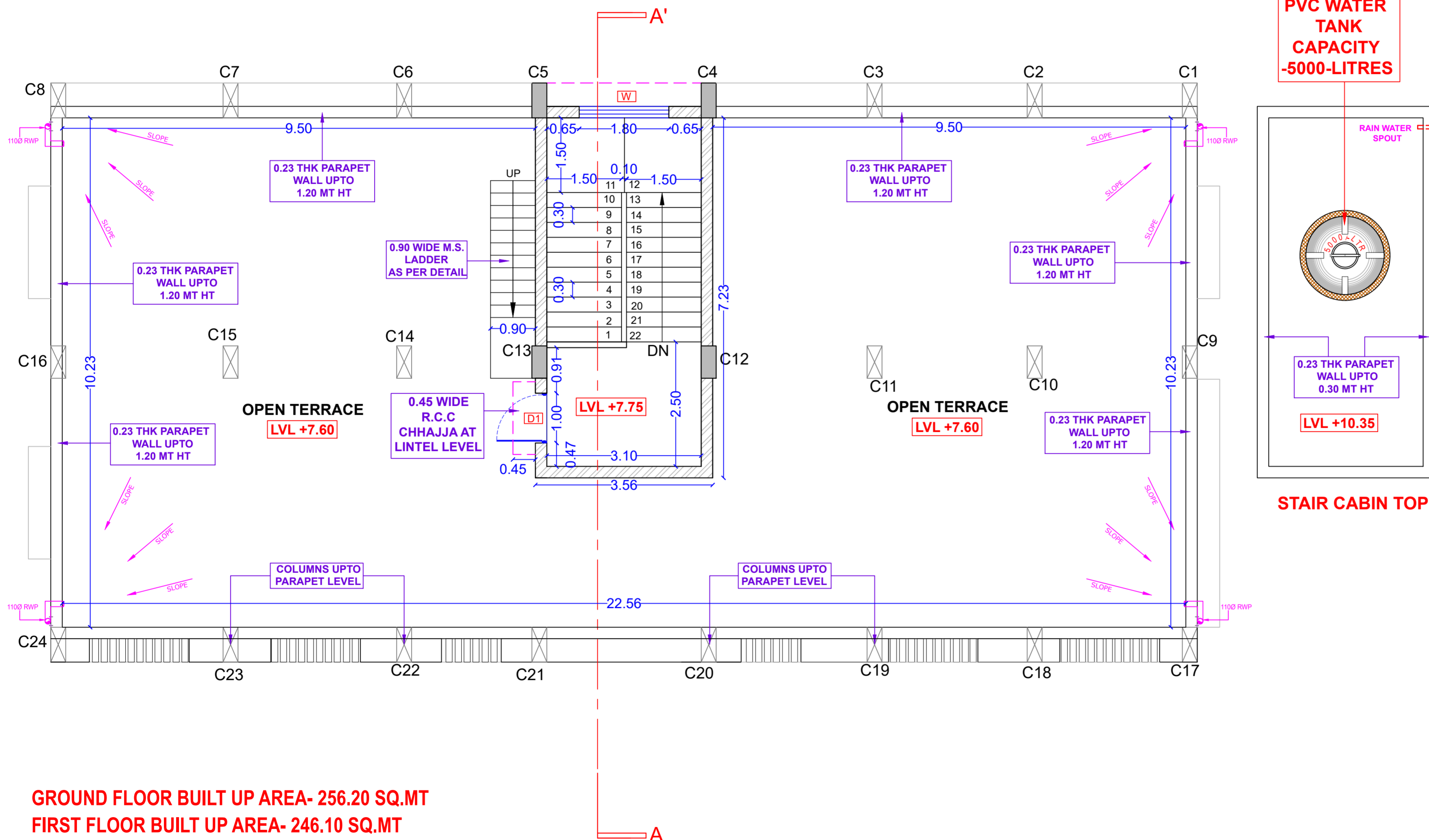
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

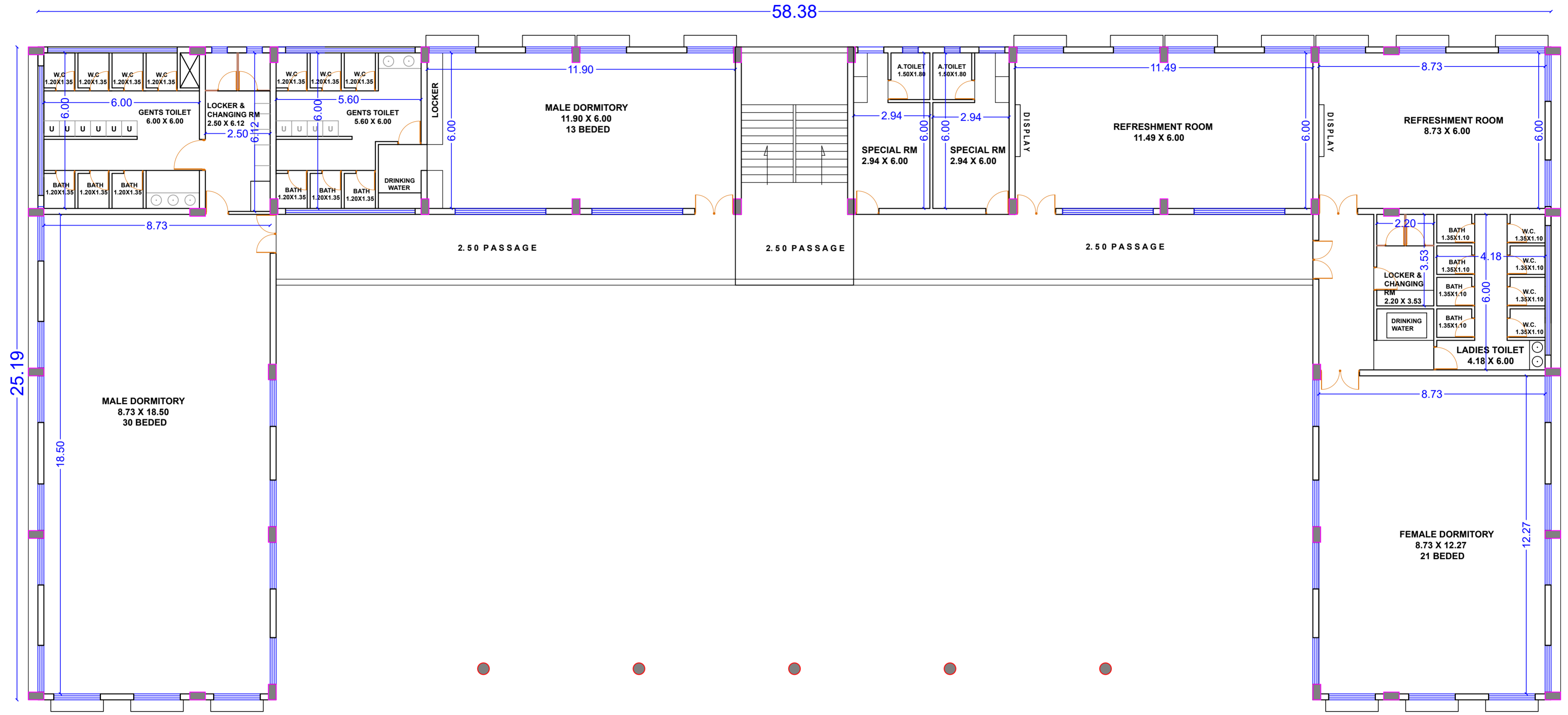
JAYESH A DALAL  
Planning & Engineering Services Pvt Ltd  
\*JALARAM SHAKTI\*, BESIDE DHAWALGIRI APARTMENT, NR LOURD'S CONVENT SCHOOL, ATHWALINES, SURAT.

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VELSI	---	---	---	49Y23



GROUND FLOOR BUILT UP AREA- 256.20 SQ.MT  
FIRST FLOOR BUILT UP AREA- 246.10 SQ.MT  
STAIR CABIN BUILT UP AREA- 27.10 SQ.MT  
TOTAL BUILT UP AREA- 529.40 SQ.MT

**BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA ,BHAVNAGAR(B.M.C.)**



<b>COPY FOR TENDER</b>		
CLIENT	AGENCY	PMC/T.P.I.
<b>WORKING DRAWING</b>		
NOTE: ALL DIMENSIONS ARE IN METER		
NO.	DATE.	REVISION.

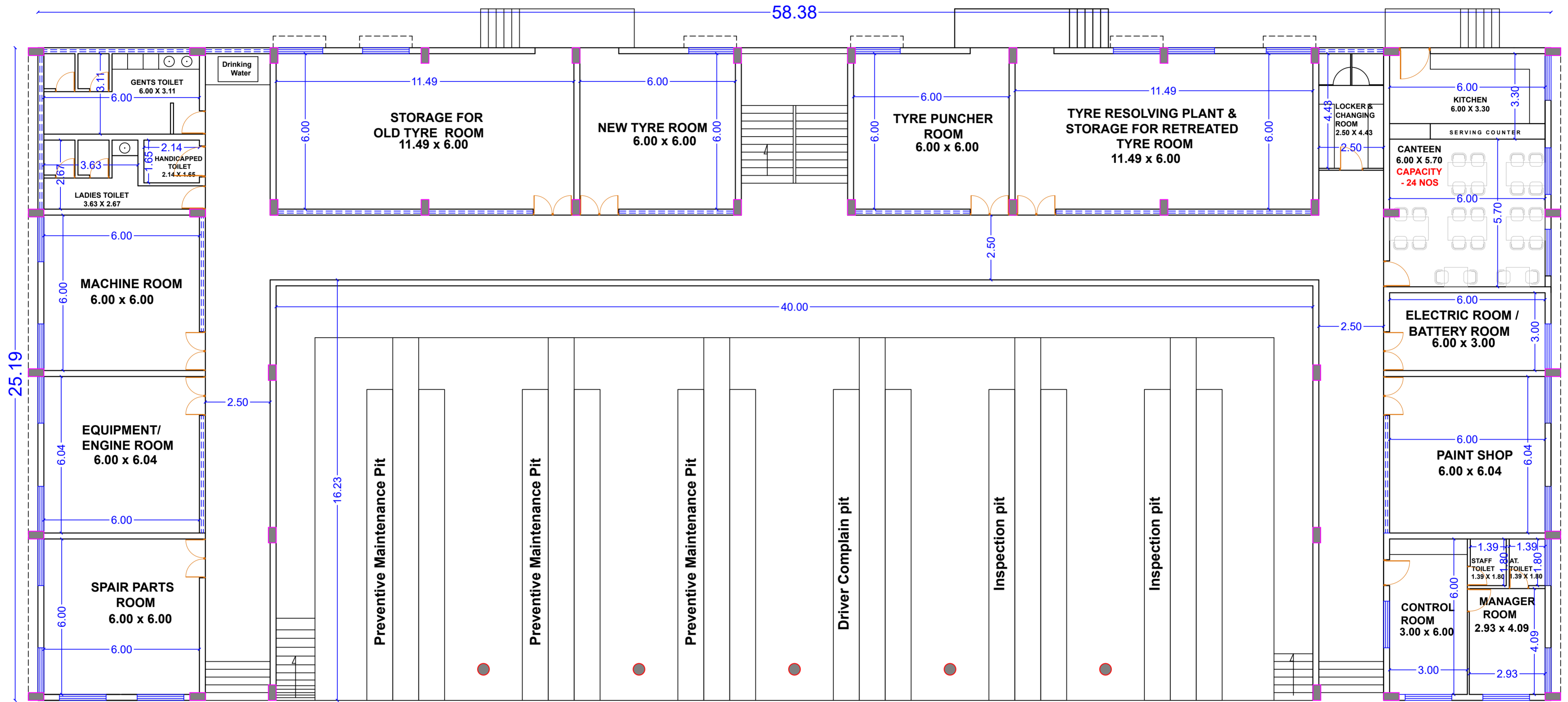
ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

REVISION DATE:	DATE: 02-12-2023
SCALE :- N.T.S	NORTH:
<b>WORKSHOP PLAN - FIRST FLOOR</b>	
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)	
AGENCY:-	
PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA, BHAVNAGAR(B.M.C.)	
JAYESH A DALAL Planning & Engineering Services Pvt Ltd <small>*JALARAM SHAKTI*, BESIDE DHAWLORI APARTMENT, NR LOUR'S CONVENT SCHOOL,ATHWALNES,SURAT.</small>	
DRAWN BY VELSI	REVISD BY ---
CHECK BY ---	DRG.NO. ---
PROJ.NO 49V23	

**BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA ,BHAVNAGAR(B.M.C.)**



<b>COPY FOR TENDER</b>		
CLIENT	AGENCY	PMC/T.P.I.
<b>WORKING DRAWING</b>		
NOTE: ALL DIMENSIONS ARE IN METER		
NO.	DATE.	REVISION.

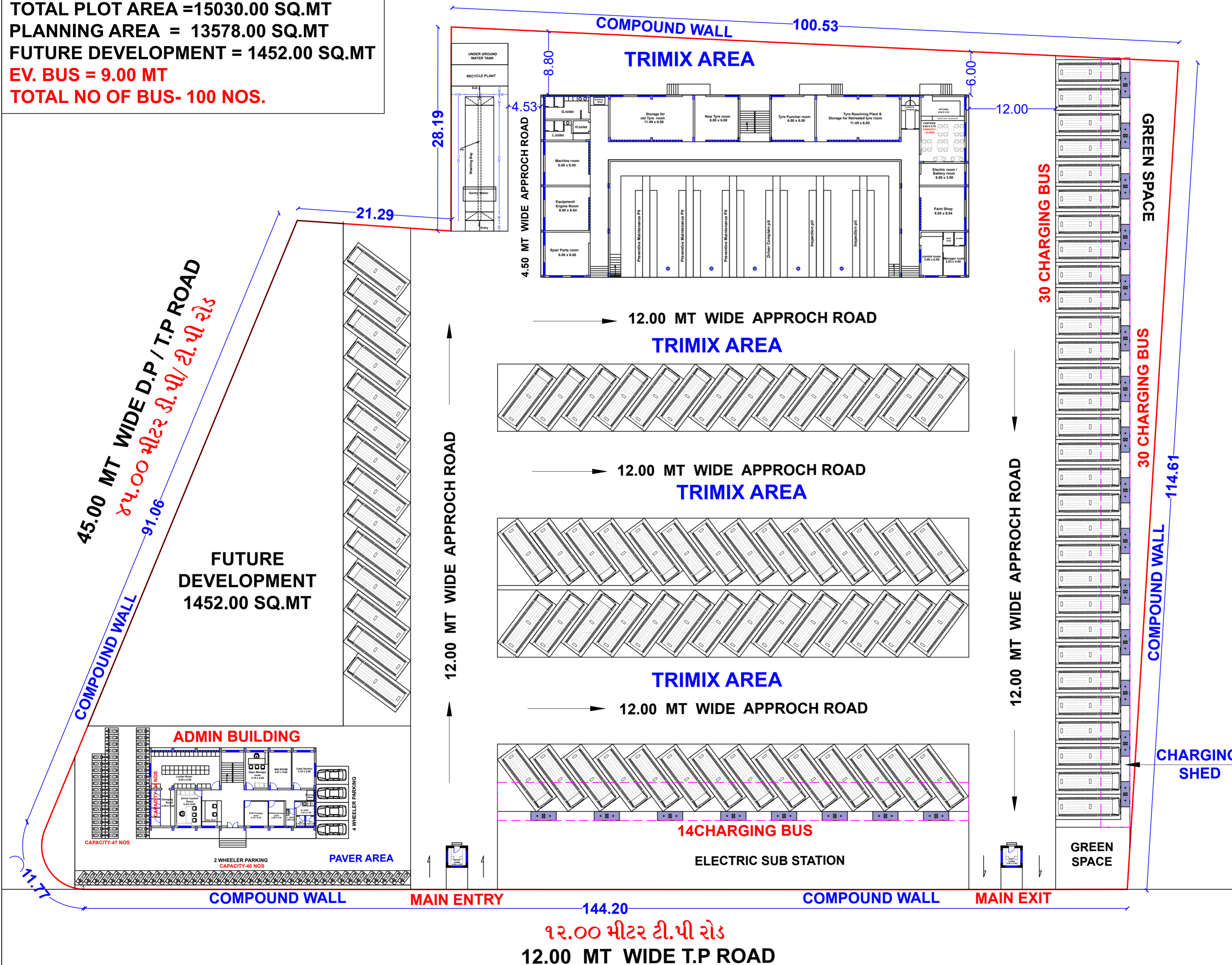
ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

REVISION DATE:	DATE: 02-12-2023			
SCALE :- N.T.S	NORTH:			
<b>WORKSHOP PLAN -GROUND FLOOR</b>				
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)				
AGENCY:-				
PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA, BHAVNAGAR(B.M.C.)				
<b>JAYESH A DALAL</b> Planning & Engineering Services Pvt Ltd <small>*JALARAM SHAKTI*, BESIDE DHAWLAGRI APARTMENT, NR LOURD'S CONVENT SCHOOL,ATHWALNES,SURAT.</small>				
DRAWN BY VELSI	REVISD BY ---	CHECK BY ---	DRG.NO. ---	PROJ.NO 49V23

TOTAL PLOT AREA =15030.00 SQ.MT  
 PLANNING AREA = 13578.00 SQ.MT  
 FUTURE DEVELOPMENT = 1452.00 SQ.MT  
 EV. BUS = 9.00 MT  
 TOTAL NO OF BUS- 100 NOS.



COPY FOR TENDER

CLIENT	AGENCY	PMC/T.P.I.

PRESENTATION DRAWING

NOTE:  
 ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

LEGEND

- PAVER BLOCK AREA- 315.00 SQ.MT
- TRIMIX FINISH R.C.C AREA - 11736.00 SQ.MT
- RAIN WATER HARVESTING- 160 DIA - 300 RMT
- RAIN WATER HARVESTING- 200 DIA - 300 RMT
- COMPOUND WALL - 512.00 RMT
- CHARGING SHED AREA - 740.80 SQ.MT

BUILT UP AREA

- ADMIN BUILDING - 530.20 SQ.MT
- WORKSHOP - 1485.69 SQ.MT

REVISION DATE:	DATE: 30-11-2023
SCALE :- N.T.S	NORTH:

PRESENTATION DRAWING

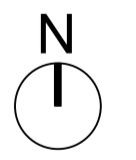
CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

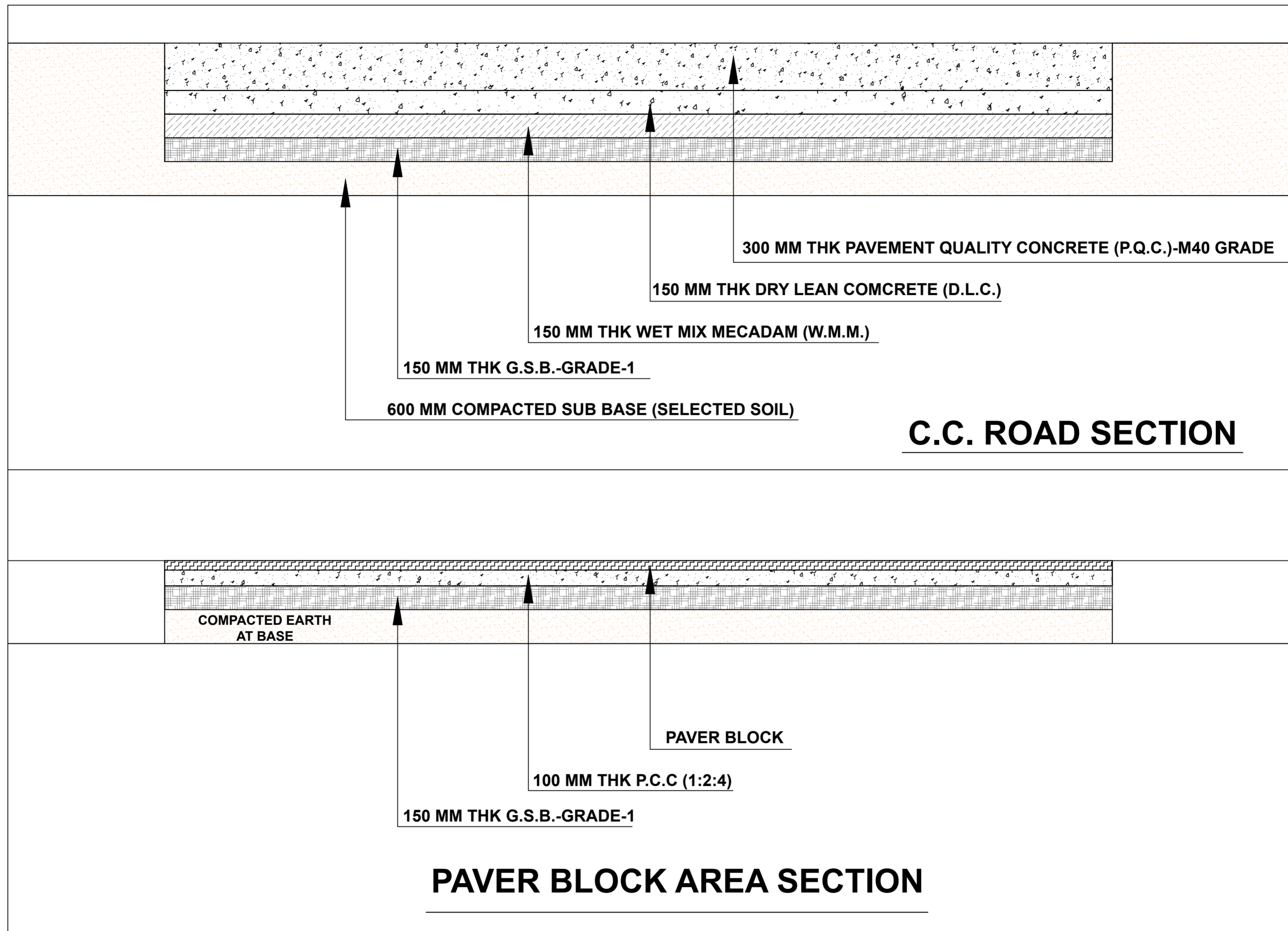
AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA, BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
 Planning & Engineering Services Pvt Ltd

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VELSI				





**COPY FOR TENDER**

CLIENT	AGENCY	PMC/T.P.I.

**WORKING DRAWING**

NOTE:  
ALL DIMENSIONS ARE IN METER

NO.	DATE.	REVISION.

