

Contract No.:

GOVERNMENT URBAN DEVELOPMENT COMPANY LIMITED

GANDHINAGAR

[A WHOLLY OWNED GOVERNMENT OF GUJARAT UNDERTAKING]



BIDDING DOCUMENT FOR

Halwad RoB LC No-65 and LHS LC No-66 under SJMMSVY

“Construction of 2 Lane RoB and LHS in Lieu of LC 65 (Km 656/7-8) and LC 66(Km 657/0-1) Between Halvad-Sukhpur Station on VG-SIOB Section On Halvad-Tikar Road” Under programme of SJMMSVY.

VOLUME – II

PART-I

“ITEM WISE SPECIFICATION”

GOVERNMENT OF GUJARAT

By

Vice President (Project)

Gujarat Urban Development Company Limited

Karmayogi Bhavan, Block-1, B-1 Wing,

Ground Floor, Sector-10/A

Gandhinagar, Gujarat -382 010.

(Through e- Procurement Portal only - <https://tender.nprocure.com/>)

ITEM WISE SPECIFICATION

The specifications in general for this bridge are as per MORT&H fifth revision. In case of any ambiguity or discrepancy MORT&H specification shall govern.

Item No.	Item Description	Specification as per MORT&H/IS
1	Empty boring through all. sorts of strata for providing 1.20 M dia. R.C.C. bored piles to required depth including providing necessary casing pipe with all plants and equipment's as required complete. (excluding concrete & reinforcement)	Cl. No. 1100 Pg. no. 457
2	Providing and laying controlled cement concrete M 35 for R.C.C.bored piles of 1.20 M dia. including ramming, vibrating and finishing excluding T.M.T Reinforcement complete.	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
3	Dismantling of Structures (Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 metres).	Cl.No.202, Pg. no. 39
4	Providing steel Liner for curbs and steining for wells including fabricating and setting out as per detailed drawing as directed.	Cl. No. 1100 Pg. no. 457
5	Static Load testing of foundation piles including loading with necessary kentledge or any other suitable method as directed.	IS-2911, Cl. No. 1105, 1113
6	Dyanamic Load testing of foundation piles including loading with necessary kentledge or any other suitable method as directed.	IS-2911, Cl. No. 1105, 1113
7	Conducting Pile low strain integrity test as per ASTM D 5882- 96 code of American Society for Testing on cast -in situ RCC pile of 1200 mm diameter inclusive of analysis with all contractor's equipment, manpower, site preparation, lead and lifts etc. complete as per standard procedure, and as directed by the Engineer in charge. Note: - Rate is inclusive All equipment, All labour and consumable required & Mobilization of equipment	IS-2911, Cl. No. 1105, 1113
8	Excavation for foundation in sand gravel, clay, soft, soils and murrum etc. including soring strutting and dewatering as necessary and dis posing off the excavated stuff as directed with all lead & lift (A) Depth up to 3.0 Mt & (B) Depth up to 3.0 Mt to 6 Mt	Cl. No. 304, Pg. no. 59
9	Excavation in hard rock by dry-wet blasting and chiselling including dewatering preparing foundation base by proper benching and stepping and disposing of the excavated stuff as directed.(B) prohibited Blasting. work.	Cl. No. 304, Pg. no. 59
10	Providing & filling in foundation with ordinary cement concrete M 15 mix and providing necessary vertical pin headers including formwork vibrating ramming & curing complete.	Cl. No. 1700 Pg. no. 535
11	Providing and casting in-situ controlled cement concrete M 35 For R.C.C. pile cap including necessary formwork vibrating, curing and finishing complete.	Cl. No. 1700 Pg. no. 535
12	Providing and casting in situ controlled cement concrete M-35 for R.C.C. return, R.C.C Sump as per drawings including centering shuttering, scaffolding where necessary, laying vibrating, curing and finishing	Cl. No. 1700 Pg. no. 535