ARCHITECT/ENGINEER  
STRUCTURAL  
CONSULTANT SIGNATURE

AGENCY SIGNATURE

ISSUE STAMP

REVISION DATE: DATE: 13-02-2024  
SCALE :- N.T.S NORTH:

**C.C ROAD AND PAVER SECTION**

CLIENT:- BHAVNAGAR MUNICIPAL CORPORATION (BMC)

AGENCY:-

PROJECT:- BRTS/CITY BUS DEPOT AND WORKSHOP ON  
F.P. NO.- 39, TPS-11, ADHEVADA,  
BHAVNAGAR(B.M.C.)

JAYESH A DALAL  
Planning & Engineering Services Pvt Ltd

DRAWN BY VELSI REVISD BY --- CHECK BY --- DRG.NO. --- PROJ.NO 49Y23





**BHAVNAGAR MUNICIPAL CORPORATION****Tender Notice (online) No. - BMC/Trans/Depo/01/2024****Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.****VOLUME – II  
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

**CONSULTANT:****JAYESH A. DALAL  
PLANNING & ENGINEERING  
SERVICES PRIVATE LIMITED,  
“Jalaram Shakti”, Beside  
Dhavalgiri Appt., Nr. Lourds  
Convent School, Athwalines,  
Surat – 395 001****CLIENT:****Transport Department,  
Bhavnagar Municipal  
Corporation., Behind LIC  
office building, Near Neelam  
baug circle Bhavnagar-  
364 001, Mobile No.: 99250  
09293**

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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.

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:-

<b>Time</b>	<b>Percentage of work (Financial)</b>	<b>MODE OF DEDUCTION AT EACH MILE STONE</b>
25%	15%	DEPOSIT
35%	25%	DEPOSIT
50%	40%	DEPOSIT
60%	50%	DEPOSIT
75%	75%	DEPOSIT
<b>100%</b>	<b>100%</b>	<b>LD Deduction</b>

- 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.

**(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 provisions 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 days 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 form 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 of 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 as per approved rate plus GST, every running bill. GST charges will be paid as extra by BMC.

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 deposit, or the proceeds of sale thereof, if the deposit is held in govt. 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 time, 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 15 days 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 from 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 BOQ.

**(14.2)** If the additional or altered work includes any class or work for 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 Dy.Municipal Commissioner(Admin.) 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 he 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 is 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 CityEngineer 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 be 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 of 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 drive 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 Detect 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 contract or from his security deposit, or proceed 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)
  - (i) 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 of 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 unauthorized 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 Dy.Municipal Commissioner(Admin.). After receipt of the dispute from the contractor under this clause, the Dy.Municipal Commissioner(Admin.) In-charge of works shall have to submit their report to the Municipal Commissioner within a period of 90 (Ninety) days. The Municipal Commissioner shall 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 Dy.Municipal Commissioner(Admin.). After hearing the contractor regarding their disputes along with their documentary support and the concern Dy.Municipal Commissioner(Admin.) & Executive Engineer in charge of the work, Municipal Commissioner shall 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 Commissioner does 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 CORPORATION will give reasonable decision within 180 (One Hundred Eighty) days from the date of receipt of appeal by the contractor. The decision of the Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATION shall be final and binding on both the parties. If the Municipal Commissioner BHAVNAGARMUNICIPAL CORPORATION does 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 work of BMC under this contract shall be appropriated by BMC shall be setoff against anyclaim of the BMC for the payment of a sum of money arising out or under any other contract made by the contractor with the BMC for the work. When no such amount for purpose of the recovery from the contractor against any claim of the BMC 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 Municipal Commissioner, BMC 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 came into force from 01-07-2017, so bidder have to quote their rate accordingly, however any new tax comes in force after submission of tender will be compensate as actual paid; after producing of necessary proof. This is applicable only upto 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 or 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 ant 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 of 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 revise 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 advice 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, QAP (Of all materials included in price bid), Design calculations etc in four sets for approval to department. The contractor is liable to submit all the document for approval within three months from the date of LOI and will resubmit within 15 days after incorporating queries if any.**

- (E) Contractor will submit following documents along with final bill duly signed by contractor and PMC/TPI.
- a. O & M manuals in 3 sets.
  - b. All test reports – cement, steel, material consumption and material receipt original registers.

- c. All goods inspection reports original.
- d. Hydraulic test register original.

**Annexure-1****Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.****INTEGRITY PACT****OUR COMMITMENT**

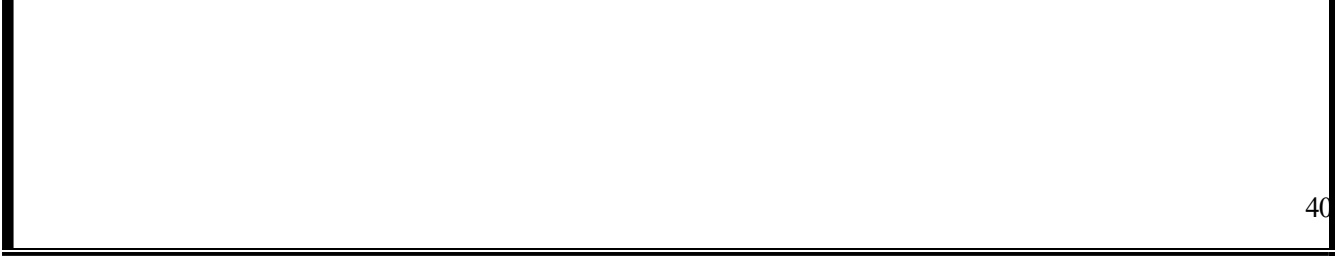
We commit ourselves to trust, transparency and setting ethical standards in implementation of various works for ultimate long term benefits for society. We also reiterate our commitment to development to mutual respect and best practices for setting very high quality standards in works and attitude.

**OUR CONDUCT****We abide to accomplish our work with**

- Integrity and trust
- Ethics and courtesy
- Transparency and quality.

<b>BHAVNAGARMUNICIPAL CORPORATION Commitment</b>	<b>Party's Commitment</b>
<ul style="list-style-type: none"> <li>● To maintain high ethical standards</li> <li>● To ensure transparency in transactions</li> <li>● To ensure to abide by the terms of agreement of contract and to consider the views of parties objectively.</li> <li>● To try to ensure timely payments for work done.</li> <li>● To ensure that no improper demand is made by employees or by anyone on their behalf.</li> <li>● 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.</li> </ul> <p style="text-align: center;">Municipal Commissioner Bhavnagar Municipal Corporation Bhavnagar</p>	<ul style="list-style-type: none"> <li>● Not to bring pressure/recommendation from outside to influence decision.</li> <li>● To abide by general discipline to be maintained in our dealings.</li> <li>● To be prompt and reasonable in fulfilling the terms of agreement of contract and legal obligations.</li> <li>● To ensure high standards are set for quality of work or supplies at lowest possible cost.</li> <li>● Not to use any pressure, threat, intimidation or inducement of any kind of any of the employees.</li> <li>● To be true and honest in furnishing specification and information and make all efforts for completing the contracted assignment well in time.</li> </ul> <p style="text-align: center;">Signature of Contractor</p>
<b>Building ethical Partnership and working Together</b>	





**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 sub contractor 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. BHAVNAGARMUNICIPAL 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 ) નું નિયમન અને નોકરી ની શરતો હેઠળ ૧૯૯૬ અધિનિયમ ( બાંધકામ કરતી સંસ્થા ની નોંધણી કરાવવાનો કલોસ ટેન્ડર/LOC/વર્ક ઓડર રાજચિહ્નીમાં ઉમેરવા બાબત.

મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ રોજગારી ) નું નિયમન અને નોકરી ની શરતો તેમજ ૪૬ની કલમ ૧૯૯૬ અધિનિયમ ( )-૫૫ તે હેઠળ ન નિયમ ૧ મુજબ (બાંધકામ પ્રવૃત્તિ શરૂ કરવાના દિવસ પહેલા આવી પ્રવૃત્તિ ચાલુ કરવાની ચોક્કસ તારીખ ૩૦ માં તેમના વિસ્તારના બ ૪-ટિસ નિયત નમૂના તથા પ્રવૃત્તિ પુરી કરવાની સંભવિત તરોખ તથા અન્ય વિગતોની નોંધકામ નિરીક્ષકની કચેરીએ મોકલી આપવાની હોય છે .કલમ ૭ તેમજ તે હેઠળ ના નિયમ દરેક માલિકે કામકાજ શરૂ કર્યા ના ૬૦ દિવસમાં બાંધકામ સાઈટ ની નોંધણી [www.if.p.gujarat.gov.in](http://www.if.p.gujarat.gov.in) વેબસાઈટ પર જરૂરી દસ્તાવેજ સાથે ઓનલાઈન કરવાની રહે છે

વધુમાં બાંધકામ વ્યવસાયમાં રોકાયેલ અને ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગી કલ્યાણ બોર્ડમાં નોંધાયેલ શ્રમયોગીને ચાલુ કામે અત્રેની કચેરીએ નોંધાયેલ બાંધકામ સાઈટના 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 સાઈટ 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 સાઈટ નું રજીસ્ટ્રેશન અત્રેની કચેરીએ થયેલ હોતું નથી જેથી આપના દ્વારા આપવામાં આવતા ટેન્ડર/LOC/વર્ક ઓડર રાજચિહ્નીમાં / રો) મકાન અને અન્ય બાંધકામ શ્રમયોગીઓ ” વાનો આ મુજબનો સદર કાયદા હેઠળ બાંધકામ સાઈટનું રજીસ્ટ્રેશન કરાજગારીનું નિયમન અને નોકરીની શરતો અધિનિયમ (, ૧૯૯૬ દિવસ પહેલા સદર ૩૦ હેઠળ દરેક માલિકે બાંધકામ પ્રવૃત્તિ શરૂ કરવાના “ માં નોટીસ બાંધકામ નિરીક્ષક ૪-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 સાઈટની નોંધણી કરવાની રહેશે કલોઝ ઉમેરવામાં આવે તેમજ સંસ્થા દ્વારા સદર કાયદા હેઠળ બાંધકામ સાઈટની 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 લાભાર્થી તરીકે નોંધણી થવી જરૂરી છે શ્રમિકોને લાભો મળી શકે તે સાડું શ્રમિકોની સદર બોર્ડમાં



આવે છે તેમજ શ્રમયોગી ગુજરાત મકાન અને અન્ય બાંધકામ શ્રમયોગી કલ્યાણ બોર્ડમાં નોંધાયેલ નોંધ પર 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/રજાચિકીમાં 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 સેક્ટરી 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 બિલ્ડીંગ 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/રજાચિકી ની એક નકલ ઉક્ત કચેરીનાં સરનામે મોકલી આપવા અને તેઓને નોંધણી કરાવવા અર્થે જરૂરી સુચના આપવા વિનંતી છે.



~~\_\_\_\_\_~~  
આસીસ્ટન્ટ ડાયરેક્ટર  
ઇન્ડસ્ટ્રીયલ સેક્ટરી એન્ડ હેલ્થ  
(બાંધકામ શાખા) ભાવનગર

નકલ રવાના:-

- ૧) નગર વિકાસ અધિકારીશ્રી, ભાવનગર મ્યુનિસિપલ કોર્પોરેશન
- ૨) સિટી ઇન્જનેરશ્રી, 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.

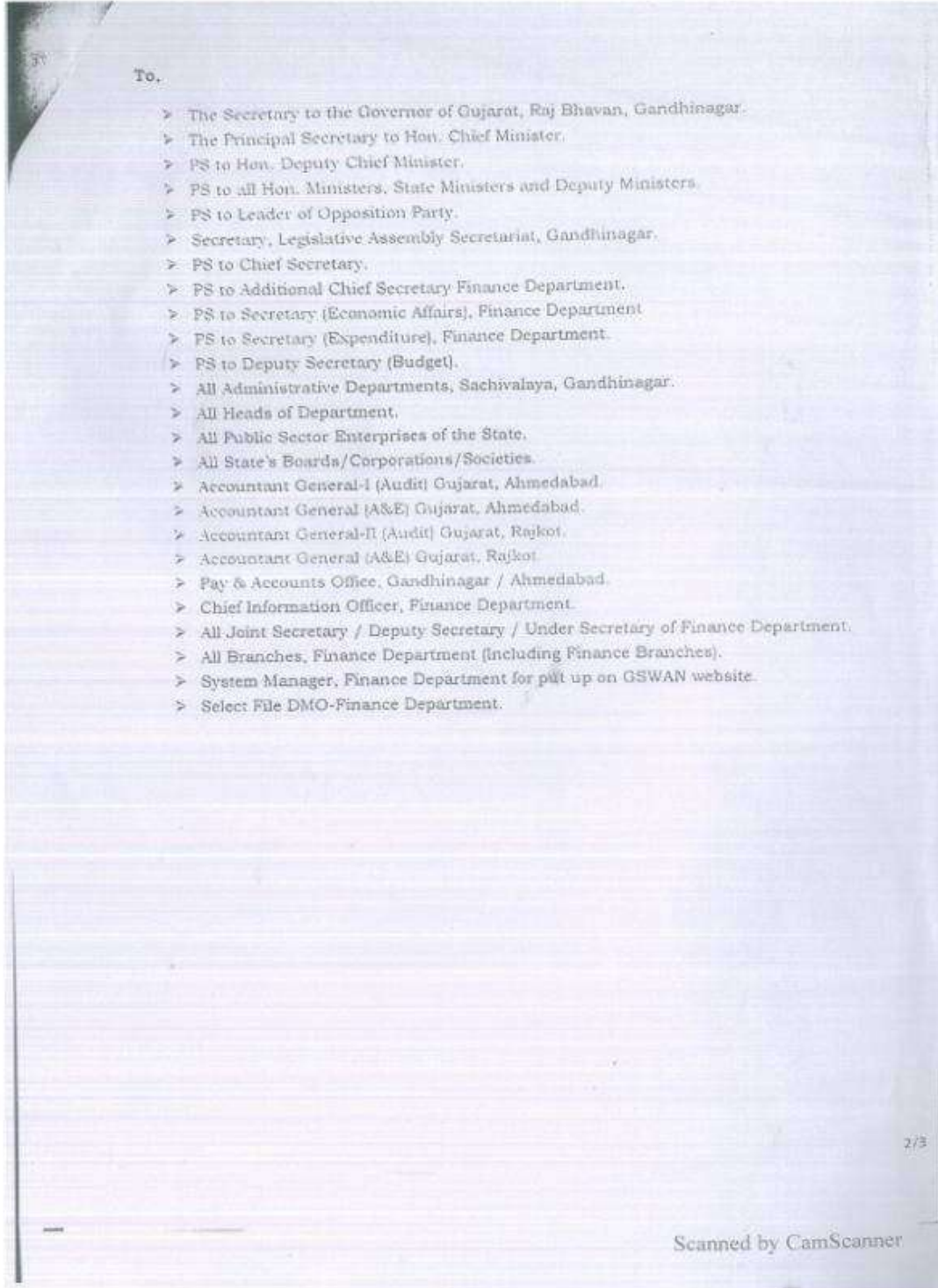
The tendering authority will be required to ascertain the authenticity of the Bank Guarantee and set up necessary internal control procedures.

**By order and in the name of the Governor of Gujarat**

  
(J G Shelat)  
Section Officer  
Finance Department

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## 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**

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ટેન્ડરમાં ભરેલ અસામાન્ય ઊંચા ભાવોના સંદર્ભે કામ પર પડતા ભર્ય 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 કં. પરચ/ 102002 / (E1) / ચ  
તા. ૨૭-૧૧-૨૦૦૮.

**પરિપત્ર :**

ટેન્ડરમાં અસામાન્ય ઊંચા કે નીચા ભાવો ઉજારદારશ્રીઓ દ્વારા દર્શાવી વાર 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 પતાં 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 ઊંચુ કે નીચું મંજૂર થયું હોય તે ટકાવારીથી ૧૦% થી વધુ ઊંચો રહેતો હોય તેવી આઈટમનું ચૂકવણું રેન્જિંગ 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 કાઉનલ ઝિલ મંજૂર કરતી વખતે વ્યાજભારણ વગર જૂટી કરવામાં આવશે.

ઉક્ત જોગવાઈની સ્પષ્ટ સમજણ માટે આ સાથે આપેલ ઉદાહરણ ધ્યાને લેવું.

અનું.....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 કાર્ડલ.
૭. શાખા સિલેક્ટ કાર્ડલ ૨૦૧૩.

૧૩૨

ટેન્ડરમાં ભરેલ અસામાન્ય ઉંચા ભાવોના સંદર્ભે કામ પર પડતા ખર્ચ પર નિમંત્રણ રાખવા તથા કામની નાણાકીય પ્રગતિ ભૌતિક પ્રગતિ સાથે સુમેળમાં રહે તે માટે જરૂરી જોગવાઈ કરવા ધ્યાન.

ગુજરાત સરકાર  
માર્ગ અને મકાન વિભાગ  
પરિપત્ર કં. પરચ/૧૦૨૦૦૮/(૬૧)/સ  
તા.૨૭-૧૧-૨૦૦૮.

પરિપત્ર :

ટેન્ડરમાં અસામાન્ય ઉંચા કે નીચા ભાવો ડિજિટાઇઝેશન દ્વારા વર્ષી વાર 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 પસંદ કરવાની રહેશે.

જોગવાઈ :

જે કોઈ આઈટમનો ભરેલ ભાવ તે આઈટમના ટેન્ડરમાં મૂકેલ અંદાજ ભાવ કરતાં ટેન્ડરમાં મૂકેલ અંદાજ રકમથી સમગ્ર ટેન્ડર જેટલા રકા ઉંચુ કે નીચું મંજૂર થયું હોય તે ટકાવારીથી ૧૦% થી વધુ ઉંચો રહેતો હોય તેવી આઈટમનું ચૂકવણી રેન્જિંગ બીલ વખતે જે તે આઈટમના અંદાજ ભાવ +/- મંજૂર ટેન્ડરની ટકાવારી + તે આઈટમના અંદાજ ભાવની ૫% ની મર્યાદામાં કરવામાં આવશે. આ રીતે વીથડેલ 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

(૨)

૧.	ટેન્ડરમાં મૂકેલ અંદાજ રકમ	રૂ. ૧૦૦/-
૨.	મંજૂર થયેલ ટેન્ડરની રકમ	રૂ. ૧૧૦/-
૩.	ટેન્ડરમાં મૂકેલ અંદાજ રકમ સામે ખરેખર મંજૂર થયેલ ટેન્ડરની ટકાવારી	રૂ. ૧૦%
૪.	ટેન્ડરની એક આઈટમનો ટેન્ડરમાં મૂકેલ અંદાજ ભાવ	રૂ. ૧૦/-
૫.	તે આઈટમનો ભરેલ ભાવ	રૂ. ૧૪/-
૬.	તે આઈટમમાં ભરેલ ઊંચા ભાવની ટકાવારી	૪૦%
૭.	તે આઈટમ માટે રનીંગ બીલ વખતે ચૂકવવાપાત્ર ભાવ	રૂ. ૧૦ + કોલમ-૩ પ્રમાણે ૧૦% ઊંચા + અંદાજ ભાવની ૫% = રૂ. ૧૧.૫૦
૮.	કાઈનલ બિલ વખતે વાજ ભારણ વગર ચૂકવવાપાત્ર થતો વીરા હેલ રાખેલ ભાવ.	રૂ. ૧૪.૦૦ - રૂ. ૧૧.૫૦ રૂ. ૨.૫૦

જો સંકર આઈટમના ભાવ રૂ. ૧૨/- કે તેથી નીચે ભરેલ હોત તો રનીંગ બિલમાં ભાવ કપાત આ જોગવાઈ મુજબ કરવાની રહેતી નથી.

સર્વિ-

(આર.કે.ચૌહાણ)  
ખાસ ફરજ પરના અધિકારી  
માર્ગ અને મકાન વિભાગ

પ્રતિ,  
તમામ અધિકારક ઈજનેરશ્રીઓ, માર્ગ અને મકાન વિભાગ,  
તમામ કાર્યાલયક ઈજનેરશ્રીઓ, મા.મ. વિભાગ

નકલ રવાના :

૧. સચિવશ્રીના અંગત મદદનીશશ્રી, મા.મ. વિભાગ.
૨. તમામ મુખ્ય ઈજનેરશ્રી અને અ.સ.શ્રી મા.મ. વિભાગ.
૩. તમામ તાંત્રિક ઉપસચિવશ્રીઓ, મા.મ. વિભાગ
૪. ના.કા.ઈ.શ્રીઓ, મા.મ. વિભાગ પ્રે.પર
૫. નાજા શાખા, મા.મ. વિભાગ
૬. ના.સે.અ. સિલેક્ટ ફાઇલ
૭. શાખા સિલેક્ટ ફાઇલ.

૭૫



## ગુજરાત પાણી પુરવઠા અને ગટર વ્યવસ્થા બોર્ડ

તકેદારી એકમ, જલસેવા ભવન ચેરફોર્સ સ્ટેશન સામે,  
સેક્ટર-૧૦ / એ, ગાંધીનગર ☎ : ૦૭૯- ૨૩૨૫૧૩૬૦ Fax: ૨૩૨- ૨૫૯૭૯  
Email: vigilancecell@gmail.com

જા.નં. તકેદારી એકમ/ઇન્સ્પેક્શન નોંધ/૧૮૮  
તારીખ:- ૧૯ /૦૩/૨૦૧૨

### પરિપત્ર

ઇજારદાર મારફતે થતી કામગીરીના ઠેઠરમાં જે જે બાબતો માટે ઇન્ચોરન્સ લેવાની જોગવાઈ કરાયેલ હોય તેના માટે નીચે જણાવ્યા મુજબની જોગવાઈઓ સ્પષ્ટ રૂપે કરારખતમાં રાખવાની સૂચના ગુજરાત તકેદારી આયોગ દ્વારા આપવામાં આવેલ છે.

(૧) ઇજારદાર ધ્વારા ચોકકસ સમયમાં ઇન્ચોરન્સ લઇને આધાર /પુરાવા સહિત જાણ ન કરાય તો આવા ઇન્ચોરન્સ નહી લેવાના કારણે જે કોઇ જવાબદારી ઉભી થશે તેની સંપૂર્ણ જવાબદારી ઇજારદારની રહેશે અને તે પટે જે કોઇ રકમની વસુલાત કરવાની જરૂર પડે તો ઇજારદારની લહેણી નીકળતી કોઇ પણ રકમમાંથી બોર્ડ વસુલ કરી શકશે.

S. E. P. H. CIRCLE	
G. W. S. S. B.	
RAJKOT	
No :-	
Date	
S. E.	
D. E.	
O. S.	
ખર.	

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.

( 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 બોર્ડે કરેલ કાર્યવાહી અર્થે જાણ સારુ.
- સર્વે મુખ્ય ઇજનેરશ્રી/ સર્વે અધિક્ષક ઇજનેરશ્રી/ સર્વે કાર્યપાલક ઇજનેરશ્રી
- માસ્ટર ફાઇલ.

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**MUNICIPAL CORPORATION**

**BHAVNAGAR**

**VENDOR LIST**

**(A) LIST OF APPROVED VENDORS FOR CIVIL WORKS**

<b>Sr. No.</b>	<b>ITEMS</b>	<b>Approved Brands / Quality</b>
1	CEMENT PPC 53 Grade & SULPHATE RESISTANT CEMENT,S.R.C.	Ambuja, Hathi, Ultra Tech, Sanghi, Siddhi,Hi-bond
2	BRICKS	MBM, Arjun, PBM, 555, Kisan, ABM, TRD, 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 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
38	RCC bench	Sardar Pre cast
39	Rubber mould garden curbin	Sardar Pre cast

<b>Sr. No.</b>	<b>ITEMS</b>	<b>Approved Brands / Quality</b>
40	Rubber mould Paver block	Sardar Pre cast
41	Fencing Pole	Sardar Pre cast
42	RCC Masonry block	Sardar Pre cast
43	Pre cast wall	Sardar Pre cast

**(B) LIST OF APPROVED VENDORS FOR MECHANICAL & ELECTRICAL WORKS**

Sr. No.	Description	Name of Manufacturer
1	HSCF Pump	Crompton Greaves Ltd
		Kirloskar Brothers Limited (KBL)
		JASCO
		Mather & Platt Pumps Ltd.
		Jyoti Ltd.
2	Electric Motor	Lubi Industries LLP
		Bharat Bijlee Ltd.
		Jyoti Ltd.
		JSL Industries Ltd.
		Jeumont Electrical India Pvt. Ltd.
		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 કિર્લોસ્કર 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
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

Sr. No.	Description	Name of Manufacturer
		&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, Mitsubishi Electric
	HRC Fuse	L&T, Siemens, Mitsubishi Electric
	Timer	L&T, Siemens, Mitsubishi Electric
	Relay	L&T, Siemens, Mitsubishi Electric
	Push Button Stations	L&T, Siemens, Mitsubishi Electric
	Indicating Lamp	L&T, Siemens, Mitsubishi Electric
	Cable Jointing Kit	CCI, M. Seal, Mitsubishi Electric
	MCB/DB's	MDS, Siemens, Indokupp, Mitsubishi Electric
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

Sr. No.	Description	Name of Manufacturer
		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, ક્રિબલ ઇન્ડસ્ટ્રીઝ IVC, IVI, Audco, R & D multiple, Jupiter, Cair, Orbit Engineers
34	Check Valve (Dual Plate check Valve)	KIRLOSKAR Brothers Limited(KBL), DURGA valves Pvt Ltd, Orbinox, R&D MULTIPLE, Orbit Engineers
35	Metallic Expansion Bellow	Beloflex(B.D. Engineers), Stanfab Engineering Pvt. Ltd., D. Wren Engineering Pvt. Ltd., Sur Industries,
36	Centrifugal / Centrifugal Non Clog Pumps	Beacon Weir, KSB, Mather & Platt (Wilo), Worthington, WPIL, Xylem pumps , Grundfos Pumps Pvt. Ltd., MBH, JASCO
37	Submersible non Clog Pumps / Submersible Centrifugal Pumps	Kirlosker, KSB, ABS, ITT- Flyght, Xylem pumps, Grundfos Pumps Pvt. Ltd. , MBH, JASCO, AQUA, Jyoti, PULLEN PUMPS, Alpha, Het Pump
38	Screw Pump	Roto, Netzsch, Tushaco, Seepex
39	Metering / Dosing Pumps	Swellore, V.K. Pumps, Shapotools
40	Non Return Valves ( Single / multi door) / Dual Plate Check Valves	Kirlosker, IVC, IVI, R & D multiple, Durga, Jupiter, Cair, Orbit Engineers
41	Knife Gate valves	Jash, Fouess, Vass (Dezurick), Vag, Orbinox, Orbit Engineers
42	Sluice gates / open Chanel Gates	Jash Engineering, IVC, R & D Multiple, Jupiter
43	Mechanical Fine Screens – Step (Mat) Type / Drum Type	Jash, Huber, Johnson, Savi, Italy, Apollo Screens
44	Mechanical Course bar Screen	Jash, Huber, Johnson, HDO, Triveni, Savi, Italy
45	Manual Bar Screen	Jash, Japs, HDO, Triveni, Auric
46	Grit mechanism	EIMCO – KCP, Hindustan Dorr – Oliver, Jash-Shivpad, Triveni, Voltas
47	Diffused Aeration System	EDI, OTT, Rehau
48	Air Blower	Kay, Swam, Everest, Usha Compressors, Gardner Denver
49	Agitator / mixer	Remi, Schurtek, Fibre & Fibre, Milton Roy
50	Gear Boxes	Greaves, Elecon, CPEC, PEPL, Bonfiglioli

<b>Sr. No.</b>	<b>Description</b>	<b>Name of Manufacturer</b>
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 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
71	CHANGE OVER SWITCH	LEGRAND/ SCHNIEDER/ HAVELLS/ SIEMENS/ L&T
72	STARTER (STAR-DELTA / DOL)	LEGRAND/ SCHNIEDER/ HAVELLS/ SIEMENS/ L&T
73	LUGS	DOWELL'S / 3M / JAINSON / COMET / HMI / (ISI MARKED)
74	MODULAR SWITCHES, SOCKETS & OTHER ACCESSORIES	LEGRAND / HAVELLS / GM / ANCHOR
75	SMC PRESS BOX	SINTEX / EPP
76	MODULAR LIGHT POINT WITH ACCESSORIES	ANCHOR / HAVELLS / MK / LEGRAND
77	SOLAR POWER SYSTEM	TATA / HAVELLS / SOLARSOKO / WARRI
78	DWC PIPE	Rex Poly Extrusion Ltd / VEC Engineering / GEMINI
79	WATER COOLER & RO	VOLTAS / USHA / BLUESTAR / EUREKA FORBS

<b>Sr. No.</b>	<b>Description</b>	<b>Name of Manufacturer</b>
80	CCTV SYSTEM	HICKVISION / PANASONIC / HONEYWELL
81	PoE SWITCH	CISCO / AVAYA
82	CAT-6 CABLE	DIGI LINK / FINOLAX / ANCHOR / D LINK
83	NETWORK RACK	VALRACK / APW
84	FIRE EXTINGUISHER	SAFEX / MINIMEX / AAAG / NEW AGE

**(C) LIST OF APPROVED VENDOR FOR INSTRUMENTATION SYSTEM**

<b>SR NO</b>	<b>DESCRIPTION</b>	<b>Name Of Manufacturer</b>
1	Electromagnetic Flow Meter	E+H, Siemens, Abb, Fuji, Yokogawa, Krohne-Marshall, 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	Peppri + Fuchs, Baumer, Waaree, E+H , Pune Techtrol , SBEM
9	Float & Board Type Level Gauge	Levcon, Nivo, Toshbro, Pune Techtrol, SBEM
10	Electromagnetic Flow Meter	E+H, Siemens, ABB, Fuji, Yokogawa, Krohne-Marshall
11	Field Transmitter (P, DP, F, L, T)	ABB, Fuji, Yokogawa, Honeywell, Emerson
12	Pressure Gauges	Wika, H.Guru, General Instruments Consortium Manometer (India) P. Ltd., Baumer, Waaree
13	Panel Mounted Process Indicator & Flow Integrator	Masibus, Nishko, Nivam, Selectron, Radix, Yokogawa, ABB
14	Pressure Switch	Danfoss, Indfoss, Switzer
15	Programmable Logic Controllers	Rockwell (Allen Bradeley), Siemens, Schneider, Fuji, ABB, GE Fanuc
16	Control Panel Enclosure	Rittal, Enklotek, Bartakke, BCH, Eldon
17	Alarm Annunciator	Aplab Ltd., Minilec , IIC
18	Solenoid valves	Asco, Rotex, Schrader
19	Tube Fitting	Excel Hydropneumatic, Multimetal, Placka



20	Instrument Valves , Manifolds	Aptek, Anmol (Superlok), Excel Hydropneumatic, General
21	Fitting	Instrument Consortium , Multimetal, Technomatic, Placka
22	Pneum , Brass Fitting	Swagelok, Multimetal Industries, SMC, Festo
23	Control Panel Accessories / Components	
a.	Miniature Relay	Wago, Omron,Phoenix, Rockwell
b.	Indication Pilot Lamps (LED Type)	Teknic, Schneider, Siemens
c.	Push Button / Selector Switch (with NO/NC Elements)	Teknic, Schneider, Siemens
d.	DC Power Supplies (DIN Rail mounted)	Phoenix, Omron, Schneider, Rockwell
e.	Terminals	Elmex, Phoenix, Wago, Connectwell
f.	Panel Wires	Finolex , Havell's , R R Kabel
g.	Panel Illumination	Philips , Crompton , GE
24	Instrument Cables (Power , Signal , Control)	Associated Cables, Associated Flexible and Wires P.Ltd., Brooks Cables, Thermo Cables, Udey Pyro
25	Cable Glands	Ex- protecta, Braco, Sudhir, Comet, Connectwell
26	Junction Box	Ex- protecta, CEAG, Sudhir, Baliga, FCG
27	Cable Tray	M.M.Engineering, Globe, Jacinth, Equi. Reputed, JETCOTECH Engineering LLP
28	Computer System	HP-Compaq, Dell, IBM, Sony, Samsung
29	UPS	Hirel-Hitachi, Emerson, APC
30	<ol style="list-style-type: none"> <li>1. PLC (Programmable Logic Controller )</li> <li>2. SCADA (Supervisory Control and Data acquisition )</li> <li>3. VFD (Variable Frequency Drive Up to 500 KW )</li> <li>4. ACB ( Air Circuit Breaker up to</li> </ol>	MITSUBISHI ELECTRIC INDIA PRIVATE LIMITED, Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune 411026

	<p>6000A)</p> <ol style="list-style-type: none"> <li>5. MCCB ( Moulded Case Circuit Breaker up to – 1600 A)</li> <li>6. MCB (Miniature Circuit Breaker up to – 63 A)</li> <li>7. ELCB (Earth Leakage Moulded Case Circuit Breaker up to 1600 A)</li> <li>8. Contractor up to – 800 A &amp; OLR (Over load Relay) up to 630 A</li> <li>9. Multi Functional Meters</li> <li>10. MPCB (Motor Protection Circuit Breaker up to 32 A )</li> </ol>	
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**(D) LIST OF APPROVED VENDORS FOR MATERIALS RELATED TO WATER****SUPPLY AND SEWERAGE NETWORK**

<b>SR. NO.</b>	<b>ITEMS</b>	<b>NAME OF AGENCIES</b>
1	A C Pressure pipe MAZZA process	Lotus, Kirti
2	A C Pressure pipe MEGHNANI process	Lotus, Kirti, Hindustan
3	Sluice Valve	Durga, kartar, Kirloskar, Jupiter, SACHDEVA ( C.I. & D.I.), શ્રી કિર્તી ઇન્ડસ્ટ્રીઝ, Cair, Orbit Engineers
4	DI Pipe	Electrotherm (I) Ltd.,Ahmedabad, Lanco Industries Ltd.,Chennai, Electrsteel, Jindal Saw Ltd.,Ahmedabad, Kesins, Welspun
5	R.C.C. PIPE ( COLLAR JOINT & SOCKET SPIGOT JOINT) CLASS NP3 & NP4, & R.C.C. COLLARS	VIPUL SPUN PIPES (SIHOR & LATHIDAD,BOTAD), KATARIYA & CO. (DHASSA), OMKARESHVAR PIPES ( NAVAGAAM), OMKAR PIPES ( LATHIDAD, BOTAD), MARUTI PIPES ( BAGODARA ,AHMEDABAD), KALATHIYA PIPES(BAGODARA ,AHMEDABAD), R. S. PIPES (BODELI), UMA HUME PIPES (KALOL, GANDHINAGAR), SIDHDHIVINAYAK ( KARDEJ ,BHAVNAGAR)
6	R.C.C. MACHINEOLE FRAME & COVER, INLET FRAME COVER 10T.(600*450 MM.) , 20T.,35T., & 50T.	SONI CEMENT PRODUCT , VIPUL SPUN PIPES, KATARIYA & CO., OMKARESHVAR PIPES, OMKAR PIPES, MARUTI PIPES, KALATHIYA PIPES , R. S. PIPES, UMA HUME PIPES, SIDHDHIVINAYAK , S.K. Corporation, Laxmi Price Industries, S.J.Corporation, Sardar pre cast
7	Stone ware PipeManufacturer having BIS Certificate for ISI marking	Krishna Pipe, j.K. Pipe, Taya ceramic, Burn & co., perfect Potteries, Navroji Vakil, Kashmira
8	D.I. & C.I. FITTINGS	RG BRAND, ESSEM Engineering Industries, Bikaners Engineers works
9	CID Joints	ESSEM Engineering Industries
10	Valves & Graded Castings	ESSEM Engineering Industries
11	Pipe Fittings	ESSEM Engineering Industries, Bikaners Engineers works
12	CI/DI/MS graded castings	Bikaners Engineers works
13	Scaper machine hole	Sardar Pre cast

**Important Note :**

- (1) Equivalent makes shall be approved by Engineer In Charge (Bhavnagar Municipal Corporation) before procurement.**
- (2) Engineer In Charge (Bhavnagar Municipal Corporation) reserves the right to select the Make or Brand other than mentioned in above tables.**

**BHAVNAGAR MUNICIPAL CORPORATION**

**Tender Notice (online) No:-BMC/Trans/Depo/01/2024**



**Construction of City e-Bus Depot and Workshop on F.P. No. - 39, TPS-11,  
Adhevada, Bhavnagar.**

**VOLUME – I,  
Part – I  
TECHNICAL BID**

Milestone Dates	
On-line Downloading Start Date of Technical Bid & Document	Dt. 13/03/2024
Pre-Bid Meeting	Dt.21/03/2024at 12:00hr@ office of The Dy.Muni.Commissioner(Admin),BMC
Last Date of On-line Submission of Technical Bid & Price Bid	Dt. 12/04/2024 upto18:00hrs.
Last Date for Physical Submission of Tender Fee ,EMD and other Pre Qualification Documents etc.	Dt.20/04/2024 upto17:00hrs.
On-line Opening of the Technical Bid	Dt. 20/04/2024at17:30hrs.Onwards
On-Line Opening of Commercial Bid	Dt. 23/04/2024 at 12:00hrs Onwards

**CONSULTANT:**  
**JAYESH A. DALAL**  
**PLANNING & ENGINEERING**  
**SERVICES PRIVATE LIMITED,**  
**“Jalaram Shakti”,Beside**  
**Dhavalgiri Appt.,Nr.Lourds**  
**Convent School,Athwalines,**  
**Surat-395 001**

**CLIENT:**  
**Transport Department,**  
**Bhavnagar Municipal Corporation.**  
**Behind LIC office building, Near Neelambaug**  
**circle, Bhavnagar-364 001.**  
**MobileNo.:9925009293**



**BHAVNAGAR MUNICIPAL CORPORATION  
BHAVNAGAR**

**Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.**

**VOLUME – I, Part – 1  
TECHNICAL BID**

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 <b>BHAVNAGAR MUNICIPAL CORPORATION</b> Bhavnagar Tender Notice No: <b>BMC/Trans/Depo/01/2024</b> <b>ONLINE E-TENDERING</b>	
	
Bhavnagar Municipal Corporation (BMC), invites Item rate Tender on line in single stage two bid system from interested qualified bidders for the work shown in the schedule given below :-	
Tender Notice No.	<b>BMC/Trans/Depo/01/2024</b>
Work Description	Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.
Estimated Cost	Rs. 15,86,27,070.49
EMD	Rs. 15,86,271.00
Tender Fee	Rs.18000/- (Non-refundable)
Qualification of Bidder	Duly registered with State/Central Govt. / Municipal Corporation/PSU depts. in Class 'AA' or above.
<p>The detail tender notice &amp; Bid Documents will be available for downloading &amp; submission on the website: <a href="https://bmc.nprocure.com">https://bmc.nprocure.com</a> from date: <b>13/03/2024 to 12/04/2024 upto 18:00hrs.</b> And notice/details can be seen on <a href="https://www.bmcgujarat.com">https://www.bmcgujarat.com</a> . The Municipal Commissioner reserves the right to accept or reject any or all offers received without assigning any reasons thereof. Further details required if any, may be obtained from Executive Engineer (Transport Department), BMC.</p>	
Date: 12/03/2024 Place: Bhavnagar	Executive Engineer (Transport Dept.) Bhavnagar Municipal Corporation

**DETAILED TENDER NOTICE**

<b>Tender Notice No.</b>	<b>BMC/Trans/Depo/01/2024</b>	
<b>Organization Name</b>	BHAVNAGAR MUNICIPAL CORPORATION	
<b>Department Name</b>	<b>TRANSPORT DEPARTMENT</b> Executive Engineer (Transport Department), Bhavnagar Municipal Corporation, Behind LIC of fice building, Near Neelam baug circle Bhavnagar-364 001	
<b>Name</b>	Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.	
<b>Tender Notice</b>	<b>BMC/Trans/Depo/01/2024</b>	
<b>Tender Type</b>	Open Online	
<b>Bidder Nationality</b>	LCB(Local Competitive Bidding)	
<b>Qualification of Bidder</b>	Duly registered with State/Central Govt./Municipal Corporation/PSU depts. In Class 'AA' or above.	
<b>Type of Contract</b>	Item Rate	
<b>Bidding Type</b>	Single stage	
<b>Bidding Currency</b>	Single(Rupees)	
<b>Rebate</b>	Not Applicable	
<b>Joint Venture</b>	Not Applicable	
<b>Schedule of E-Tender</b>	Document downloading Start and end date & time	<b>Dt.13/03/2024 to 12/04/2024 upto 18:00hrs.</b>
	Pre-Bid Meeting date time	<b>Dt.21/03/2024 at 12:00hr @ office of the Dy.Muni.Commissioner(Admin), BMC, Bhavnagar</b>
	Last date & time of online Bid submission	<b>Dt.12/04/2024 upto 18:00hrs.</b>
	Last date of Physical submission of EMD, Document Fee, PQ bid and Supporting documents	<b>Dt.20/04/2024 up to 17:00 hrs. to Executive Engineer (Transport Department), Bhavnagar Municipal Corporation by RAPD or Speed Post only</b>
	Opening of PQ Bid On-line) (Technical)	If possible, On <b>Dt.20/04/2024</b> at 17:30hrs. Onwards
	Opening of Price Bid(Online)	If possible, On <b>Dt.23/04/2024</b> at 12:00 hrs. Onwards
	Bid validity period	180 days from opening of Price-bid on-line
	Project Period Completion	11 Months <b>(Including Monsoon period)</b>



<b>Payment Details</b>	Document Fee	<b>Rs.18,000/- (Rupees Eighteen Thousand Only)</b> 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.
	EMD	<b>Rs.15,86,271.00 (Rupees Fifteen lacs Eighty Six thousand Two hundred and Seventy One rupees only)</b> EMD in form of DD in the name of Commissioner, Bhavnagar Municipal Corporation valid upto 28 days from the date of closure of the bid validity period of 180 days (i.e. <b>Total of 180+28=208 days</b> ), 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.
	Estimated Value	<b>Estimated Cost: Rs. 15,86,27,070.49, Excluding GST (Rupees Fifteen crores Eighty Six lacs Twenty seven thousand and Seventy rupees Only)</b>
	Performance Security Deposit for successful bidder	5% of Contract amount in the form of BG/FDR ( <b>BG/FDR of SBI is not accepted</b> ) payable to Commissioner, BMC
<b>General Terms &amp; Conditions</b>	<p>Bidders who wish to participate in this E-Tender will have to procure valid digital certificate as per information Technology Act 2000. Bidders can procure this certificate from any of the Government approved certifying agency i.e. (n) Code Solution.</p> <p><b>DOWNLOAD OF TENDER DOCUMENT:-</b></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 <a href="http://www.bmc.nprocure.com">www.bmc.nprocure.com</a></p> <p><b>SUBMISSION OF TENDER:-</b></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 details online. The Demand Drafts toward Tender Document fees and EMD can be submitted before the due date as specified above. This should be as per details given online DD 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 &amp; EMD, bidder shall send the same in original With physical bid documents submission through RPAD/SPEED POST only so as reach To <b>Executive Engineer (Transport Department), Behind LIC of fice building, Near Neelam baug circle, Bhavnagar Municipal corporation, Bhavnagar-364 001</b> during office hours on or before last date 20/04/2024 upto 17:00hrs.</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 digitally signed.</p> <p>(b) Scanned copy of DD as EMD.</p> <p>(c) Scanned copy of Demand Draft as tender fee.</p> <p><del>(d) The Successful Contractor have to 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 <math>\text{₹} 4 \times 11</math> etc.</del></p> <p>(e) Scanned copy of contractor's registration certificate 'AA' Class in Govt. Of Gujarat (R&amp;B/WRD/GWSSB/ Board, Corporation, and Government Undertaking /Organizations of state/ Central government).</p> <p>(f) Scanned copy of Bidder's solvency certificate. (Minimum of Rs 3,17,25,414/-)</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 criteria documents &amp; other all documents required as per P.Q. and tender term &amp; conditions.</p> <p>The Bidder should submit price Bid electronically only. <b>Price bid in physical form shall Not be accepted</b> 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><b>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.</b></p>
	<p><b>OPENING OF TENDER:-</b></p> <p>The Technical Bid will be opened on the specified date online on website <a href="https://bmc.nprocure.com">https://bmc.nprocure.com</a> Bidders or their representative who wish to participate in online tender opening can log on to <a href="https://bmc.nprocure.com">https://bmc.nprocure.com</a> 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><b>Information for online participation</b></p>	<ol style="list-style-type: none"> <li>1. Internetsiteaddressfore-Tenderingactivitieswillbe<a href="https://bmc.nprocure.com">https://bmc.nprocure.com</a></li> <li>2. Interested bidders can view detailed tender notice and download tender documents from the above mentioned website.</li> <li>3. 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 &amp; password on their own in registration process.</li> <li>4. Bidders who wish to participate in this tender need to procure Digital Certificate as per Information Technology Act-2000 using that they can digitally sign</li> </ol>

	<p>Their electronic bids. Bidder can procure the same from any of the CCA approved certifying agencies, or they may contact (n) code Solution at below mentioned address and they will assist them in procuring the same. Bidders who already have a valid Digital Certificate need not to procure the same. In case bidders need any clarification regarding online participation, they can contact</p> <p>M/S (n)code Solution 301,G.N.F.C.InfoTower, Near The Grand Bhagwati Hotel, Ahmadabad 380015, India. Tel:+9179 26857316 Tel:+9179 26857317 Tel:+9179 26857318 E-Mail: URL:<a href="https://bmc.nprocure.com">https://bmc.nprocure.com</a></p> <p>5. Bidders who wish to participate in e-Tender need to fill data in predefined forms of tender fee, EMD, PQ (Technical) or 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 &amp; Reference Documents in hard copy if such instructions are given by tendering authority.</p>
<b>General Instruction</b>	<ol style="list-style-type: none"> <li>1. The Bid Document Fee will not be refunded under any circumstances.</li> <li>2. EMD in the form of specified in tender document only shall be accepted.</li> <li>3. The offer shall be valid for 180 days from the opening date of price bid.</li> <li>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.</li> <li>5. Not more than one tender shall be submitted by a Bidder.</li> <li>6. Conditional tender shall not be accepted.</li> <li>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.</li> <li>8. This Tender notice shall form a part of contract document.</li> <li>9. The bidders are advised to read carefully the "Instruction" and "all Eligibility Criteria's" contained in the tender documents.</li> </ol>
<b>Qualifying Criteria</b>	<b>As per tender Documents</b>
<b>Contact person</b>	For further details of any query regarding the tender Contact to: Executive Engineer (Transport Department),

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	<p>Bhavnagar Municipal Corporation. Behind LIC office building, Near Neelam baug circle Bhavnagar-364 001 Mob. No:99250 09293</p> <p>Pre-Bid queries if any, contractor will deliver it in hard copy to Executive engineer in two days prior to Pre-Bid meeting and also e-mail to following e-mail addresses. Email address: <a href="mailto:transport.bmcgujarat@gmail.com">transport.bmcgujarat@gmail.com</a></p>
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Date: 13/03/2024

Place: Bhavnagar

Executive Engineer (Transport Department)  
Bhavnagar Municipal Corporation  
Bhavnagar

**MEMORANDUM OF WORK IN BRIEF**

**Name of work: Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.**

**Name of Employer:** Bhavnagar Municipal Corporation

- a. **Name of concerned Executive Engineer** (Transport Department): Mr. P.J.Chudasama
- 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 : Online submission only on Scanned copy of EMD and tender fee and <https://bmc.nprocure.com> other supporting documents.
- b. Other documents in Hard copy- Registration : "Address of the Executive Engineer Certificate, IT certificate, Tender fee, EMD, (Transport Department), Bhavnagar solvency certificate, required supporting all Municipal Corporation By RPAD/ documents& tender volumes. 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 opening of Price-bid on-line
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

**BHAVNAGAR MUNICIPAL 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 **“Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.”** 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/ Central Government bodies/ Authority along with the tender.