	complete. complete as per specification.(1) Piers (2) Abutment (3) RCC return '(Height from 0.0 to 5.0 M.) ('Height from 5.0M to 10.0M)	
13	Providing and casting in situ controlled cement concrete M-35 for R.C.C. work in pier cap,abutment cap and dirt wall including controlled cement concrete M-40 bed blocks or pedestals of required size below bearings as per detailed drawings, centering, shuttering, scaffolding, wherever necessary, laying vibrating, curing and finishing complete.	Cl. No. 1700 Pg. no. 535
14	Providing and fixing in position of steel grade FE-550D (TMT) for R.C.C. bored piles & Pile Cap including cutting hooking, tying, welding etc., complete as per detailed drawing and specification.	Cl. No. 1600 Pg. no. 527
15	Providing and fixing in position steel bar for pier, Retaining wall ,pier cap ,Dirt wall,pedestal & seismic arrester, RCC Box reinforcement of steel grade FE-550D (TMT) including cutting , bending, hooking, tying, welding etc., complete as per detailed drawing and Specification.	Cl. No. 1600 Pg. no. 527
16	Providing and applying Coal Tar Epoxy protective paint for Pile Cap in two coats of DFT 210 microns for foundations /concrete surfaces in contact with soil complete as per Specifications and as directed by the Engineer including all leads and lifts etc. complete.	Cl. No. 1906 Pg. no. 614
17	Providing and casting in situ controlled cement M 35 for R.C.C. work in superstructure including centring shuttering scaffolding, ramming, vibrating curing and finishing complete.	Cl. No. 1700 Pg. no. 535
18	<p>Supplying, fabrication, assembling of all types of steel girders of specified spans with structural steel conforming to Quality "B0" Grade Designation E350 conforming to IS:2062, erection / slewing / end launching of steel girders with cranes or any other approved launching methods as per site conditions (not requiring traffic block) on substructure including provision of trolley refuges etc., complete as per approved QAP and drawings conforming to IRS-B1-2001 and other relevant codes and specifications.</p> <p>Note:</p> <ol style="list-style-type: none"> 1. Detailed fabrication and erection drawings & launching methodology will be prepared by the contractor and got approved from Railway. 2. The rate is all inclusive including launching in position, complete in all respect except cost of (i) Painting / Metalising; (ii) Bearings & (iii) HSFG bolts which shall be paid extra under relevant item. 3. The payment shall be made on the theoretical weight of main components and gusset plates only. 4. Payment Schedule: <ul style="list-style-type: none"> (i) Receipt of material at site: 40% (ii) Fabrication of girders: 20% (iii) Erection/Launching: 20%(iv) Completion in all respects: 20% 	Cl. No. 1900 Pg. no. 585, As per Detailed Specifications Of part 2 & part 3 (A)Technical Specification
19	Supplying and fixing HSFG bolts of any dia and any length with suitable nuts including DTI washers conforming to IRS-B1-2001 for bridges and steel structures with contractors labour, tools and plants and lead and lift etc., complete	Cl. No. 1904 Pg. no. 600
20	Providing and placing in position FE 550D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawing. For Super Structure & Crash barrier, Crash barrier with friction slab	Cl. No. 1600 Pg. no. 527

21	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by a disc or unreinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel/fabricated structural steel, metal and elastomer elements to be as per IRC: 83 part-I & II respectively and other parts conforming to BS: 5400, section 9.1 & 9.2 and clause 2006 of MoRTH Specifications complete as per drawing and approved technical specifications.	Cl. No. 2000 Pg. no. 623
22	Strip Seal Expansion Joint (Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	Cl. No. 2600 Pg. no. 723
23	Providing and casting RCC in M-40 controlled concrete Crash Barriers as per detailed drawings including necessary scaffolding, centering, formwork, mixing in machine, transporting, placing, compacting, finishing, curing, etc. complete including providing and fixing of inserts if any with all leads and lifts as per drawing & specification and as directed by Engineer, excluding reinforcement.	Cl. No. 1700 Pg. no. 535
24	Providing and erecting a Double "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fittings to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 811..	Cl. No. 811.3 Pg. no. 361
25	Providing and laying precast R.C.C. footpath slab in controlled cement concrete of M-25 grade (7.0Cm. thickness including necessary reinforcement and providing and setting cement chequered tiles in C.M. 1:5 as per drawing including necessary formwork, curing and finishing complete.	Cl. No. 1700 Pg. no. 535
26	Providing parapet of controlled cement concrete M-30 as per detailed drawings with necessary reinforcement including, shuttering, laying vibrating and finishing to line and level complete. (ii) Cast in situ.	Cl. No. 1700 Pg. no. 535
27	Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene (conforming to IS14930II) with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground/road surface for enclosing cable as directed by engineer in charge. (A) 50 mm outer dia	As per Detailed Specifications
28	Providing G.I. 100mm diameter water spouts including necessary iron gratings as per drawings.	Cl. No. 2700 Pg. no. 751
29	Providing, laying and jointing in true line and level 110 diameter 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 diameter x 149 mm length x 145 mm height 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.	Cl. No. 2700 Pg. no. 751