##### 1.1 SPECIAL ATTENTION

This tender consists for the work **“Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.**

”

- (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 two 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/- dully attested by notary public regarding document submitted, are true. BMC 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 contractors 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. (

~~(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 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 Bhavnagar Municipal 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 Bhavnagar Municipal 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 Bhavnagar Municipal 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

**“Construction of City e-Bus Depot And Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.**

The successful bidder shall have to undertake the construction work of Building units namely Admin building, Workshop building, Security cabin and e Bus charging shed. It also includes infra structure work like Pavement Quality Concrete (PQC) work for internal road, Concrete paver block work, Compound wall and U.G. Water tanks etc.

The details description of the works in included in the tender documents.

## **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 seal etc in Offline mode" would mean that the tender fee, Earnest Money Deposit, Registration Certificate, Solvency Certificate etc in physical bid 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](http://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](http://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 Construction of City e-Bus Depot And Workshop including infrastructure works.

**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.

1.2.17. **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.

1.2.18. **CONTRACTOR'S OBLIGATIONS:**

Means the obligation to execute the Project in all its entirety and shall, without limitation,

**1.2.19. 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.

**1.2.20. COUNTRY:**

Means the Country in which the site (or most of it) is located, where the Permanent Works are to be executed.

**1.2.21. DAY:**

Means a day from midnight to midnight.

**1.2.22. DEFECTS LIABILITY PERIOD:**

1.2.23. Means the period of Five years from the certified date of completion of work

**1.2.24. 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.

**1.2.25. 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.

**1.2.26. 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.

1.2.27. **Deleted**

1.2.28. **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.



1.2.29. **EXECUTIVE ENGINEER/DY.MUNI.COMMISSIONER(ADMIN.):**

Means the Executive Engineer / Dy.Muni.Commissioner(Admin.) in overall charge of the works i.e. Engineer In- Charge.

1.2.30. **Deleted**

1.2.31. **GOODS:**

Means Contractor's Equipment, Materials, Plant and Temporary Works, all or any of them as appropriate.

1.2.32. **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 organization.

1.2.33. **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.

1.2.34. **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.

1.2.35. **Deleted**

1.2.36. **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.

1.2.37. **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.

1.2.38. **MONTH:**

Means from the beginning of a given date of calendar month to the end of preceding date of the next calendar month.

1.2.39. **PERFORMANCE GUARANTEES:**

Means the List of Guarantees offered / provided by the Contractor in his Bid Submission pursuant of the Bid Documents.

1.2.40. **PERMANENT WORKS:**

Means the works to be designed and executed by the Contractor under the Contract.

1.2.41. **Deleted**

1.2.42. **RUPEE:**

Means Indian National Rupees (INR)

1.2.43. **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.

1.2.44. **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.

1.2.45. **TEMPORARY WORKS:**

Means all temporary works of every kind required for successful execution of the Contract.

1.2.46. **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.

1.2.47. **WEEK:**

Means seven consecutive days.

1.2.48. **WORKS:**

Means the works / action to be executed in accordance with the contract.

1.2.49. **Deleted**

1.2.50. **Deleted**

1.2.51. **Deleted**

1.2.52. **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 this 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.

1.5.1. **Deleted**

## **2.0 Time of Performance:**

The successful bidder will be expected to complete the works within stipulated time 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 **11 Months** (Including Monsoons Period), as per time limit given in memorandum of work from the date of Letter of Intent.

The defect liability shall be **5 years** , from the date of issue of Successful Completion Certificate

## **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 (Transport Department) / Dy.Muni.Commissioner(Admin.) 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 Five 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.

- 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 P.G.V.C.L Bhavnagar for his power requirements during construction phase.

### **10.7. Deleted**

₹



10.8. **Deleted**

**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. **Deleted**

**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.

<b>VOLUME: I (Part-1)</b>	<ul style="list-style-type: none"> <li>• Section I : Tender Notice</li> <li>• Section II : Instruction to Bidders</li> <li>• Section III : Qualification criteria &amp; Evaluation Procedure</li> <li>• Section-Iv:QualificationDataSheetToBe Filled Up By The Bidder</li> </ul>
<b>VOLUME – I (Part-2)</b>	<ul style="list-style-type: none"> <li>• Specification Index</li> <li>• Technical Specifications (Civil + Electrical)</li> </ul>
<b>VOLUME – I (Part-3)</b>	<ul style="list-style-type: none"> <li>• Tender Drawing</li> </ul>
<b>VOLUME- II</b>	<ul style="list-style-type: none"> <li>• Special Condition of Contract</li> </ul>
<b>VOLUME- III</b>	<ul style="list-style-type: none"> <li>• Price Bid (Schedule – B)</li> </ul>

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 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/mail (hereinafter the term "fax/mail" 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 2 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](mailto: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 date of opening of price bid. 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 Commissioner, BMC bid as per tender notice and issued by short listed bank as per tender notice.
- (b) D.D. receipt pledged in the name of the Commissioner, BMC 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 opening of price 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 10 days 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.

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.
- 21.6 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.nprocure@ncode.in](http://www.nprocure@ncode.in)
- 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 last three financial year 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 Transport department, 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 authorized 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](http://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 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 [bmc.nprocure.com](http://bmc.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.



**BHAVNAGARMUNICIPAL 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 10<sup>th</sup> day of date of 'Letter of Intent'.
- 1.7 The intending Bidder shall get himself registered with nproucre.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.

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
7	Form-5	Financial data
8	Form-6	List of works already completed by the Bidder

12	Form-10	Information for tenders submitted but not awarded
13	Form-11	Certificate for experience of work
14	Form-12	Joint Venture data ( <b>Deleted</b> )
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.
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 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 / 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)	1 Nos
(2)	Mechanical Engineers (Degree holders)	N.A.
(3)	Electrical Engineers (Degree holders)	1 Nos
(4)	Construction Engineer (Degree holders)	1 no
(5)	Supervisors (Diploma holders)	2 Nos
(6)	Technical Assistants (Diploma / ITI)	2 Nos

**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-4).~~

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 achieved minimum annual financial turnover (at current price level) from contract receipt of works (in all classes of civil engineering construction works only) of **Rs. 7.93 crores** in any one financial years out of last Five (5) financial years i.e. from 2018-19 to 2022-23

**Note :** The details pertaining to turnover for the year 2018-19 to 2022-23 shall be certified by Chartered Accountant on his own letter head and duly attested. Turnover of financial year 2022-2023 shall be considered subject to submission of provisional/audited certificate from chartered accountant by the Bidder.

###### **4.1.2 SIMILAR NATURE OF WORK:**

The bidder must have completed similar nature of work i.e. Building and infrastructure work Projects within last 07 financial years i.e. from Year 2016-17 to 2022-23 and upto one month prior to last date of submission of the bid of value not less than:

One contract minimum of Rs.12.69 Crores (80% of Estimated Project Cost) Or

Two contracts minimum of Rs.7.93 Crores Each. (50% of Estimated Project Cost) Or

Three contracts minimum of Rs 6.35 Crores Each.(40% of Estimated Project Cost)

**4.1.3 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.15,86,27,070.49(100% of the estimated cost)**The bidder's capacity shall be computed as shown below.

Where :

<b>A</b>	=	Performance of the Bidder for maximum annual turnover for last seven financial year updated at the financial year 2023-24
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<b>N</b>	=	Years prescribed for completion of the work for which bids are invited. <b>(1.5 Year) (Equivalent to duration of the project)</b>
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~~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 Form 11...
- (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	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 upto one month prior to last date of submission of the bid.

- 4.2.1. Deleted  
 4.2.2. Deleted  
 4.2.3. Deleted

# **BHAVNAGARMUNICIPAL CORPORATION**

## **VOLUME – I**

### **SECTION-IV**

#### **QUALIFICATION DATA SHEET TO BE FILLED UP BY THE BIDDER**

The qualification questionnaire contains the following forms:

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
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
18	Form-16	Details of experience for physical qualification criteria
19	Form-17	Approach & Methodology with conceptual design & supporting calculations of the system.

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
<del>25</del>	<del>Form-23</del>	<del>“Assured Pipe Supply Declaration” ( To be filled without proposed dispatch schedule at the time of Bidding)</del>
<del>26</del>	<del>Form-24</del>	<del>Performa for memorandum of understanding (MOU) with pipeline supplier</del>

**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.

4	Permanent Account Number (PAN) And Income Tax Details	Copy of the at least last three years. Income Tax Return with permanent account number (PAN) and Income Tax ward where assessed. <b>(Scanned copy)</b> ,		
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. <b>(List of Work on hand to be supported with non-judicial stamp paper of Rs. 300/ duly notarized).</b>		
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)	<b>Deleted</b>	
12	Bidder Past Performance	The bidder, whose contracts are earlier terminated on account of poor performance in Bhavnagar Municipal Corporation works, will not be eligible. For this tender Self Declaration by bidders is required	

- 13 Other Documents
- Schedule of construction method
  - Work plan
  - Schedule of Major items of equipments
  - Schedule of key personnel

**Note:** All s-submittals shall be numbered chronically and reference of page nos shall be entioned 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,

Bhavnagar Municipal

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 Bhavnagar Municipal Corporation to approach the Bank issuing the solvency certificate to verify the correctness thereof. We also authorize, Bhavnagar Municipal Corporation to 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 opening of price bid 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 Bhavnagar Municipal Corporation should we not Deposit the amount of Security Deposit specified in the Clause 1, General Conditions of Contract, Volume-II
- 9 We enclose .....DD in favor of Commissioner BMC & 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.

<b>Sr. No.</b>	<b>Works</b>	<b>Client / owner</b>
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- 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 including Building and Infrastructure wok ( civil & electrical)	
15	<del>Give details of experience for construction of large water supply and sewerage projects.</del>	
16	<del>Give details of experience in using heavy earth moving machinery, machinerics for pipe laying</del>	
17	Give details of testing laboratory, if any.	
18	In how many of your works cases of litigations have arisen?	
19	<del>Deleted</del>	
	<del>_____</del>	

**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/Civil Engineer.			
	2.	Construction Engineer			
	3.	Electrical Engineer			
	4.	Civil Supervisor			
	5.	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

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**

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)**

<b>Year</b>	<b>Turnover</b>	<b>Annual income from contracting</b>	<b>Annual income from other sources</b>
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)	<b>Name of Firm</b>		
2)	<b>Name of Partner / Director</b>		
3)	<b>Capital</b> <b>(a) Authorized</b> <b>(b) Issued and paid up</b>		
4)	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 i) Working Capital ii) Foreign Investment iii) Turnover for the last seven (7) financial year, the contract receipts for Civil Engineering works (Furnish reference page number to balance sheet attached)		
<b>Sr. No.</b>	<b>Year</b>	<b>Turnover (Rs in Crores)</b>	<b>Reference page No. to balance sheet or other documents</b>
(I)	2018-19		
(II)	2019-20		
(III)	2020-21		
(IV)	2021-22		
(V)	2022-23		
<b>GROSS INCOME IN THE LAST FIVE (5) FINANCIAL YEAR</b>			
<b>Sr. No.</b>	<b>Year</b>	<b>Gross Income (Rs in Crores)</b>	<b>Reference page No. to balance sheet or other documents</b>
(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)	<b>Details of work on hand</b> 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 <b>vi) Anticipated date of completion.</b>	
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 <b>from Engineer In -Charge</b> )  a) Of key quantities, total physical output of last seven (7) financial year (Separately for each item) (For EPC contract for Building and infrasture 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*

Note:

**If the information is hidden or misleading by the bidder, he shall be disqualified for the Tender and debarred for three financial years.**

**FORM - 9**

**ADDITIONAL INFORMATION AND LITIGATION HISTORY / DEBARMENT / BLACKLISTING**

**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

**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)	



**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.

**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)**

**PERSONNEL/STAFF PROPOSED FOR THE PROJECT**

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: <b>Project Manager/ Civil Engineer</b>
	Name of prime candidate:
	Name of alternate candidate:
2.	Title of position: <b>Mechanical Engineer – N.A.</b>
	Name of prime candidate - <b>N.A.</b>
	Name of alternate candidate - <b>N.A.</b>
3.	Title of position: <b>Procurement Engineer- N.A.</b>
	Name of prime candidate
	Name of alternate candidate
4	Title of position: <b>Electrical Engineer</b>
	Name of prime candidate
	Name of alternate candidate
5.	Title of position: <b>Construction Engineer</b>
	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 - 13**

**CURRICULUM VITAE OF PROJECT MANAGER & ALL KEY TECHNICAL PERSONNEL's**

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**

- 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 Management<sup>1</sup>
- 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.

**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
				Building construction work			
				Infrastructure work			
				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](http://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 the .....by **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 Bhavnagar Municipal Corporation tender for three years and my/our security deposit may be forfeited by Bhavnagar Municipal Corporation in full & the tender, if any, to the extent accepted, may be cancelled.

**Signature along with seal of the Company**

(Duly authorized 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**

**Deleted**

**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-21**

**PERFORMANCE 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

**JOINT VENTURE AGREEMENT**

**Deleted**

**BHAVNAGAR MUNICIPAL CORPORATION**  
Tender Notice (online) No. - BMC/ Trans/Depo/01/2024



**Construction of City e-Bus Depot And Workshop On F.P. No.- 39,  
TPS-11, Adhevada, Bhavnagar.**

**VOLUME – III  
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:**

JAYESH A. DALAL  
PLANNING & ENGINEERING SERVICES  
PRIVATE LIMITED, "Jalaram  
Shakti", Beside Dhavalgiri  
Appt., Nr. Lourds Convent  
School, Athwalines,  
Surat – 395 001

**CLIENT:**

Transport Department,  
Bhavnagar Municipal Corporation.,  
Behind LIC office building,  
Near Neelam baug circle Bhavnagar-  
364 001, Mobile No.: 99250 0929

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**Bid Documents for****Construction of City e-Bus Depot and Workshop On F.P. No.- 39, TPS-11, Adhevada,  
Bhavnagar.****INDEX**

<b>SR NO.</b>	<b>PARTICULARS</b>
A	Preamble to Price Schedules
B	Bid form
C	Price Schedule



**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-4 bidder shall furnish breakup of his prices quoted in Price Schedule B.~~
- ~~8. The Bidder shall quote his prices for Operation & Maintenance in Schedule B-4. The total shall be carried forward to Schedule B for comparison and evaluation.~~
9. 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.
10. 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.
11. Items not specifically listed in this 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.
- ~~12. The total of the item prices in Price Schedule B 1 to Schedule B 4 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 4 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.~~

13. 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.
14. Prices shall be filled online only.
15. 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.
16. The bidder shall interpret the data furnished and carry out any additional surveywork, or investigation work required at his own cost.
17. The prices quoted shall also include the cost of materials utilized for testing.
18. 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.
19. 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.
20. ~~The amount to be quoted for O&M shall be as per Volume II, General Conditions of Contract, Clause No. 1 "Security Deposit".~~
21. 1% of the value of work will be deducted from the Running bill against labour cess, which shall be non-refundable.
22. If required Third Party Inspection / CSC agency will be deployed by Bhavnagar Municipal Corporation and charges of the same will be borne by Bhavnagar Municipal Corporation.
23. 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.
24. The prices shall be quoted inclusive of all taxes (Excluding GST), royalties and duties prevailing at the time of submission of the bids. Statutory variation if any during the currency of contract shall have to be borne by the agency which shall be not reimbursed by the BHAVNAGAR MUNICIPAL CORPORATION.
25. 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: Construction of City e-Bus Depot and Workshop On F.P. No.- 39, TPS-11, Adhevada, Bhavnagar.**

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, 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 Lumpsum 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 **11 Months**, including 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 date of opening of price 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/terms to Bid and agree that they represent a fair estimate of the damages likely to be suffered byyou 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

\_\_\_\_\_  
\_\_\_\_\_

<b>BHAVNAGAR MUNICIPAL CORPORATION</b>				
<b>Name of Work :- BRTS/CITY BUS DEPOT AND WORKSHOP ON F.P. NO.- 39, TPS-11, ADHEVADA, BHAVNAGAR(B.M.C.)</b>				
<b>Schedule B</b>				
<b>Item No.</b>	<b>Item Description</b>	<b>Unit</b>	<b>Total Qty</b>	<b>Total Amount</b>
1	Excavation for foundation upto 1.5 m depth including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	3290.60	
2	Excavation for foundation for depth from 1.5 m to 3.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	1728.32	
3	Excavation for foundation for depth from 3.0 m to 5.0 m including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil	Cum.	24.00	
4	Box cutting the road surface to proper slope & camber for making a base for road work including removing the excavated stuff, and depositing on the road side slopes as directed up to 50 Mt. Lead	Cum.	3697.00	
5	Boring holes 3.5 m deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 Meter for following diameter of pipes.(ii) 250 mm	Each	32.00	
6	Boring holes 2.1 m deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 Meter for following diameter of pipes.(ii) 250 mm	Each	210.00	
7	Providing and laying cement concrete 1:4:8 (1- Cement : 4-coarse sand : 8- hand broken stone aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	Cum.	33.60	
8	Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, Footings	Cum.	23.60	
9	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work upto floor two level in : (C) Ground Beam	Cum.	35.50	

10	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work upto floor two level : (D) Column	Cum.	26.00
11	Providing and laying controlled cement concrete work M200 and curing complete including the cost of form work but excluding reinforcement of reinforced concrete work in : (C) Coping	Cum.	12.00
12	Providing and laying controlled cement concrete M.250 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, footings, Base of columns and Mass concrete.	Cum.	129.00
13	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in (A) Foundation footing base of columns and mass concrete.	Cum.	411.07
14	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Column upto Plinth Level.	Cum.	105.00
15	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from work but excluding cost of Reinforcement for RCC work in Beam. .GB/PB	Cum.	104.70
16	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)(B) Conventional	Cum.	121.15
17	Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each dispoisted layer by ramming and watering.	Cum.	4587.73
18	Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.	Cum.	8901.30
19	Filling in plinth with sand under floors including watering ramming, consolidating and dressing complete.	Cum.	222.50
20	Rolling and Consolidating of soling including filling in depression which occurs during the process with power roller 8 tonne to 12 tonne. and compacting the bed as per specifications to core test 97% compacting complete in all respects to the entire satisfaction of the Engineer-in -charge.	Sq.Mt.	12654.00

21	Providing and laying cement concrete 1:2:4 (1-Cement : 2- Coarse sand : 4- graded stone aggregates 20 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth	Cum.	1755.52	
22	Providing Rubble Pitching with hard stone of approved quality in cement mortar 1:6 (1 Cement : 6 Coarse sand) including leveling up ,Curing etc. complete excluding pointing	Cum.	8.00	
23	Applying general insecticide pest control treatment to floors, cupboards etc including labour material etc. complete. Using Heptachloride 20 EC. As Per 6113_pests Concentration Weight 0.50 percent is recommended one litre chemical emulsion dilute with 39 liter of water will give. Total dilute concentration will be 40 litre inclusive of one litre chemical emulsion application 0.5 Litre chemical / Sqm of surface is recommended as per I.S	Sqm.	1716.00	
24	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from work but excluding cost of Reinforcement for RCC work in Column (G.F.)	Cum.	74.60	
25	Providing and laying controlled cement concrete M.250 work with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for RCC work in Column (F.F.)	Cum.	60.50	
26	Providing and laying controlled cement concrete M.250 work with curing etc. complete including the cost of formwork but excluding the cost of reinforcement for RCC work in Column (S.F.)	Cum.	22.00	
27	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (G.F.)	Cum.	21.40	
28	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (F.F.)	Cum.	18.70	
29	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Lintel/Coping (S.F.)	Cum.	1.10	
30	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (G.F.)	Cum.	144.05	

31	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (F.F.)	Cum.	94.00	
32	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Beam (S.F.)	Cum.	4.50	
33	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (G.F.)	Cum.	13.30	
34	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (F.F.)	Cum.	8.30	
35	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in CHAJJA, (S.F.)	Cum.	0.70	
36	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (G.F.)	Cum.	216.12	
37	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (F.F.)	Cum.	155.00	
38	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in SLAB (S.F.)	Cum.	8.10	
39	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Staircase (G.F.)	Cum.	9.50	
40	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Staircase (F.F.)	Cum.	9.50	
41	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Pardi (G.F.)	Cum.	132.71	
42	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (G.F.)	Kg.	198857.25	



43	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (F.F.)	Kg.	46265.50	
44	Providing TMT Bar FE 500D reinforcement for R.C.C. work including Cutting, bending, binding and placing in position complete upto floor two level (S.F.)	Kg.	6501.50	
45	Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. (G.F.)	Cum.	544.95	
46	Brick work using common burnt clay Building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. for F.F.	Cum.	188.10	
47	Brick work using common burnt clay Building bricks having crushing strength not less than 35 Kg/ Sq.Cm. In Super Structure above plinth level up to floor two level in cement mortar 1:6 (1 Cement: 6-Fine sand) with curing etc. (b)Conventional. for S.F.	Cum.	76.00	
48	Half brick masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in Cement mortar 1:4 (1- Cement : 4 - coarse sand ) in foundation and plinth (B) Conventional (upto 10 ton) (for GF)	Sqm.	86.50	
49	Half brick masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in Cement mortar 1:4 (1- Cement : 4 - coarse sand ) in foundation and plinth (B) Conventional (upto 10 ton) (for FF)	Sqm.	188.15	
50	Providing and Fixing of Mild Steel Hollow Profile Section of 1.25 mm thick for Door Frames of size 125 mm x 65 mm with Heavy Stainless Steel 4' Long Hinges (4 no Each Side). The Frame Should be of Approved Shape, Single Rabate or double rebate as per site Requirement and as per instruction of Engineer incharge the Frame Sections of Doors should be fixed with heavy hold fasts and with Necessary Cement Mortar (1:3;6) Filling inside hollow portion and also include two coat of Oil paint including red lead primer etc complete After Fixing of Frame .	Rmt	141.00	

51	<p>Providing &amp; fixing in position partly fixed and partly openable standard extruded Aluminium door with color anodized hollow section frame of approved shade &amp; pivoted double shutter fabricated from alluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt) and door styles and toprial of alluminium section size 47.5mm x 44.5 mm (of app. Wt. 1.05 kg/ Rmt) Bottom rail &amp; lockrail for door of size 114mm x 44.5mm (of app. Wt Kg./Rmt) and providing rubber gasket and glazing chips around the glass allover including providing heavy handle, heavy lock, bracket, stoppers,Aldrop (Color anodised) 5 mm th. transparent float glass of copper tint (Structural Glass) fixed with rubber gasket and 19 x 17 mm size Glasing Clip same in Bottom Portion with providing 9 mm thick decorative water proof Both side prelaminaaed pressed wood based board with fixing Glasing clips 19 X 17 mm including all required materials labours and equipments as per detailed drwg. as directed.</p>	Sqm.	28.50	
52	<p>Providing &amp; fixing in position standard extruded Aluminium Partition with Colour anodized hollow section frame of approved shade &amp; pivoted without shutter fabricated from alluminium standard section for outer frame size 101 mm x 44.5 mm (of app. Wt. 1.2 kg / Rmt.) and using Glasing Clips of weight of 0.15 kg per running meter and providing rubber gasket around the glass allover including providing 5 mm th. transparent float glass of copper/ gray tint (Structural Glass) fixed with transparent silicon gasket and in bottom panel 12 mm thick prelaminated bothside partical board including all required materials labours and equipments as per detailed drwg. as directed.</p>	Sqm.	171.00	
53	<p>Providing and fixing flush door both side laminated shutter fabricated from 35 mm thick solid core malemine faced three layered pre laminated flat pressed wood based exterior grade bonded BWP/BWR synthetic resin having stemped IS 12823 grade I type II including three coats of lacquer polishing to exposed wooden surfaces and Stainless steel decorative type designs fixtures/fastning etc. including I.T.W. triangular batten patti of size 30 mmX30 mm etc as per architectural detailed drawing and as directed by engineer in charge.</p>	Sqm.	140.25	

54	Providing and fixing FRP frame size 100x50 mm and 28mm thick FRP depress panel shutter having extra reinforcement on sides & edges in Gel coat finish. The core of the shutter & frame is to be filed up with injected fire retardant grade polyurethane foam done in situ alongwith embedded wooden pieces for stiffening & also taking hinges & fintures. The whole FRP frame & shutter is to be water proof weather proof, termite proof & resistance to mild acid/alkali. Rates are to be inclusive of S.S hinges with necessary screws & alluminium fixtures & fastenings & fastener sleeve	Sqm.	56.00	
55	Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 95mm x 24mm x 1.17mm @ wt.of 0.738 Kg/mt , horizontal Three track member size 92mm x 31.75mm x 1.30mm,@ Wt.1.07 Kg/mt , vertical member of size 92mm x 31.75mm x 1.50mm @ Wt. 1.06 Kg/mt with sliding shutters of horizontal member size 40 mmx18mm x1.29mm @ wt.of 0.456 Kg/mt, vertical member of size 40mm x 18mm x 1.29 mm @ wt.of 0.456Kg/mt/ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc	Sqm.	180.50	
56	Providing and fixing window having extruded Aluminium colour anodized Section Frame main Outer Size 63.5mm x 38.1mm x 1.95mm( of Jindal Section No. 4605 @ Wt. of 1.094 Kg./Mt.) Horozontal Two track member size 61.85mm x 31.75mm x 1.20mm(of Jindal Section No. 8687, @ Wt. 0.695Kg./Mt.) Vertical Member of size 61.85mm x 31.75mm x 1.30mm (of Jindal Section No. 8758, @ Wt. 0.659 Kg./Mt.) with sliding shutters of Horizontal member size 40mm x 18mm x 1.29mm(of Jindal Section No. 8947 @ Wt. of 0.456 Kg./Mt.) Vertical Member of size 40mm x 15mm x 1.29mm (of Jindal Section No. 8948 @ Wt. of 0.457 Kg./Mt.) with 5mm thick transparent bronze colour tinted float glass with powder coated Aluminium fittings & fixtures & trasparent silicon sealant glass fixing to frame as per detail etc. complete.	Sqm.	17.85	
57	Providing and fixing standared extruded of alluminium section of size 63mm x 38.10mm x 1.2mm @ Wt. 0.643 Kg/mt with colour anodized alluminium frame for ventilation with 5 mm thick frosted glass as details etc complete for Ventilation	Sqm.	92.00	

58	Providing and fixing M.S. grills of required pattern to marble/granite frames of window etc. with M.s. flats at required spacing and frames around, square or round bars fixed with round headed bolts and nuts or by screws, including oil painting with one coat of primer of approved quality and brand & two coats of synthetic enamel oil paint etc. complete as per detail drawing and as directed by Engineer in charge.	Kg.	4475.00	
59	Providing and fixing 0.75 meter wide and 0.80 meter high sand which type platform including supplying and fixing granite stone 18 mm thick mirror polished stones in top and side position and vertical strip at front over 25 mm thick polished kotah stone platform fixing in top and sides and intermediates supports fixing with cement mortar and adhesive and finishing etc complete.	Sqm.	3.00	
60	P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for light shade	Sqm.	949.85	
61	P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finised with flush pointing & cleaning the surface etc. complete for antiskit	Sqm.	169.50	
62	Providing and laying Vitrified tiles 8 to 10 mm thick , 24" x 24" in skirting risers of steps and dedo on 10mm thick cement plaster 1:3 (1-cement : 3- coarse sand) and jointed with white cement slurry	Sqm.	656.60	
63	Providing and laying granite slab 18mm thick in flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarsesand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete colour and shed as approved by achitect and engineer in charge.	Sqm.	134.50	
64	Providing and laying polished granite stone slab 18 mm thick in risers of steps, dedo and sill, Jambs of door-window laid on 10 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with gray cement slurry including rubbing & polishing etc. Complete	Sqm.	230.90	

65	Providing and laying polished Kota stone slab flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarse sand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. (A) 25mm thick	Sqm.	1415.00	
66	Providing and laying polished kota stone slab 25mm thick in risers of steps,skirting Dedo and pillars laid on 10mm thick cement mortar 1:3 (1-Cement : 3 coarse sand) and jointed with gray cement slury mixed with pigment to match the shade of slab including rubbing and polishing etc. complete.	Sqm.	586.00	
67	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. Ground floor	Sqm.	1338.45	
68	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. First floor	Sqm.	974.50	
69	Providing 10 mm thick cement mala plaster on ceiling and soffits of stairs for interior upto floor two level, in cement mortar (1:4) (1 cement : 4 sand) etc complete. Second floor	Sqm.	43.00	
70	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. Ground Floor	Sqm.	3442.00	
71	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. First Floor	Sqm.	1806.00	
72	Providing 15 mm thick cement mala plaster in single coat on fair side bricks/concret walls for interior plastering up to floor two level finished even and smooth in cement mortar 1:4 (1 cement : 4 sand) etc complete. Second Floor	Sqm.	395.00	
73	20mm.thick sand faced cement plaster on walls upto height 10 meters above ground level consisting of 12mm. Thick backing coat of CM.1:3 (1-cement:3-sand) and 8mm.thick finishing coat of C.M. 1:1 (1-cement:1-sand) etc. complete.	Sqm.	6165.25	

74	Providing 20 mm thick water proof cement plaster using water proofing powder 1Kg/1bag of cement for all floors on brick / concrete wall work using water proofing materials in C M 1: 4 ( 1 cement 4 coarse sand) including finishing with a floating coat of neat cement slurry etc complete for all floor. and shall be guaranteed for minimum period of 10 years after handing over the completed building by the main contractor to be finished as directed. Stamp paper guarantee 10 years to be furnished before receiving any payment from the client.	Sqm.	294.68	
75	Providing throating or plaster drip and moulding to R.C.C. Chajja etc.comp	Rmt	550.40	
76	Prov.20mm deep finished groove etc.comp	Rmt	7387.15	
77	Providing and fixing chicken wiremesh jali at R.C.C. masonry joints at any height with all labour & material etc. complete.	Sqm.	4021.50	
78	Applying two coats of birla(White cement based) or Asian (acrylic lappy putty) or equivalent two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other matter foreign and sand papered smooth.	Sqm.	10255.00	
79	Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.	Sqm.	7560.00	
80	Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on ceiling and slopping roofs to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.For All Floors.	Sqm.	131.00	
81	Finishing wall with weather proof exterior emulsion paint (Apex) on wall surface (two coats) to give an required shape even shade and including priming coat and after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete.	Sqm.	5073.00	
82	Finising wall with weatherproof exterior emulsion paint on wall surface (two coats) to give and required shape even shade after thoroughly brushing the surface to remove all dirts , and remains of ioose powdered materials etc. complete. two Coats of primer has to be applied.	Sqm.	1092.25	

83	Texture paint- Providing and applying textures paint (Apex Duracast Dholpurtex,Spatula/Trowel) as per manufacture's specification including material is first deposited to the surface of using trowel/spayula of 2-2.5 mm thick and getting final finish use plastic trowel and topcoat with antialgal and anti fungal pant (like Asian-Apex ultima) for final touch as per instruction of architect/Engineer in charge.	Sqm.	900.00	
84	Painting two coats (including priming coat ) on new steel & other metal surfaces with enamel paint brushing interior to give an even shade including cleaning the surface of all dirt , dust & other foreign matter.	Sqm.	1415.10	
85	Providing cement vata, 10 cm. x 10 cm. size, quarter round in cement mortar 1:1 including neat cement finishing, watering, etc. complete.	Rmt	1006.20	
86	Providing and laying chaina mosaic water proofing treatment on terrace including applying neat cement slurry 2.75 Kg./Sqm. Of cement admixed with water proofing compound after cleaning the surface (b) laying cement concrete usig brick bats 25 to 100 mm size with 50% C.M. 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound over 20 mm thick layer of C.M. 1:5 to required slope including rounding of junction of walls and slabs (a) after two days of proper curing applying a second with 20 mm thick C.M. 1:4 and china mosaic tiling and finally finishing the surface with trowel white cement slurry (e) after finishing the whole terrace shall be flooded with wateweeks.	Sqm.	951.00	
87	Supply & Fixing of Broken Glazed (China Mosaic) tiles size 5-6 mm thick of different size and shade (approved crazy patern) in Cement:Mortar 1:2 and joint filling with White Cement / Coloured Cement with water proofing component including Ramping, Watering, Curing etc. complete (FOR ALL FLOOR)	Sqm.	87.35	
88	Steel work welded in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. [A.] In beams and joists, channels angles tees, flats with connecting plates or angle cleats as in main and cross beams, Hip and jack rafters, purlins connected to common rafters and the like.	Qntl	1229.60	

89	Providing and Fixing 90 cm high stainless steel railing made from anticorrosive 304 grade S.S. Staircase Railing modular type welded fitting (S-Rail SR11 Square Type Steel Baluster), Main hand Rail pipe (DASA Pipe) 50mm outer dia 1.6 mm Thickness SS 304 Grade, Balustar steel square type 32X32mm outer dia. 1.6mm thickness ss 304 pipe, 3 pipe below main dasa pipe 16 mm outer dia. 1.6mm thickness ss304 grade as a vertical support fixed in RCC S.S. pipe with steel modular type fitting baluster including all type accessories as per detailed drawing as directed etc. complete for all floors.	Rmt	39.50	
90	The providing & fixing of Fix louvered work. The main frames both verticals and horizontals have to be Aluminium pipes of 100 mm x 50 x 3.0 mm with colour anodized 20 micron (silver) thick all colour anodized of 15 microns. including All hardware, labour, scaffolding, fixtures, fasteners transport and all other taxes included etc. complete as per architect's details at all floor levels.	Sqm.	158.40	
91	Providing corrugated G.I. sheet of class-3 roofing fixed with galvanized iron J or L Hooks, Bolts and nuts 8mm diameter with bitumen and G.I. limpet washer or G.I. limpet washer. filled with white lead complete excluding the cost of purlins, Rafters and Trusses.(1) 0.80 mm thick sheet.	Sqm.	1865.00	
92	Providing & fixing 150mm wide 450mm over all semicircular plain G.I. sheet class-3 gutter with iron brackets 40mm x 3mm size bolts, nuts, washers etc. including marking necessary connection with rain water pipes. (i) 0.63mm thick	Sqm.	104.00	
93	Providing and laying and fixing 50mm thick expansion joint by hydro cell semi rigid UV resistance with high performance laminated closed cell polythene foam joint filler in sheet foam as directed, etc. complete.	Sqm.	18.00	
94	Providing and fixing hot dip Concertina Coil of 610 mm. dia made out of 2.59 mm. (12SWG) hot dip galvanized ( G.I. coating not less than 200 gm / s.m. )th. Wire having 80 nos. of spies and 200 nos. of clips made out of stainless steel (AISI 304) 1.5 mm thick. Dia, G.I. Strips 0.5 mm. ht. (G.I coating not less than 120 gm / s.m. ) weight of one coil should not be less than 15 kg etc. complete, at the top of compound wall fixed with S.S clips and binding wires wherever necessary etc. complete. (Note : Stretching length of one coil should not be more than 9 m.)	Sqm.	510.00	



95	Steel work welded in built up sections, frame work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint :- (A) In beams and joists channels angles, tees, flats with connection plats or angle cleats as in main and cross beams, hip and trussed purlins connected to common rafter and the like.	QUINTAL	9.00	
96	Providing, fabricating & fixing steel works for M.S. grills of windows of required design/pattern as per drawing including cutting, bending, welding and fixing, using M.S. flats, angles, square or round bars, hollow square/rectangular sections & necessary steel sections with fitting in RCC / clamping /screwing, including applying a primer coat of red lead paint/oxide and two coats of oil painting as per drawing & directed by E.I.C etc complete. at all floors.	Kg.	701.00	
97	Providing and fixing rolling shutters of approved make made of 80 mm wide M.S. laths inter-locked together through their entire length and jointed together at the ends by end locks mounted on specially designed pipe shaft with bracket plates, guide channels and arrangements for inside and outside locking with push-pull operation including the cost of hood cover and spring etc. complete. (A) Shutters having width below 3.5 M.	Sqm.	18.00	
98	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting make or equivalent as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at every two meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (i) 15mm dia.	Meter	400.00	
99	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting make or equivalent as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at every two meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (ii) 25mm dia.	Meter	420.00	

100	Providing laying and jointing in true line and level U.P.V.C. Pipe (SCH-40) including fitting of PRINCE/SUPREME/ASTRAL/FINOLEX or equivalent make or as approved by Engineer In charge. Pipe shall be fixed on the wall with the help of clamp at every two meter C/C or shall be concealed as directed including necessary fitting etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. (i) 40mm dia.	Meter	250.00	
101	Providing and fixing 15 mm dia brass chromium plated screw down bib taps.	Each	24.00	
102	Providing and fixing brass Cromiam Plated brass half trun Flush cock of approved quality including fixing in pipe line etc Complete. 25mm dia.	Each	31.00	
103	Providing & fixing gun metal check or non-return full way wheel valve (A)15 mm dia.	Each	6.00	
104	Providing & fixing gun metal check or non-return full way wheel valve (C)25 mm dia	Each	6.00	
105	Providing & fixing gun metal check or non-return full way wheel valve (E) 40 mm dia	Each	6.00	
106	Providing and fixing 600 x 450 mm bevelled edge mirror of superior glass with mounted on 6mm thick A.C sheet or plywood sheet and fixed to wooden plugs with C.P brass screws and washers.	Each	16.00	
107	Providing & fixing C.P. Brass towel rails complete with C.P. brass brackets fixed to wooden plugs with C.P. brass screws (B) 600 mm x 20 mm size	Each	16.00	
108	Providing erecting and fixing double coated Syntex PVC. (ISI) water tank of required capacity each with all necessary fittings and connection etc. complete on terrace.	Liter	10000.00	
109	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having national sanitation foundation seal for potable water of following dia. Nominal bore tube fitting and clamps including making good the wall, ceiling and floor etc. complete. : 15 mm dia.	Meter	200.00	
110	Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having national sanitation foundation seal for potable water of following dia. Nominal bore tube fitting and clamps including making good the wall, ceiling and floor etc. complete. : 25 mm dia.	Meter	275.00	
111	P/f SFRC cover for chambers with locking arrangements including frames and fittings in the plaster on top of RCC cover 450x 600mm size	Each	10.00	

112	Providing and constructing B.B. masonry in C.M. 1: 6 ( 1. Cement, 6 coarse sand ) and cement concrete 1: 2: 4 ( 1 Cement, 2 sand, 4 graded stone agg. Of 20 mm nominal size B.T. kapachi )SEPTIC TANK of 3 M X 0.9 M X 1.5 M internal dimension with necessary compartment of grit chamber and septic tank with necessary inlet and outlet connection with cement plaster ( 15 mm thick ) in C.M. 1: 4 (1 cement, 4 sand) with water proofing materials 1: 5: 10 ( 1 Cement, 5 Sand, 10Brick bats aggregate 40 mm nominal size ) brick bats concrete bedding R.C.C.1:2:4 top cover slab 12 cm. thick with C.I. Cover of 60cm. X 45 cm. size (light duty ) 75 mm. dia PVC SWR ventilating pipe 2 mtr. Long with cowl vent, 40 mm thick I.P.S. flooring 10 cm. thick cement vata mild steel for slab and finishing to exposed faces in C.M. 1:3 ( 1 Cement, 3 Sand ) curing etc comp. as directed by E.I.C.	Each	4.00	
113	Providing and construction SOAK WELL OF 2.50 M. dia. & 5.00 M. depth clear dimension incl. B. K. masonry solid and honey comb masonry in C.M. 1:6 ( 1 cement, 6 sand ), R.C.C.1:2:4 ( 1 cement, 2 sand, 4 graded stone agg. 20 mm nominal size of B.T. kapachi ) top slab thick with C.I. manhole cover 60 cm. X 45 cm. size ( medium )75 mm C.I. ventilating pipe 2 M. long with 75 mm dia. Cowl vent and incl. filling brick bats of required size and depth incl. cost of reinforcement excavation refilling finished top of slab with C.M. 1:3 ( 1 Cement, 3 sand ) curing etc. comp. as directed by E.I.C.	Each	4.00	
114	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 300mm	Rmt	200.00	
115	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 450mm	Rmt	240.00	
116	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 600mm	Rmt	160.00	

117	Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(H) 900mm	Rmt	70.00	
118	Providing and fixing to wall, ceiling and floor 10.0 Kg f/cm <sup>2</sup> working pressure polythelene pipes of the following outside dia. high density, complete with special flange compression type fittings wall clamps etc. including making good the wall, ceiling and floor 75mm	Rmt	260.00	
119	Providing and fixing P V C SWR pipes (IS 13592) spigot and socket soil waste and ventilating pipe of the following nominal size 110 mm dia	Rmt	340.00	
120	Providing and fixing P V C SWR pipes (IS 13592) spigot and socket soil waste and ventilating pipe of the following nominal size 160 mm dia	Rmt	130.00	
121	Provdg. & fixing on wall face PVC rain water pipe of Finolex, Supreme, Kishan or Prince brand is used incl. filling the joints with spun yarn soaked in neat cement slurry and cement mortar 1:2 (1 cement : 2 fine sand) . PVC pipe 6 Kg/Sqcm. (ii) 110 mm Dia	Rmt	125.00	
122	Providing and fixing PVC SWR Nahni Trap IS 14735 for drain with jali of the following nominal diameter of self cleansing design with C.I. Scream down or hinged grating including the cost of cutting and making good the walls. (i) 100 mm dia	Each	58.00	
123	Providing & Fixing white or coloured glazed China Veterious China Orissa Pattern water closet squatting (Indian Type)pan size 580 mm. x 440 mm. including providing and fixing vetrrious china 100 mm. size S or P trap including jointing the trap with pan and soil pipe in C.M. 1:1 including all fitting and fixtures.Whitr Colour (Long Pattern )	Each	6.00	
124	Providing & fixing wash down Water closet (European type W.C.Pan of Cera or Hindware brand)with integral 'P' or 'S' trape including jointing the trape with soil pipe in cement mortar 1:1[1-Cement:1-Fine sand], plastic seat and cover for wash down water closet with C.P.Brass hinges and rubber buffers. [A] Vitreous China pattern in white colour.	Each	22.00	
125	provdg. & Fixing urinal of approved quality incl. connection with trap and with integral longitudinal flush pipe. (A) Squating plate pattern white earthenware 550mm x 300mm.	Each	17.00	

126	Providing and fixing Veterious China flat back wash basin with single hole for pillar trap with CI or MS brackets painted with including cutting holes and making good the same including all necessary fittings in white colour.including pillar trap15mm Dia & Waste Pipe 32mm Dia	Each	14.00	
127	Providing and fixing ( 600 X 450 X 150 mm) size vitreous china laboratory sink with CI or MS brackets painted white including cutting holes in wall and making good the same 40 mm dia CP waste couplin rails etc. complete.	Each	15.00	
128	Providing and fixing in position cowl vent to pipes : (ii) 75 mm. Dia.	Each	15.00	
129	Providing and fixing in position cowl vent to pipes : (ii) 110 mm. Dia.	Each	28.00	
130	Providing and fixing G.I. Rain water spout of 50mm dia. and 30cm. length.	Each	4.00	
131	Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight.(i) Square mouth traps. (A) 100mm x 100mm size P type.	Each	11.00	
132	Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm <sup>2</sup> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm intenal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slabe with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(i) Inside dimensions 455mmx 610mm and 450mm deep for single pipe line.	Each	65.00	
133	Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber.(ii) for 455mm x 610mm size.	Each	38.00	

134	Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm <sup>2</sup> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg. ) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete.(ii) Inside dimensions 500mm x 700 mm and 450mm deep for pipe line with one or two inlets.	Each	16.00	
135	Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber.(ii) for 500mm x 700mm size.	Each	48.00	
136	Providing and fixing pre- cast concrete kerb stone of gray cement based concrete block 30 cm length, 30 cm height and 15cm thick of 250 grade concret as per approved design and including excavation for fixing in proper line and level, fillig the joint with C: M 1:3 ( 1 Cement : 3 Fine Sand) etc. complete	Rmt.	113.00	
137	Providing, laying, spreading and consolidation graded stone aggregate to wet mix macadam 150mm compacted thick as per MORT & H specifications including premixing the material with water at OMC in mechanical plant carriage of mixed material by tippers to site, laying in uniform layers with paver in sub base/ base course on well prepared surface and compacting with vibratory roller to achieve the desired density	Cu.Mt.	1899.00	
138	Providing & laying of specified compacted thickness Granular sub base (GSB) in specified grading in table 400-1 of the specification MORT&H and compactor to the required density with 8 - 10 tonne vibratory roller with plain drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement .( fully saturated having CBR value greater or equal to 30) compacted thickness of 150 mm consisting of Machine crust stone aggregate as per grading 1 in table 400-1 of the specification MORT&H fifth Revision	Cu.Mt.	1899.00	

139	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.	Sq.Mt.	331.00	
140	Dry Lean Cement Concrete Sub- base (Construction of dry lean cement concrete Sub-base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600- 1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.)	Cu.Mt.	1849.00	
141	Cement Concrete Pavement: Providing and Laying of un-reinforced, dowel jointed, M40 pavement cement concrete pavement over a prepared sub base with 53 grade cement with coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing Compound, finishing to lines.	Cu.Mt.	3697.00	
142	Carring out plinth treatment to post construction / existing structure by spraying chemical solution for termite control treatment including labour and material consistment with I.S.I specification. Using Chlordene and Chiorpurfiles 20 EC. As Per 6131_paret-II Consentration Weight one percent is recommended i.e one litre 20 EC chemical emulsion with 19 liter give 1 % concentration inclusive of one litre chemical emulsion appication at the rate of 5 Litre chemical / Sqm of surface is recommended as per I.S	Sq.Mt.	98.90	

143	Providing and laying 20 mm thick water proof cement plaster using water proofing powder 1Kg/1bag of cement for all floors on brick / concrete wall work using water proofing materials in C M 1: 4 ( 1 cement 4 coarsrse sand) including finishing with a floating coat of neat cement slurry etc complete for all floor.	Sq.Mt.	29.00	
144	Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and oraganic mater and grading as per I.R.C. Code.(iii) 25mm	Cu.Mt.	1.00	
145	Supplying of crushed stone aggregates, chippings etc. of hard stone of following nominal size free of disintegrated pieces deleterious and oraganic mater and grading as per I.R.C. Code.(ii) 40mm	Cu.Mt.	2.00	
146	Spreading the stone aggregate including filling the interstices to required camber and gradient (excluding spreading of Blindage)(iii) 25mm to 50mm size crushed stone	Cu.Mt.	3.00	
147	Drilling 300 mm dia pilot bore at above site in all strata by mud flush direct rotary rig/reverse rotary rig. From 0.00 mt to 220 mt .	R.Mt.	90.00	
148	Reaming of 300 mm dia bore hole including assembling , jointing lowering housing casing strainer pipes and gravel and assemble item with gravel packing and clay packing 500 mm dia hole for 200 mm dia pipe	R.Mt.	90.00	
149	Supply of clay ball having Size of 25 mm to 50 mm	Cu.Mt.	1.00	
150	Supply of gravel of Selected Size 4 mm to 10 mm	Cu.Mt.	5.00	
151	Cement Sealling	Job	1.00	
152	Lowring of drop line & air line : Lowring 200 mm dia. Dropline (Blind & Slotted pipe) and 32 mm GI air line for devlopment of each water bering zone coming across the full depth of tube well for each zone	R.Mt.	90.00	
153	Supply and delivery of PVC blind pipe 200 mm dia as per IS: 12818	R.Mt.	50.00	
154	Supply and delivery of PVC slotted pipe 200 mm dia as per IS: 12818	R.Mt.	40.00	
155	Supply of (A) M.S. bore clamp -for 300 mm dia. Pipe	No.	1.00	
156	Supply of (B) M.S. bore Plug-for 250 mm dia. Pipe	No.	1.00	
157	Supply of (C)M.S. bail plug.-for 300 mm dia. Pipe	No.	1.00	
158	Supply of (D) Steel bent plats -for 300 mm dia. Pipe size-200 X 150 X 6 mm.	No.	1.00	



159	Providing, laying and jointing in true line and level 160 diametre U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant.	R.Mt.	5.00	
160	Providing and supplying in standard length ISI mark rigid unplasticised PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material etc. complete. Test Pressure 10 Kg/cm <sup>2</sup> (160mm dia. pipe)	R.Mt.	300.00	
161	Providing and supplying in standard length ISI mark rigid unplasticised PVC pipes suitable for potable water with ring fit joint including cost of rings, as per IS specification no. 4985/1988 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to the departmental stores and including cost of jointing material etc. complete. Test Pressure 10 Kg/cm <sup>2</sup> (200mm dia. pipe)	R.Mt.	300.00	
162	Lowering, laying, fixing and jointing PVC/uPVC/cPVC pipes and specials of following class and diameter including cost of conveyance from stores to site of works including cost of labour, material, cement solvent, giving satisfactory hydraulic testing as per ISI code (160mm dia. pipe)	R.Mt.	300.00	
163	Lowering, laying, fixing and jointing PVC/uPVC/cPVC pipes and specials of following class and diameter including cost of conveyance from stores to site of works including cost of labour, material, cement solvent, giving satisfactory hydraulic testing as per ISI code (200mm dia. pipe)	R.Mt.	300.00	
164	Providing and laying white glazed tiles 6mm thick in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand ) finishing with flush pointing in white cement.	Sq.Mt.	303.88	
165	Supplying & fixing C.I man hole cover 0.60mt x 0.45mt size having weight not less than 35 Kg.	Each	12.00	

166	Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35- 2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide liminance coefficinet on cemend road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section- 15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.	Sq.Mt.	272.00
167	Providing and laying controlled cement concrete M250 work with curing etc. complete including the cost of from workbut excluding cost of Reinforcement for RCC work in Pardi	Cu.Mt.	57.00
168	Providing and Fixing Pre-cast R.C.C. Drain Cover Using controlled cement concrete work M250 and curing complete including the cost of form work and including the cost of reinforcement	Each	356.00

169	<p>Providing approved make oil immersed ONAN cooled, double wound, core type indoor / outdoor copper wound 11KV/ 433V step down transformer of following capacities operating on 3 phase, 50 Hz 4 wire &amp; neutral earthed system continuously rated for a full temperature rise in oil not exceeding 45 Deg.C.at maximum ambient temp. of 50 Deg. C. complete with necessary radiator first filling of new transformer oil &amp; standard fitting as below complying with IS 1180( Part 1 ):2014 standards with energy efficiency level 2 Off load tap changing range manufacturers steps +2.5% to 5% on H.V for variation should be provided. The H.V. shall be connected Delta &amp; Secondary with star connection. The transformer should have cable-end boxes on H.T. side suitable for up to 3 core 150 sq.mm. XLPE cable &amp; on L.T. side suitable for bus duct or cables as per requirement complete with test certificates from 1. Oil conservator with filling Hole</p> <p>&amp; Cap - One No.</p> <p>2. Thermometer pocket with 6" dial type thermometer switch alarm &amp; trip contacts- Two nos.</p> <p>3. Silica-gel breather with charge- One No.</p> <p>4. Plain oil level gauge - One No. 5. Drain / Sampling / Filter valve- One No.5. Drain / Sampling / Filter valve- One No.</p> <p>6. Top Filter Valve - One No.7. Explosion vent with Diaphragm - One No.8. Rating &amp; Diagram plate - One No.</p> <p>9. Additional neutral bushing for earthing - One No.</p> <p>10. Bi directional Roller - Four Nos.</p> <p>11. Earthing terminals - Two Nos.</p> <p>12. Lifting lugs - Two Nos.</p> <p>13. Air release plug. - One No.</p> <p>14. Double float buchholz relay with Alarm and trip contacts.</p> <p>15. Control cable as required from Transformer to VCB Panel is</p>	Ea.	3.00	
170	<p>Providing, and erecting 11 KV D.P. 9 mtr. high Structure made of 6" x 3" 'I'-Section Girder, 4" x 2"channels, clamps, nuts, bolts etc. Suitable for erection of the followings duly connected with necessary ACSR conductors. as per drawing approved by the Engineer- in charge complete with following. Height as per IS 7 Mtr above ground ) (A) 11 KV 200 Amps Drop out fuses with S.R.B.P. tubes carries.-Three nos (B) 11 KV G.O.D. switch complete with insulators, operating handle with galvanised pipe, Sq.bar etc. 400 Amp.- One Set (C) 11 KV lightning arrestor with clamp- Three Nos. (D) 11 KV shackle insulators- Six Nos. (E) The above D.P. structure should be earthed with 25 mm.X 3 mm thick double copper earth strips run separately and connected with separate copper plate earth electrode. (Near GEB feeder)</p>	Ea.	2.00	
171	<p>Supplying rubber matting of following thickness as per IS:15652/IEC 61111 (c)12mm</p>	Sq.Mtr	30.00	

172	<p>Outdoor type enclosure having modular construction of 1.6/2mm Cr steel sheet IP54 for HT component. Enclosure shall be painted with pure polyester based powder coated paint. The bottom base frame shall be welded and black painted channel structure with fitting arrangement for the RMU. Each component is provided with door and pad locking arrangement. The component illumination lamp with door operated switch shall be provided for each component. having earth busbar aluminium size of 50 x 6 sq. mm</p> <p>SF6 gas insulated Compact Outdoor VCB: Sheet steel enclosed, free standing, indoor mounted, 11 kV, 630A, 21kA/3s, 5-WAY Non - extensible RMU, consisting of 5Nos. Fixed VCB (Manual charging &amp; closing), mechanical ON/OFF indicator, trip coil, Manual Close &amp; Trip PB, live cable indicator, mechanical interlocks, pad locking facility, SF6 gas manometer, cable boots,</p> <p>CTs ratio: 100/1+1A, 2.5VA/2.5VA, CL: 1.0/5P10</p> <p>Self-Powered Relay 30/C + 1E/F (50,50N,51,51N)</p> <p>Numerical Relay</p> <p>Air Insulating Metering Unit</p> <p>FIX type PTs ratio: 11kV/V3 / 110/V3, CL: 1.0, 100VA</p> <p>Digital Multifunction Meter with RS485 port, CI-</p>	Each	1.00	
173	1250Amp Outdoor type Vacuum tube circuit breaker with Installation.	Ea.	3.00	
174	<p>providing and erecting Approved make standard Draw out type 3 Pole Air circuit breaker. Having following kA breaking capacity with ICU=ICS=ICW (1 sec)Vsr=690 v, Ui=1kv, impulse voltage=12 kv with following type of relay and accessories. (1) Manual Draw out type (MDO) with following type of relay system (B) with microprocessor Release with over load, short circuit, earth fault protection (L.S.I.G.) and metering display in modular design with LED display and Test Trip button facility, CTs and auxiliary contacts, of following current ratings (viii) 4000 Amp 80kA Cat III</p>	Ea.	3.00	
175	<p>Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 50 KA and above at 415 V having Normal current rating 400A. with variable Thermal &amp; magnetic release suitable to work on A.C.supply 50 c/s. With all internal connections, spreader tinned copper &amp; complete erected in existing 16 G.M.S. housing. ICS=100% of ICU only Cat III</p>	Ea.	30.00	

176	Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections. (G) Suitable for 1200 Amp. Capacity	Rn.Mtr	40.00	
177	Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board necessary IP-42 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accesories , supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating. (B) The standard companies switch gear shall be used and only manufacturers at CPRI approved factory (iv) with 1000 mm depth	Sq.Mtr	10.00	
178	Providing & erecting L.T. Current Transformer with bar primary 50/5 to 1000/5 ratio 15 VA burden erected in existing CRCA box duly secured with insulating materials connected to the meter	Ea.	150.00	
179	Supplying and erecting approved make set of indicator lamps of LED type lamp, lens cover, Bakelite holder complete erected with necessary connections.	Ea.	42.00	
180	providing and erecting Approved make Earth fault Relay suitable to mount with inter connection suitable to following size of moulded case circuit breaker having CT ratio & MCCB rating as following along with shunt trip 220V AC. with all internal connections & complete erected in existing M.S.housing.. (4) 600 A -800 A , CT Ratio 1/800	Ea.	3.00	

181	Supplying and erecting approved make panel mounting type Digital Voltmeter having 3 digits LED display, 0 to 750 AC Volts range erected on existing panel board with all connection, wiring etc .with manufacturers calibration certificate.(make: havells , L & T , Simens , legrand , ABB,Hager) (1 for ac panel, 1 for main panel)	Ea.	3.00	
182	Supplying and erecting approved make panel mounting type Digital Ammeter having 3 digits LED display, external CT operated, calibrated for 0 to 1000 Amps suitable to operate on 500 Volt AC , erected on existing panel board with all connection, wiring etc .with manufacturers calibration certificate.	Ea.	5.00	
183	providng and erecting Approved make energy meter 3 phase 4 wire unbalanced load rating, 10A to 60 Amp. based on ASIC(Application specific Integral Circuits) digital technology with accuracy Class - 1 , temper proof, free from effect of external magnetic field with 3 phase indication, earth & impulse indication, 6 digit electro mechanical impulse counter, suitable work on 120 V to 300V per phase 45-55 HZ, housed in robust enclosure with erection as directed. Cat. III	Ea.	3.00	
184	Supplying and erecting Ammeter / Voltmeter selector switch for 3 phase AC Supply 500 V on existing panel board with necessary connections.	Ea.	15.00	
185	Supplying & erecting approved make Power Factor Meter 150mm dia flush/projection type/ balanced & unbalanced load to work with appropriately provided CT's 100/5A to 400/5A ratio & other accessories complete erected in M.S. box & connected to the circuit by means of PVC	Ea.	3.00	
186	Making trench in soft soil of suitable width of 90 cms deep for laying cable or locating the fault all over the run and backfilling the same and making the surface as normal ground. (only for terminal station, service station and road crossing)	Mtr.	350.00	
187	Providing and erecting cable end termination kit, heat shrinkable Push on type Densons/ Raychem/ Elastimold make suitable for 11 KV XLPE cable 3core 95 & 120 Sq.mm (B) Indoor type	Each	5.00	
188	Providing and erecting cable end termination kit, heat shrinkable Push on type Densons/ Raychem/ Elastimold make suitable for 11 KV XLPE cable 3core 95 & 120 Sq.mm (A) Outdoor type	Each	15.00	

189	Providing and erecting ISI Marked 3core 185 Sq.mm XLPE insulated 11 KV armoured cable Aluminium conductor IS-7098 to be laid on wall with clamps or in provided cable trench / pipe approved manner as directed.	Mtr.	150.00	
190	Providing and erecting cable end termination kit, heat shrinkable Push on type Densons'/ 'Raychem'/ Elastimold make suitable for 11 KV XLPE cable 3 core 185 Sq.mm (B) Indoor type	Ea.	4.00	
191	UG outdoor busduct electroplated grade 91 at support of 500cm capacity of 4000 Amp. Including All related accessories.	Mtr.	30.00	
192	Providing and erecting ISI Marked 3core 300 Sq.mm XLPE insulated 11 KV armoured cable Aluminium conductor IS-7098 to be laid on wall with clamps or in provided cable trench / pipe approved manner as directed.	Mtr.	250.00	
193	Providing and erecting cable end termination kit, heat shrinkable Push on type Densons/ Raychem/ Elastimold make suitable for 11 KV XLPE cable 3core 300 Sq.mm (A) Outdoor type	Each	2.00	
194	Providing and fixing approved make Perforated C type cable tray. Made from sheet steel. The cable tray should be single or double bended as per required and as per IS 2062/1079 and shall be coated with hot dip galvanizing as per IS 2629/4759. with max 17.5% perforation with coupler plate / Fish plate and GI hardware like nut - bolt and washers etc. erection with necessary support( included) as per Specification and as per instruction of engineer in charge.. (6) 450 X 50 X 2.0 mm Thick	Rmt,	150.00	
195	Providing and fixing approved make 'T' Junction for Perforated C type cable tray. Made from sheet steel. The Junction should be bended as per IS 2062/1079 and shall be coated with hot dip galvanizing as per IS 2629/4759. with max 17.5% perforation with coupler plate / Fish plate and GI hardware like nut - bolt and washers etc. erected on existing support as per Specification and as per instruction of engineer in charge of following size (6) 450 X 50 X 2.0 mm Thick	Ea.	2.00	
196	Providing and erecting HOT deep Galvanized iron strip wire 8 to 16 SWG.	Kgs	60.00	

197	Supplying & erecting earth pit of minimum bore dia.150mm size approved make Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 50mm having 80-200 Micron galvanising, Inner pipe dia of 25 mm having 200- 250 Micron galvanising, connection terminal dia of 12mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover.(approved make OEM has to submit test certificate) & having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 • / meter testing as per IEC 62561-2017, Voltage drop:- < 1 volt at no load & dry form, Sulphar content:- <2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted. (b)For Electrical installation up to 11 KV in normal soil. Length of Pipe : 2.00 mtrs Back filling Compound :1 no. Bag of 25 Kg.	Ea.	10.00	
198	(c) For Electrical Installation covering Transformer Neutrals, Lightning arrester Earthing, A.C.Plant & Sensitive Computer System(like Automation, SCADA) i.e independent Earthing in normal soil. Length of Pipe : 3.00 mtrs Back filling Compound :2 nos Bags of 25 Kg.	Each	18.00	
199	Providing and erecting required size HOT deep Galvanised iron strip for earthing of H.T. , OCB/ ACB/ Transformer LT panel board, Motors etc. using proper clamp.	Kg	300.00	
200	Providing and erecting required size Copper strip for earthing of H.T. OCB / ACB/ Transformer, LT panel board, Motors etc. using copper clamp.	Kg	100.00	



201	Supplying and erecting, commissioning and testing of Diesel Generating set confirming to IS: 4722:1968 & BS:5514 having continuous rating, 3 phase, 415 volts, 50 cycles A.C. supply comprising of a totally enclosed air/water cooled diesel engine with multi-cylinders developing suitable BHP not less than following capacity at 1500 RPM with 10% overload for one hour in 24 hours with standard accessories like fly wheel, lubricating oil cooler, "A" class governor, heavy duty fuel wheel and lubricating oil filter, oil bath air filler, lubricating oil pressure gauge, end exhaust manifold, standard set of tools with adjustable spanners, screw drivers, cylinder head to cover, joint cylinder head to exhaust, element lube oil filter, 12 / 24 volts electric starting equipment complete with standard heavy duty battery, dynamo, cut-outs, ammeter, necessary wiring, pressure gauge, starter etc and heavy duty Residential type exhaust silencer and vertical hot air duct both logged with asbestos rope, save oil trays, exhaust piping of required length, standard wall/floor mounted fuel with level indicator and piping and drip proof alternator, self excited, self regulated, screen protected, with excitation system, capable of delivering the rated system output at 415 volts, 3 phase, 0.8 PF, 50 Hz, 4 wire,	0.00	1.00	
202	Supply of Approved make Iron Clad or metal clad four pole change over switch 415V. confirming to IS of following capacity (B) 100 A / 125 A (For bus terminal , maintainance office) Cat III	Ea.	1.00	
203	Providing and erecting busbar chamber confirming to IS-375 fabricated from 16 G.M.S. sheet, dust & vermin proof having hinged door with rubber gasket and necessary busbar supports with Aluminium busbar having current density not more than 0.8 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulation tape for phase sequence, three phase & neutral each Suitable for following current capacity with necessary painting mounted on wall or pedestal frame of required size with necessary connections. (B) Suitable for 200 Amp. Capacity	Rn.Mtr	2.00	

204	Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for (B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI) (b) sheet steel double door (iv)12 way(FOR LIGHTING LOAD)	Ea.	1.00	
205	Providing and erecting Sheet Steel powder coated Vertical MCB distribution board (VTPN) - flush / surface mounted double door (IP54) fitted with copper insulated busbar, isolated neutral bar, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3, suitable for 63/100 AMP TPN MCCB + RCCB as incomer and three phase outgoing as per following .(The DBs should be used of same company of MCB to be used) (C)8 way outgoing (FOR INFRA INDUCTIVE LOAD)	Ea.	1.00	
206	providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on single phase 240 V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed (ii) 40Amps. DP Cat. III	Ea.	3.00	
207	Providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on 3 phase and neutral 415V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component for following Max. rating erected as directed. (ii) 40Amps. FP Cat. III	Ea.	3.00	

208	Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity (A) 6 to 32 Amp. Cat.III '	Ea.	30.00	
209	Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (a) 6 to 32 Amp. Cat.III	Ea.	8.00	
210	Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (c)63 Amp. Cat.III	Ea.	2.00	
211	providng and erecting Suitable set of CTS for 100A Energy Meter	Ea.	3.00	
212	Supply of Fibreglass Platform Step (A Type) Ladder - 6 FT having following specifications : It should have large fully serrated platform 15" wide 20" deep which locks ladder ,Aluminium feet with thick rubber tread, top rail guard to serve as a railing, two pairs of gusset support at the bottom step and All gussets are heavy duty steel. Capacity : 300 lbs. Step Width : 3' Approx. spread : 50" Width : 26.5" Approx. Wt. : 16 Kg Approx. Cube : 8.15"	Ea.	1.00	
213	Supply of Fibreglass Platform Step (A Type) Ladder - 8 FT having following specifications : It should have large fully serrated platform 15" wide 20" deep which locks ladder, Aluminium feet with thick rubber tread, top rail guard to serve as a railing, two pairs of gusset support at the bottom step and All gussets are heavy duty steel. Capacity : 300 lbs. Step Width : 3' Approx. spread : 62" Width : 29.5" Approx. Wt. : 22 Kg Approx. Cube : 11.62	Ea.	1.00	
214	Supply of Fibreglass Platform Step (A Type) Ladder - 10 FT having following specifications : It should have large fully serrated platform 15" wide 20" deep which locks ladder , Aluminium feet with thick rubber tread, top rail guard to serve as a railing, two pairs of gusset support at the bottom step and All gussets are heavy duty steel. Capacity : 300 lbs. Step Width : 4' Approx. spread : 75" Width : 32" Approx. Wt. : 29 Kg Approx. Cube : 15.31	Ea.	1.00	

215	Supply of Fibreglass Platform Step (A Type) Ladder - 15 FT having following specifications : It should have large fully serrated platform 15" wide 20" deep which locks ladder , Aluminium feet with thick rubber tread, top rail guard to serve as a railing, two pairs of gusset support at the bottom step and All gussets are heavy duty steel. Capacity : 300 lbs	Ea.	1.00	
216	Supply of Fibreglass Platform Step (A Type) Ladder - 18 FT having following specifications : It should have large fully serrated platform 15" wide 20" deep which locks ladder , Aluminium feet with thick rubber tread, top rail guard to serve as a railing, two pairs of gusset support at the bottom step and All gussets are heavy duty steel. Capacity : 300 lbs.	Ea.	1.00	
217	Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand / Solid Copper conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe at road crossing or floor of following size of cables. (B) 4 core 4 Sq. mm (FOR STREET LIGHT)	Mtr.	400.00	
218	Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Copper conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe at road crossing or floor of following size of cables.(A) 4 core 10 Sq. mm (FOR HIGH MAST)	Mtr.	500.00	
219	Making trench in soft soil of suitable width of 90 cms deep for laying cable or locating the fault all over the run and backfilling the same and making the surface as normal ground. (only for terminal station, service station and road crossing)	Mtr.	350.00	
220	Providing & laying. R.C.C. hume pipe for cable to be laid 90 cms. below ground across the road crossing or on floor with necessary material in an approved manner and making the ground as per original. (D) 250 mm dia (only for terminal station, service station and road crossing)	Mtr.	100.00	
221	Providing & laying. R.C.C. hume pipe for cable to be laid 90 cms. below ground across the road crossing or on floor with necessary material in an approved manner and making the ground as per original. (B) 400 mm dia	Mtr.	100.00	

222	Providing , erecting , fabricating the M.S. structure as per requirement on site incorporating proper size of M.S. angles,square,round, flats, bars, channels, sections complete with cutting, welding, grinding & finishing duly painted with one coat of red oxide with erection on site as per direction of engineer in charge with necessary grouting, cementing, plastering & finishing complete.	Kg.	260.00	
223	Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II )with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground / road surface for enclosing cable (A)50 mm outer dia	Mtr.	100.00	
224	Providing and fixing approved make 'Cross over Junction' for Perforated C type cable tray. Made from pre galvanized sheet steel. The Junction should be bended as per IS 2062/1079 with max 17.5% perforation and shall be coated with hot dip galvanizing as per IS 2629/4759. with coupler plate / Fish plate and GI hardware like nut - bolt and washers etc. erected on existing support as per Specification and as per instruction of engineer in charge.. (5) 300 X 50 X 2.0 mm Thick Cross Junction (To be fixed in RCC trench for charger point in 2 layer)	Each	800.00	
225	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (B) 2 to 4 core 6 Sq. mm	Each	15.00	
226	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (C) 2 to 4 core 10 Sq. mm	Each	15.00	
227	Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Copper conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (A) 2 core 2.5 Sq. mm	Mtr	30.00	
228	Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Copper conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (B) 2 core 4 Sq. mm	Mtr	20.00	

229	Providing & laying approved make ISI marked Rigid PVC pipe having 6Kg / cm <sup>2</sup> (Class-3) to be erected at road crossing on or floor as directed for laying of cable. The pipes as following size of dia & weight per 6 mtr. (B) 50 mm inner Dia. (2.5Kg/6RMT)	Mtr.	50.00	
230	Providing & laying approved make ISI marked Rigid PVC pipe having 6Kg / cm <sup>2</sup> (Class-3) to be erected at road crossing on or floor as directed for laying of cable. The pipes as following size of dia & weight per 6 mtr. (E) 90 mm inner Dia (8.0 Kg / 6RMT)	Mtr.	45.00	
231	Providing & laying approved make ISI marked Rigid PVC pipe having 6Kg / cm <sup>2</sup> (Class-3) to be erected at road crossing on or floor as directed for laying of cable. The pipes as following size of dia & weight per 6 mtr. (F) 110 mm inner Dia. (11.63 Kg/6 RMT)	Mtr.	45.00	
232	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (A) 2 to 4 core 2.5 / 4 Sq. mm	Ea.	26.00	
233	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (B) 2 to 4 core 6 Sq. mm	Ea.	26.00	
234	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (C) 2 to 4 core 10 Sq. mm	Ea.	26.00	
235	Solder less crimping type Copper lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner.(A) 1.5/2.5 to 6 Sq.mm	Ea.	120.00	
236	Solder less crimping type Copper lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (B) 10 Sq.mm	0.00	60.00	
237	Pipe type earthing having 150 cms.long and 2.5 cms. dia. galvanised iron pipe with coupling and buch buried in specially prepared earth pit complete with necessary 8 SWG earth wire.	Each	28.00	
238	For using salt and charcoal / coke as required for pipe type earthing.	Each	28.00	

239	Supplying and erecting approved make Octagonal pole made from HR sheet steel. The pole should be made as per IS. and shall be coated with hot dip galvanizing as per IS 2629/2633 /4759, suitable suspend local wind speed with integral Junction box consist of terminal plate of min 6mm Hylam sheet, standard profile 35mmX7.5mm Din-Rail for MCB Mounting, stud type terminal and arrangement for cable termination to be erected on foundation as per details given by manufacturer considering site requirement. (E) 7 Mtr. Long 70 mm Top X 135 mm bottom dia, 3 mm thickness with 225mmX225mmX16mm base plate, 4-M20 Bolts and 600mm long J-Bolt.	Each	28.00	
240	Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses, with toughened glass with company mark/name engraved or embossed 160 to 270 V,Power Factor more than 0.95, THD < 10 %, CCT 3000 K to 5700K,Uniformity ratio >0.45, Luminaire efficacy> 100 lumens/watt . LED driver efficiency > 85 %.( fittings required LM-79 & LM-80 certificates) (NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (A) Street Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (i) above 36 to 48 watts Cat-III	Each	28.00	

241	<p>Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses, with toughened glass with company mark/name engraved or embossed 160 to 270 V,Power Factor more than 0.95, THD &lt; 10 %, CCT 3000 K to 5700K,Uniformity ratio &gt;0.45, Luminaire efficacy&gt; 100 lumens/watt . LED driver efficiency &gt; 85 %.( fittings required LM-79 &amp; LM-80 certificates) (NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (B) Flood Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (iii) Above 60 to 90 watts Cat-III</p>	Each	8.00	
242	<p>Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses, with toughened glass with company mark/name engraved or embossed 160 to 270 V,Power Factor more than 0.95, THD &lt; 10 %, CCT 3000 K to 5700K,Uniformity ratio &gt;0.45, Luminaire efficacy&gt; 100 lumens/watt . LED driver efficiency &gt; 85 %.( fittings required LM-79 &amp; LM-80 certificates) (NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (B) Flood Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (vii) above 200 to 250 watts Cat-III</p>	Each	48.00	



243	Providing and erecting street light pole bracket comprising main B Class GI pipe of 4.2 cm/require outside dia. complete with suitable B Class G.I sleeve tubing of approx. 45cms.length and suitable for 76.5 mm / 80mm. / require size pole top having sufficient fasteners for fixing the brackets and having spread of 1 mtr. length with suitable rise as per site condition & suitable welded stiffener reducer and nipple with check nut complete painted with one coat of Red oxide / PU base primer and two coats of Aluminium / PU paint. paint with following nos of arms. [A] Single Arm bracket 1 Mtr	Each	28.00	
244	Providing 1:2:4 cement concrete foundation & 70 % PCC from bottom including excavation for the pole of size 60 x 60 x 120 cm. Deep in below ground level with plinth of 45 cm x 45 cm(or 45 cm dia x 45 cm) high upper ground level with necessary curing and finishing in approved manner. ( for 7.5 & 8/8.5 mtr pole)	Each	28.00	
245	Supplying & erecting IP 55 grade following size section pillar fabricated from joint less M.S. Sheet with angle iron legs made from jointless M.S. Angle with cable clamps to be buried in ground to have appropriate erection to work uniform until erected with cement concrete foundation and 45 cm high bricks work finishing with plaster etc. hinged double door internally supported on both side, with internal and outside looking arrangement with lock and keys in duplicate 35 x 35 x 5 mm M.S. Angle of Two Nos. one is welded and other with nut and bolt for erecting Bakelite sheet. Painting the Section Pillar inside and outside with three tank powder coated paint. section pillar roof should be without joint with water leakage proof & tested as per IP 55 test & followed by IS 2147 of 1962 (A) 150 X 90 X 75 cm section pillar fabricated from 14 Gauge MS Sheet with angle iron legs 95 cm long made from 40 X 40 X 6 mm thick MS angle.	Each	1.00	
246	Supplying and erecting approved make Segment time switch suitable for 230V+10%16A. floating contacts with 24 hour dial having 15/30 min. segments with early manual override switching for on & off without influencing the program sequence with quartz time switch With power reserve, housed in fire proof thermoplastic enclosure & transparent cover terminal covers erected as required wire necessary connection erected as directed.	Each	1.00	

247	Supplying, erecting, testing, commissioning approved make M.S. Polygonal High Mast Pole having following general Specification. (a) Polygonal Section fabricated from M.S. Plate confirms BSEN 10025 & Hot deep galvanized minimum 65/86 micron (as per IS 2629 /1985) Lantern carriage with ring and rubber lines for erection of luminaries of suitable site. (b) Maximum telescopic section not more than four (c) Double drum gear pipe motorized winch with 6mm dia S.S. Rod (For 16 mtr and above size) (d) Approved make L.E.D. aviation light = 1 No. Lightening arrestor = 1 No. with necessary wiring of 2.5 sq.mm 5 core ISI copper cable Unarmoured. (e) Bottom most section suitable for mounting reversible motor and switchgears having door not more than 1400mm x 300mm with waterproof gasket & hinges & locking arrangement. (f) Pole structure comprises suitable size of reversible motor, cable and necessary switchgears with control panel. (g) bottom section shall have suitable size of thickness supports ribs foundation bolts nuts etc. (h) Item not comprises the cost of lanterns. (i) Necessary Cement Concrete foundation as per IS including testing & commissioning of the entire structure for following size of High Mast poles [8]	Each	4.00	
248	Approval & Liasioning work for Obtaining the necessary legal permissions from the concern govrnment authorities, including to prepar drawings before/after execution for the work etc complete as directed by E.I.C (Certificate For LIFT, Highrise Permission DG set. Also for Power supply meter connection) It includes charges of Name Transfer of Electric Meter of each flat as well as service Meter.	Job	1.00	
249	Iron Road Safety Automatic Boom Barriers Gate With Sensor Or Rfid Cards, For Parking	Each	4.00	
250	Providing and fixing printed instruction chart both in English and Gujarati and duly framed with front glasses, for treatment of person suffering from Electric shock with minimum 50" diagonally size.	Each	3.00	
251	Providing pair of rubber hand gloves suitable for working on 11 KV/22 KV supply.	Each	4.00	
252	Supplying stand first AID box with antiseptic cream, medicine for use on wounds due burn, crepe bandage, gauge bandage, medicated ready to use bandage (Band-aid) adhesive tape for medicinal user, Scissors, anti-septic solution (Savlon or similar) etc. (All above contents shall be of standard makes)	Ea.	2.00	

253	Supplying FIRE bucket round bottom of 9 litres capacity made out of 24 gauge G.I. sheet with extra handle at bottom duly painted white inside and Red out side with FIRE mark, filled with dry-sand and kept on existing stand provided or hung on wall hook.	Ea.	8.00	
254	Supplying and erecting floor mounting stand for keeping four nos. of FIRE buckets comprising 1500 mm in length, 900 mm height frame made out of 30mm X30 mm X 4 mm angle iron with cross supports for legs, welded with 4 hooks and duly painted with one coat of red lead and two coats of approved enamelled silver paint.	Ea.	2.00	
255	Providing and erecting metallic vitrified danger notice board as per language suggested by engineer incharge for MEDIUM VOLTAGE installation to be erected as per IS-2551.	Ea.	4.00	
256	Providing and erecting metallic vitrified danger notice board as per language suggested by engineer incharge for HIGH VOLTAGE installation to be erected as per IS.-2551.	Ea.	6.00	
257	Providing & erecting Medium Voltage Danger Notice Board sticker as per language suggested by engineer incharge of standard size as per IS-2551	Ea.	125.00	
258	Providing & erecting High Voltage Danger Notice Board sticker as per language suggested by engineer incharge of standard size-as per IS 2551	Ea.	50.00	
259	Painting the number and words for inventory Identification on erected fittings / equipment's or Such accessories as may required with good quality of enamelled paint as directed by engineer in charge. (i) up to 20 characters, up to 50 mm height.	Ea.	150.00	
260	Painting the number and words for inventory Identification on erected fittings / equipment's or Such accessories as may required with good quality of enamelled paint as directed by engineer in charge. (iii) Add for additional each 25mm. height	Ea.	100.00	
261	Supplying & erecting single phase approved make industrial exhaust fan suitable for medium duty ring mounted low noise operation suitable for medium duty having following dia size and maximum speed in RPM [D] 450 mm dia 900 RPM Cat.II	Ea.	4.00	

262	Supplying and erecting approved make double ball bearing oscillating type Heavy duty bracket fan with Aluminium Blades A.C. 230V. 50cy/s wall mounted with height adjustment and rotary tilting device complete with guard, wall bracket,mounting accessories as directed. (C) 750mm	Ea.	4.00	
263	Providing & erecting stand alone ceiling mount PIR motion Sensor with ABS Housing single phase AC operation. Complete with Dual element pyroelectric sensor, Digital Signal Processing Detection Range 14 feet at 10 feet height, angle 360 degree, RFI and EMI immunity, Detects motion in it's coverage area. Multipurpose device can be used as security device, an energy saving device, an automatic switch. Complete with infra red sensor, Light & sensitivity Sensor, Timer with Bye pass facility. Suitable for 400 watts electrical load	Ea.	6.00	
264	Point wiring for Light / Bell with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length , in below type of pipe erected with 6A Modular type switch / bell push & accessories and earth continuity of following type, erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D.Connector as directed.(f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete Cat. III	Pt.	270.00	
265	Point wiring for Tissino / Modular secondary light point with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires, in below type of pipe to be erected complete with earth continuity and necessary connection with primary light with accessories erected on Metal / PVC / wooden box covered with 3 mm thick PC(Polycarbonate) / Acrylic sheet for open / concealed wiring. with necessary Lamp holder / ceiling rose / H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete'	Pt.	84.00	

266	Point wiring for FAN with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of .ISI marked 1.1 KV Grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected with 6A Modular type switch and hum free EME step type electronic fan regulator mounted and accessories with earth continuity of following type erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected. with necessary ceiling rose / H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete Cat. III	Pt.	125.00	
267	Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories.[I] For 6A Plug and 6 a switch with 2-1.5 sq.mm Cu. Wire from nearby switchboard/mcb db board (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete Cat. III	Pt.	40.00	
268	Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories.[II] For 16A Plug and 16 amp switch with 2-2.5 sq.mm Cu. Wire from mcb db board. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete Cat. III	Pt.	60.00	
269	Point wiring for on board Looped Plug with 6A Modular type switch & 5 pin socket erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate modules erected on / in wall / ceiling with following type accessories Cat. III	Pt.	45.00	

270	Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size (A) With medium class Rigid PVC pipe and accessories (b) 2 wire 2.5 sq. mm	Mtr	1800.00	
271	providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected in / on wall / ceiling with 2.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size (A) with medium class Rigid PVC pipe and accessories.(h) 4 wire 6 sq. mm	Mtr	120.00	
272	Providing & Erecting approved make following size of TV Co-axial flexible cable comprising inner conductor of solid bare copper insulated with Foam PE & Secondary conductor made of poly - Aluminium film bonded Al. Braids @ suitable coverage overall sheathed with black PVC insulation. b).RG-6	Mtr	150.00	
273	Supplying & erecting approved make Telephone Cable electrolytic copper conductor PE insulation twisted in two pairs, & wrapped with FRLS PVC tape & sheathed with FRLS PVC or HFFR outer Jacket suitable for telephone wiring & confirming to C-DOT erected in existing pipe. of following size of conductors & nos.of pairs. With necessary connections. [A] Conductor Size 0.5 mm (a) Unarmoured 2) Two Pairs	Mtr	245.00	
274	Providing and erecting ISI mark Medium class RIGID PVC PIPES of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed (a)20 mm	Mtr	1550.00	

275	Providing and fixing approved make Ladder type cable tray. Made from M.S sheet. The cable tray should be bended as per IS 2062/1079 shall be fabricated of double bended channel section longitudinal members with single bended Channel section. Rungs of members welded to the base of the longitudinal members at 250 mm c/c spacing . as per IS and shall be coated with hot dip galvanizing as per IS 2629/4759. with coupler plate / Fish plate and GI hardware like nut - bolt and washers etc. erected on existing support as per Specification and as per instruction of engineer in charge.. (3)300 X 50 X 2.0 mm Thick	Mtr	230.00	
276	Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (3)Two pin RJ-11 Telephone socket with top [A] For One Gang Cat. III	Each	4.00	
277	Supplying & erecting approved make LAN cable of following size in existing pipe as per direction [C] CAT - 6	Mtr	1200.00	
278	providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark Cat.III	Each	40.00	
279	Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for (A) single phase incoming and horizontal single phase outgoing (b) sheet steel double door (IP-43) (iii)8 way	Each	10.00	
280	Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for (B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI) (b) sheet steel double door (i)4 way	Each	3.00	

281	Providing and erecting Approved make ELCBs / RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on single phase 240 V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed. (i) 25 Amps.DP Cat. III	Each	18.00	
282	providing and erecting Approved make ELCBs / RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on 3 phase and neutral 415V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component for following Max. rating erected as directed.(iv) 100 Amps. FP (100 mA Sensitivity) Cat. III	Each	3.00	
283	Supplying & fixing box for housing RCCB + MCB combination made of 18 SWG sheet steel duly powder coated with gasket, dust & vermin proof bakelite shield two earthing terminals for following type of RCCB, RCCB + MCB [a] For 2 pole	Each	10.00	
284	Supplying & fixing box for housing RCCB + MCB combination made of 18 SWG sheet steel duly powder coated with gasket, dust & vermin proof bakelite shield two earthing terminals for following type of RCCB, RCCB + MCB [b] For 4 Pole	Each	3.00	
285	Providing & erecting 240 V MCB double pole switch for motor & inductive load (C Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity (A) 6 to 32 Amp. Cat.III	Each	12.00	



286	Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board necessary IP42 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S.sheet for internal partitions with necessary accesories , supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copperaluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - boltsbase Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket,heavy duty end terminal connection,danger notice board,necessary ventilation,earthing strip complete. The Panel shall be painted with epoxy powder coating.(The rates excludes the cost of switchgears, bus bars, inter connecting mains & Copper Aluminium strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall	Sq Mtr	4.00	
287	Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 35 KA. at 415 V. having normal current rating 125A. with Fixed thermal & magnetic release suitable to work on A.C.supply 50 c/s. with all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing. ICS=100% of ICU only Cat III	Each	2.00	
288	Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections. .(B) Suitable for 200 Amp. capacity	Rn.Mtr	4.00	
289	Providing & erecting 415V MCB Four Pole Switch for Lighting Load (B curve) having 10KA breaking capacity & conforms to IS :8828 in existing box having following capacity (b)40 Amp. Cat.III	Each	4.00	

290	Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/ aluminium die cast powder coated and high U.V. & corrosion resistance with diffuser with company mark/name 160V to 270V, Power Factor more than 0.95, THD < 15%, CCT 3000 K to 6500K, Luminaire efficacy> 85 lumens/watt ,LED LED driver efficiency > 85 % ( fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (A) Tube Light with integral driver (iv) 22-24 Watts, Surge - 2KV,IP-20, conventional 4 feet Cat-III	Each	269.00	
291	Supplying and erecting led lamps with following wattage capacity of 220 to 240 voltage, minimum 15000 burning hours life, 500 V in built-surge protection,Polycarbonate diffuser, mounting suitable for E14 / E27 / B22 lamp holders, pf >= 0.5 (A) LED Lamps integral type, with PC diffuser suitable LAMP holder (ii) 5 to 8 watts cat-III	Each	78.00	
292	Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V,Power Factor more than 0.95, THD < 15 %,CCT 3000 K to 6500K, Luminaire efficacy> 85 lumens/watt ,LED driver efficiency > 85 % ( fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring loaded mounting clips complete.IP20 (iv) 22-24 watts, Surge-2 KV Cat-III	Each	3.00	

293	Providing & erecting Approved make Power Saving 50 Watt Ceiling Fan with double ball bearing ISI mark with Condenser 230 volt A.C. 50 Hz 1200 mm sweep complete having 3blades with aluminium blades with , canopy & 30 cm. down rod erected with earthing.(Make shall be approved by Engineer in charge))	Each	125.00	
294	Supplying & erecting Fan Hook box of 10 mm M.S. Round bar bounded to the RCC bars up to 50 mm length each side and pierced through a 16 gauge MS box / heavy duty PVC box complete erected concealed in ceiling with necessary finishing .	Each	35.00	
295	Supplying & erecting single phase approved make industrial exhaust fan suitable for medium duty ring mounted low noise operation suitable for medium duty having following dia size and maximum speed in RPM [A] 305 mm dia 900 RPM Cat.II	Each	37.00	
296	Providing suitable M.S. louver shutter of the Exhaust fan.	Each	37.00	
297	Supplying and erecting approved make Bracket fan of 230 volt, A.C. 50 Cy/s., 400/450 mm sweep complete erected on wall or with lead Cores and connections complete.Cat.II	Each	5.00	
298	Providing & erecting open well type horizontal mono block pump set with stainless steel body having following specification (D) 1 HP Three phase open well motor pump set suitable for 190 LPM discharge @ 21 mtr. head, suitable for 32mm dia. delivery pipe. Cat. II	Each	1.00	
299	Supplying & erecting approved make Automatic liquid level controller 6A. with sensor testing as per instruction of Engineer in charge on site complete with wiring connection with existing wires , with copper conductor from pump to upper and ower tank.	Each	2.00	

300	Supplying & erecting approved make motor control cubical panel (Direct - on - line) made from 16 G. CRCA sheet duly epoxy powder painted inside and outside with hinged doors and locking, arrangement consisting of suitable size of ON- OFF isolator (AC - 3/23duty) main fuses, single phasing preventer, indicating lamps for R- Y - B phases, overload relay, Automatic water level controller, Ammeter, Voltmeter each with two way selector switch incoming, wires duly socket crimped, main contactor & overload relay, start - stop push buttons, to be erected on angle iron frame grouted on wall as directed. The isolator, overload relay & contactors will be of L & T, Siemens or BCH make only. (a) DOL up to 5.0 H.P.	Each	3.00	
301	S.I.T.C. submersible pump set suitable for bore of 100 mm. dia. or more having three phase motor capacity not more than 3 H.P. of different range with following capacity . Lifting and Lowering taken extra. (A) (20 stage) 170 to 185 LPM discharge at 57 to 48 mtrs. Respectively head suitable for 50 mm dia. delivery pipe Cat.III	Each	2.00	
302	Providing & erecting water cooler having storage capacity 150 Ltr. & cooling capacity 150 Ltr.per hour @ an ambient temp of 45° C. The outlet temp. of the water should drop by 15°C within a hour, The water cooler should be comprising of hermetically sealed compressor, fan motor, condensing unit, water tank surrounded by evaporating, coil, thermostats, relay etc.complete with necessary inlet & outlet connection. The body of water cooler will be made from Stainless Steel.	Ea.	4.00	
303	Supplying and erecting water filter cum purifier with ultra violate technology. (Aquaguard / waterdoc model or equivalent symphony/ crystal/videocon model)	Ea.	4.00	
304	Supplying and Erecting Of L.E.D. type High bay fixture having Power Consumption of following watts with, Input Voltage 110 - 290 V.AC with full efficiency, Power Factor > 0.9 with 50/60 HZ, CCVC LED Driver used for maximum power saving, Best Quality Aluminium alloy housing and aluminium Dome for better heat dissipation, CCT Cool white (6000K), CRI 80, Beam angle > 120 degrees, working temperature -20 deg c to +55 deg c, Body IP 65 (A) 70 to 90 watts	Ea.	24.00	

305	Supplying & erecting Fan Hook box of 10 mm M.S. Round bar bounded to the RCC bars up to 50 mm length each side and pierced through a 16 gauge MS box / heavy duty PVC box complete erected concealed in ceiling with necessary finishing .	Ea.	100.00	
306	Supplying and erecting approved make oscillating type medium duty bracket fan with Aluminium Blades A.C. 230V. 50cy/s, with thermal overload protection wall mounted with height adjustment and rotary tilting device complete with guard, pull cord for speed and oscillation flexible Core plug top complete erected with lead wires as directed. (a) 450mm	Ea.	8.00	
307	Providing & erecting open well horizontal mono block pump set with cast iron body, complete for three phase submersible motor having [B] For 2 HP 3 phase open well horizontal mono block pump set suitable for 200 LPM @ 25 mtr head suitable for 50 mm dia delivery pipe Cat.II	Ea.	1.00	
308	Providing & erecting open well type horizontal mono block pump set with stainless steel body having following specification (D) 1 HP Three phase open well motor pump set suitable for 190 LPM discharge @ 21 mtr. head, suitable for 32mm dia. delivery pipe. Cat. II	Ea.	1.00	
309	4MP Network IR Bullet Camera Color : 0.1Lux (F1.6, 1/30sec), B/W : 0Lux (IR LED On) • Manual Varifocal 2.8-12mm ,• IR viewable length: 50m • True day/night • H.265, H.264, MJPEG, Multiple streaming supported • DC12V/PoE IP67/IK10, Basic IVA, • 4MP resolution (2560 × 1440), • True day/night, • Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Basic intelligent video analytics, Audio In, NDAA Compliance, UL, CE, FCC Certified • IP66, IK10	Nos.	20.00	

310	Supply, Installation, Testing and Comissioning of 4MP Fixed Lens Dome Type Camera, H.265 4MP IR Vandal Proof Dome N/W Camera, 2.8mm/3.6mm, 30M IR, Micro SD, DC12V/PoE, IP67/IK10, Basic IVA, 1 / 2.7" CMOS, 2560 × 1440, 0.01 Lux, F1.2, AGC ON; Defog, True day/night, Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Cyber Security, Basic intelligent video analytics, NDAA Compliance, UL, CE, FCC Certified (Including Five year free maintenance with guarantee)	Nos.	15.00	
311	64 CH NVR 2SATA • 64 CH Holis Lite • H.265/H.265+ Embedded NVR • Gig Ethernet • 4 HDD Bay	Nos.	1.00	
312	30 days recording	Nos.	1.00	
313	8P POE Industrial Switch + 2 SFP	Nos.	5.00	
314	6 Core Single mode Armoured Fiber Cable	Mtr.	600.00	
315	POWER CABLE	Mtr.	600.00	
316	Out Door Network JB	Nos.	10.00	
317	Cat6 Cable (305 M)	Nos.	3.00	
318	SC-LC Patch Code	Nos.	10.00	
319	12 Port Din Rail Mount LIU	Nos.	10.00	
320	HDPE Pipe	Nos.	600.00	
321	Fix Camera Installation	Nos.	35.00	
322	CAT-6 Cable laying	Nos.	800.00	
323	OFC Cable laying	Nos.	600.00	
324	Pipe Laying Charges with Accessories	Nos.	600.00	
325	Splicing	Nos.	50.00	

326	<p>S.I.T.C of Poly Crystline/Mono Crystline PV Module (ALMM approved) with 72 Cells - 150 Cells or More , Frame Material : Anodized Aluminum alloy Frame With Twin Wall Profile, Front Cover : High Transmission Low-Iron Tempered Glass (AR Coated), High efficiency and positive power tolerance Pmax: 0/+5, Module Efficiency should be approx. 18%-21%, Normal operating temperature Waterproof IP67 &amp; MC4 Compatible and Enclosed with Bypass diodes 100% Electroluminescence test to ensure error free Modules, Thw temp. co-efficient of the PV module shall equal or better than -0.45%/degree C. Solar PV modules of 45°C, Junction Box with minimum fill factor 75% to be used. Unit Production:- 4 to 5 Unit /kw /day (Actual)(1Year Avg) With 10 year Product warranty and 25 year Linear Power Warranty. (E) Moudule o/p Range: 520 - 545 watt, Maximum Power Voltage Vmpp: 41 - 42 V, Maximum Power Current Impp: 12.5 - 13 A ( TATA, ADANI, WAREE, RENEWSYS )</p>	ER WAT	221379.39	
327	<p>S.I.T.C of Solar Inverter Gried Tied: MPPT Range: 80-1000 V, Max efficiency: 97.5% - 98.9%, O/p Frequency: 50/60Hz, Operating Altitude (m) ≤4000, O/p Power Factor: ~1, O/P THDi: &lt;3%, Operating Tempreture Range: -25~60°C, Anti-islanding Protection: Integrated, Input Reverse Polarity Protection Integrated, Insulation Resistor Detection Integrated, Residual Current Monitoring Unit Integrated, Output Over Current Protection Integrated, Output Short Circuit Protection Integrated, Output Over Voltage Protection Integrated, Protection Degree: IP65, User Interface LCD &amp; APP,Datalogger &amp; Communication: GPRS / Wi-Fi (Optional) (F) Solar Inverter: 50 kW to 100 kW: Max. input Current: 40 A, Max DC i/p Power: 66500-130500 W &amp; Nominal o/p Power: 50000-100000 W, Nomimal O/p Voltage: 400 V 3-Phase,Nominal O/p Current: 80-144 A.</p>	ER WAT	189311.63	

328	S.I.T.C of Solar Inverter Gried Tied: MPPT Range: 80-1000 V, Max efficiency: 97.5% - 98.9%, O/p Frequency: 50/60Hz, Operating Altitude (m) ≤4000, O/p Power Factor: ~1, O/P THDi: <3%, Operating Temperture Range: -25~60°C, Anti-islanding Protection: Integrated, Input Reverse Polarity Protection Integrated, Insulation Resistor Detection Integrated, Residual Current Monitoring Unit Integrated, Output Over Current Protection Integrated, Output Short Circuit Protection Integrated, Output Over Voltage Protection Integrated, Protection Degree: IP65, User Interface LCD & APP,Datalogger & Communication: GPRS / Wi-Fi (Optional) (D) Solar Inverter: 15 kW to 25 kW: Max. input Current: 27 A, Max DC i/p Power: 22100-32500W & Nominal o/p Power: 15000-25000W, Nomimal O/p Voltage: 400 V 3-Phase,Nominal O/p Current: 25-37A.	ER WAT	25000.00	
329	Supplying and Erecting Seamless Box Pipe of suitable size for rooftop solar installations with good stability agaist wind, Thickness 2 mm and 80 micron, Hot Dipped Galvanized steel coils. suitable arrangement for base plate for foundation , solar panel mounting, the structure should be suitable for carry the load of solar panel,wiring, sprinkler system etc. with necessary foundation work/wall mount, j bolt, anchor fastner etc. the nut bolt used for installtion of stucture should be (SS 304) quality. box. pipe ref. size (A) 40 x 40 x 2mm, (B) 50 x 50 x 2mm, (C.) 60 x 40 x 2mm,(D) 72 x 72 x 2.5mm	PER KG	20689.29	
330	Supplying and Erecting 'C' Channel of suitable size for rooftop solar installations with good stability agaist wind, Hot Dipped Galvanized steel coils. It have suitable arrangement for base plate for foundation Screw Arrangement , solar panel mounting, the structure should be suitable for carry the load of solar panel,wiring, sprinkler system etc. with necessary foundation work/wall mount, j bolt, anchor fastner etc. the nut bolt used for installtion of stucture should be (SS 304) quality.	PER KG	23.44	
331	Supplying and Erecting Stainless Steel Nut Bolt (SS 304) for Installation of Solar PV Module, Structures, and other related items with required size as engineer in charge demands for project Size, length upto 10 x 150 mm	Each	1402.89	



332	DC Cable: Electron beam cross linked compound,UV, Ozone, Temperature & Hydrolysis resistant Flame Retardant, Low Smoke Excellent Encapsulation Very long / Service life > 25 Standards / Material Properties: Fire performance : IEC 60332-1-2 Smoke emission : IEC 61034/ EN 50268-2 Halogen Free: EN 50267-2-1/-2, IEC 60754-2 Toxicity: EN 50305, ITC – Index <3 Ozone Resistant : EN50396 Weathering UV: HD 605/A1 or DIN 53367 Approvals : EN 50618; H1Z2Z2-k with suitable sized of PVC pipe(ISI Mark) and Clamps,Shadels,Lugs. (A) 1 core 4 sqmm copper DC cable Colour Red	PER MTR	232.63	
333	DC Cable: Electron beam cross linked compound,UV, Ozone, Temperature & Hydrolysis resistant Flame Retardant, Low Smoke Excellent Encapsulation Very long / Service life > 25 Standards / Material Properties: Fire performance : IEC 60332-1-2 Smoke emission : IEC 61034/ EN 50268-2 Halogen Free: EN 50267-2-1/-2, IEC 60754-2 Toxicity: EN 50305, ITC – Index <3 Ozone Resistant : EN50396 Weathering UV: HD 605/A1 or DIN 53367 Approvals : EN 50618; H1Z2Z2-k with suitable sized of PVC pipe(ISI Mark) and Clamps,Shadels,Lugs. (B) 1 core 4 sqmm copper DC cable Colour Black	PER MTR	232.63	
334	S.I.T.C of Distribution board from AC Side , ACDB 3-Phase - 51 kW - 100 kW: which includes AC1 DUTY CONTRACTOR-200A 4P, 200A MCCB 4P(Cat III) WITH SPREADER & SHUNT, 3 PHASE SPD, VOLTAGE MONITORING RELAY, ELR WITH CBCT, PHASE INDICATING LAMP, POWER CABLE & OTHER ACCESSORIES. All switchgears and connection are enclosed with IP66 Enclosure and operate the position.	Each	2.18	
335	S.I.T.C of Distribution board from AC Side ,ACDB 3-Phase - 21 kW - 50 kW: AC1 DUTY CONTRACTOR-80A 4P, 100A MCCB 4P(Cat III), 3 PHASE SPD, VOLTAGE MONITORING RELAY, ELR WITH CBCT, PHASE INDICATING LAMP, POWER CABLE & OTHER ACCESSORIES, All switchgears and connection are enclosed with IP66 Enclosure and operate the position.	Each	1.00	

336	S.I.T.C of Distributiob System DC Side, DCDB - 80 kW - 300 kW (18in:18out) : Input Mcb - 1000 V, 16 Amp, 1000 V DC SPD TYPE 2, TERMINAL/END,PLATE/ENDCLAMP: 4SQMM (KUT6) FOR OUTPUT, DC CABLE With suitable size of interconnection.	Each	2.05	
337	S.I.T.C of Distributiob System DC Side, DCDB - 20 kW - 25 kW (5in:5out) : Input Mcb - 1000 V, 16 Amp, 1000 V DC SPD TYPE 2, TERMINAL/END,PLATE/ENDCLAMP: 4SQMM (KUT6) FOR OUTPUT, DC CABLE With suitable size of interconnection.	Each	1.00	
338	Supplying & Errecting MC4 Connector Male - Female Set for Solar DC Cable which is installed in Solar PV-module/Inverter/DCDB etc.	Each	1028.85	
339	Providing & erecting Automatic solar panel cleaning system for solar power projects which includes necessary plumbing work (UPVC pipes and accessories) from source of water to project site (upto 30 meters),Suitable size of sub mercible/ open well motor, necessary wiring for motor and sprinkler system with safety, timer circuit for automatically on/off the sprinkler system, necessary size oand number of nozzles/JET (minimum 1 Nozzle/Jet per module). (D) 21KW-50KW Cleaning System	PER KW	25.00	
340	Providing & erecting Automatic solar panel cleaning system for solar power projects which includes necessary plumbing work (UPVC pipes and accessories) from source of water to project site (upto 30 meters),Suitable size of sub mercible/ open well motor, necessary wiring for motor and sprinkler system with safety, timer circuit for automatically on/off the sprinkler system, necessary size oand number of nozzles/JET (minimum 1 Nozzle/Jet per module). (E) 51KW-100KW Cleaning System	PER KW	200.27	
341	The all inclusive comprehencive annual maintance contract cost covers three years maintanance of solar Pv Modules, Inverter, wiring,earthing,switchgears, etc with material and labour cost including preventive maintanance.The cost covers entire installation. AMC also includes monthly site visit and inspection of project with submission of inspection and solar generation report. All parts should be replaced/repaired if found faulty within specified time. Agency has to provide necessary licening work for warranty,power,Bidirectional meter etc (E) 101KW-200KW System	PER KW	150.00	

342	The all inclusive comprehensive annual maintenance contract cost covers three years maintenance of solar Pv Modules, Inverter, wiring, earthing, switchgears, etc with material and labour cost including preventive maintenance. The cost covers entire installation. AMC also includes monthly site visit and inspection of project with submission of inspection and solar generation report. All parts should be replaced/repared if found faulty within specified time. Agency has to provide necessary licening work for warranty, power, Bidirectional meter etc (D) 51KW 100KW System	PER KW	100.29	
343	Electrical Driven Fire Hydrant Main Pump : Horizontal Centrifugal Monoblock 1200 lpm 80 mtr head 40 HP	No's	1.00	
344	Electrical Driven Fire Hydrant Pump : Fire Jockey Pump 180 lpm 80 metre head 10 HP	No's	1.00	
345	Deisel Pump : Horizontal Centrifugal Monoblock 1200 lpm 80 mtr head	No's	1.00	
346	Supplying, installing, testing and commissioning of Common Control Panel.	No's	1.00	
347	Providing and fixing, testing and commissioning of C.I. Butterfly valve conforming to I.S:13095 class PN 1.6 rating of size 150 mm dia	No's	2.00	
348	Providing and fixing, testing and commissioning of C.I. Butterfly valve conforming to I.S:13095 class PN 1.6 rating of size 100 mm dia	No's	6.00	
349	Providing and fixing, testing and commissioning of C.I. Butterfly valve conforming to I.S:13095 class PN 1.6 rating of size 80 mm dia	No's	1.00	
350	Providing, fixing, testing and commissioning of C.I. Non-return valve I.S:13095 class PN 1.6 rating of sizes 150 mm dia	No's	2.00	
351	Providing, fixing, testing and commissioning of C.I. Non-return valve I.S:13095 class PN 1.6 rating of sizes 100 mm dia	No's	4.00	
352	Providing, fixing, testing and commissioning of C.I. Non-return valve I.S:13095 class PN 1.6 rating of sizes 80 mm dia	No's	1.00	
353	Providing and fixing, testing and commissioning of AIR RELEASE VALVE	No's	1.00	

354	Pressure Gauge having 100 mm dial & range of 0-15 Kg/cm <sup>2</sup> with	No's	1.00	
355	Pressure switch suitable for 1-10 kg / cm <sup>2</sup> including electrical connections setting of cut - in and cut - off pressure complete in all respect.	No's	2.00	
356	Providing and fixing GI HEAVY " C class" ISI or eq.make pipe line for hydrant & sprinkler system under ground or suspended ceiling or wall with necessary fittings like elbow tee, long radius bend , flanges, supports, hangers.incl.jointing the pipes & fittings with standard procedure of welding. excl painting the pipe line with three coat of synthetic enamel over base coat of redoxide paint , incl. testing the 150mm dia	prox Mt	500.00	
357	Providing and fixing GI HEAVY " C class" ISI or eq.make pipe line for hydrant & sprinkler system under ground or suspended ceiling or wall with necessary fittings like elbow tee, long radius bend , flanges, supports, hangers.incl.jointing the pipes & fittings with standard procedure of welding. excl painting the pipe line with three coat of synthetic enamel over base coat of redoxide paint , incl. testing the 80mm dia	prox Mt	50.00	
358	Providing and fixing GI HEAVY " C class" ISI or eq.make pipe line for hydrant & sprinkler system under ground or suspended ceiling or wall with necessary fittings like elbow tee, long radius bend , flanges, supports, hangers.incl.jointing the pipes & fittings with standard procedure of welding. excl painting the pipe line with three coat of synthetic enamel over base coat of redoxide paint , incl. testing the 65 mm dia	prox Mt	200.00	

359	FIRE HYDRANT VALVE, SINGLE OBLIQUE OUTLET,Body / female inst. Oblique outlet (63mm size) with Pull out type Lug made of Stainless Steel, IS: 3444 Gr-1, 75mm N.B. Flanged inlet,Spindle made of S.S. 304 (IS: 6603) and Hand wheel made of Cast Iron,Complete with PVC blank cap & chain,BEARING IS: 5290 MARK, Flange Dimension: O.D. 200mm, PCD 160mm	No's	10.00	
360	HOSE BOX -Made of 16 gauge Mild with lock, keys and a break glass recess for keys Painted Fire Red outside "Single Door Fire HOSE Box"	No's	15.00	
361	RRL TYPE A FLEXIBLE FIRE FIGHTING DELIVERY HOSE, Dia. 63mm X 15mtr. Length.	No's	10.00	
362	"HOSE REEL", WALL MOUNTING TYPE Drum complete with wall mounting bracket,Complete with 20mm bore X 30mtr long, High Pressure Braided Rubber Hose as per IS:444 Type II, Fitted with 6mm bore PVC shut-off nozzle Without Inlet Valve GENERALLY CONFORMING TO IS: 884	No's	15.00	
363	"BRANCH PIPE" - SHORT"Made of SS.	No's	15.00	
364	"SIAMESE CONNCTION -4 WAY " Body made of SGI,Having 02 nos. SS 304 63mm male instantaneous inlets conf. to IS: 903.	No's	1.00	
365	ABC 6KG Capacity Fire Extinguisher MAKE : ISI	No's	70.00	
366	Supplying & erecting carbon dioxide (CO2) fire extinguisher user of following capacity with necessary clamps made from 50 x 6 mm M.S. Flat with nut & bolts grouted in wall complete. [B] For 5.5 / 6.5 KG Capacity	No's	70.00	
367	2 zone panel Installation & Commisionning Fire Panel	No's	2.00	
368	Fire Manual Call Point	No's	70.00	
369	Fire Alarm Sounder	No's	70.00	
370	Supplying, installing, testing and commissioning of 1.5MM 2 COR Cable Forp Alaram System.	pro x M	1500.00	

**Notes 1: - All works shall be carried out as per Public Works Department Handbook and other specifications of Division or as directed.**

**Notes 2 -Rates quotes include clearance of site (prior commencement of work and at its close) in all respects and hold good for work under all conditions, site, moisture, weather etc.**

**Notes 3 - To be continued on additional sheets, if found necessary.**

**Notes 4 - Labour cess @1% (or as per the then prevailing rules of concerned department) of the work done amount shall be deducted from the bills.**