30	Supplying, Fabricating and fixing access ladders, inspection platforms, Trolley refuges etc., on bridges with structural steel conforming to IS:2062 including welding / bolting, priming painting with one coat of ready mixed paint of Zinc Chromate (IS:104) with DFT of 25-30 microns followed by one coat of Zinc Chrome Red Oxide (IS:2074) with DFT of 25 microns with all material, labour, T&P as a complete job. Note: Painting shall be paid separately under relevant item.	Cl. No. 1900 Pg. no. 585
31	Mastic Asphalt (Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-39, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine-grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 1000C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 516.).	Cl. No. 516 Pg. no. 225
32	Providing and applying tack coat with emulsion RS1 grade at the rate of 3.0 kg/ 10 Sq.mt. including cost of asphalt and preparing the surface heating, and applying etc. complete.	Cl. No. 503 Pg. no. 168
33	Road marking with hot applied thermo plastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5mm thick including reflectorising glass beads @ 250gm/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 coefficent on cement road shall be min 130mcd/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 resistnce as mentioned in the section 15 of IRC35-2015. warrenty for retro reflectivity shall be two years..	Cl. No. 803 Pg. no. 338
34	Cat Eye/ Road Stud / RPM: Supplying of molded Twin shanks Raised Pavement Markers made of polycarbonate and ABS moulded body and reflective panles with micro prismatic lens (No Glass lens) capable of providing total internal reflection of light entering the lens face and shall support a load of 13635 kgs. tested in accordance to ASTM D 4280 Type H and Complyinh to Specification of Category of MORTH Circular No RW/NH/33023/10-97 -Do III Dt 11.06. 1997. The height, width and length shall not exceed 20mm, 130 mm and 130mm and with minimum reflective area of 13 sqcm on each side and the slope to the base shall be 35+/-5 degrre. The body of the marker should having finger grip for easy and accurate placement and application with epoxy/ bituminous Adhesive as recommended by the manufacturer of the marker. The color of the marker should be as per the IRC 35-2015 and as directed by Engineer-in-charge	Cl. No. 800 Pg. no. 325
35	Providing and applying one coat Epoxy Phenolic primer of DFT 50 micron and two coats of Epoxy Phenolic coating of DFT 100 microns each or any other equivalent epoxy coating system to all concrete surfaces exposed to atmosphere in substructure and superstructure including cost of material, labour, transportation, scaffolding and preparing the surfaces by cleaning, washing, brushing, sand / grit blasting etc. complete and as directed by Engineer and as per specification. (Paint shall be got approved from Engineer and tested from approved laboratory).	Cl. No. 1906 Pg. no. 614
36	Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of	Cl. No. 201, Pg. no. 37

	stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle	
37	Demarcation of road alignment including marking out road line by providing and fixing wooden pegs or steel rod of required size at every 25 M to 50 M & at pier location. including excavating trenches ion both sodes of 0.30 m. x 0.30M. including supplying of labours and all materials for every work etc. complete.	Cl. No. 109 Pg. no. 11
38	Dismantling the existing structure including removing and stacking the dismantelled materials as and where directed. (A) R.C.C. Work	Cl. No. 202, Pg. no. 39
39	Empty boring through in Rock for providing 1.20 Mt. diameter R.C.C. bored piles to required depth including providing necessary casing pipe with all plants and equipments as required complete.(Excluding concrete & reinforcement)	Cl. No. 1100 Pg. no. 457
40	Carting of excavated material such as murrum, earth, kapachi, gravel, brickbats, kankar, debris, sand, dismantled material, including loading, unloading, stacking etc. complete at non objectional place as directed by engineer in charge.(Lead up to 5.0 km)	Cl. No. 304 Pg. no. 59
41	Providing and casting in situ controlled cement M-40 for R.C.C. work For Piers as per drawing including centring shuttering scaffolding where necessary laying vibrating curing and finishing complete. exposed concrete finish and form mark as directed by Engineer-in-charge, etc. complete as per specification. (0.0M to 5.0M height)	Cl. No. 1700 Pg. no. 535
41A	(5.0M to 10.0M height)	Cl. No. 1700 Pg. no. 535
42	Providing and casting in situ controlled cement concrete M-40 for R.C.C. work in pier cap,abutment cap and dirt wall including controlled cement concrete M-45 bed blocks or pedestals of required size below bearings as per detailed drawings, centering, shuttering, scaffolding, wherever necessary, laying vibating, curing and finishing complete.	Cl. No. 1700 Pg. no. 535
43	Filling available excavated earth (excluding rock) in trenches, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each disposed layer by ramming and watering.	As per Detailed Specifications
44	Providing and casting in situ controlled Cement Concrete M-50 for prestressed concrete work in Super structure including centering, shuttering, curing, scaffolding, ramming, vibrating, finishing, (I) Deck Slab.(II) Main Girders.(III) Diaphragm or cross girder (IV) Solid Slab etc.	Cl. No. 1700 Pg. no. 535
45	Providing and fixing in position to exact profile high tensile steel wires of required ultimate strength including bending, cutting, tying providing necessary standard and anchorages, sheathing, stressing, grouting, ducts as per detailed drawing including necessary plant and machinery complete.	Cl. No. 1800 Pg. no. 565
46	Providing and laying in position fully moulded restrained elastomeric bearing as per detailed drawings.	Cl. No. 2000 Pg. no. 623
47	Carrying out load test of super structure as directed including all necessary materials plant equipement, instruments, labour and arrangements for test directed.	Cl. No. 2300 Pg. no. 675 IRC SP:51
48	Providing and casting in situ controlled cement concrete concrete M-35 for approach slab including formwork curing and finishing complete.	Cl. No. 1700 Pg. no. 535
49	Providing and fixing RCC M:25 architectural pylons at end of approach structures including all materials, labour, reinforcement laying, ramming, curing etc. complete as per detailed working drawing.	Cl. No. 1700 Pg. no. 535

49A	Architectural Pylon Concrete	Cl. No. 1700 Pg. no. 535
49B	Architectural Pylon TMT 550D	Cl. No. 1600 Pg. no. 527
50	Providing and fixing in position steel bar reinforcement For Approach slab, Wearing Coat & Kerb, crash barrier of steel grade FE-550D (TMT) including cutting, bending, hooking, tying, welding etc. complete as per detailed drawing and specification.	Cl. No. 1600 Pg. no. 527
51	Modular Strip / Box Seal Joint (Providing and laying of a modular strip Box steel expansion joint including anchorage catering to a horizontal movement beyond 70 mm and upto 140mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	Cl. No. 2600 Pg. no. 730
52	Providing and fixing marble slab including engraving and painting complete.(A) size 75 cm x 60 cm x 4 cm	As per Detailed Specifications
53	Providing and Laying only with Knitted and PVC coated Polyester Uniaxial Geogrid-Techgrid indigenously manufactured from selected high tenacity polyester yarn with high molecular weight (> 25000 g/mol), and low carboxyl end group (<30mmol/kg) for Reinforced soil wall with granular fill of PHi-30 degree (design is to be carried out in accordance with BS-8006 / FHWA) with concrete Panel (M40) as facia, casting & erection of panels with Techgrid, providing & laying of levelling pad of M15, providing and laying coping beam (M25), providing and laying 600mm thick filter media etc. completed as per the necessary drawing and instruction of Engineer In Charge. Excluding providing, laying and compacting selected backfill and retained fill behind the wall, excavation and ground improvement, if any.	Cl. No. 3100 Pg. no. 801
54	Providing Earth fill / Sand & filling in approach portion of RE/Retaining Wall as per MORTH section 3100 and IRC:SP:102 latest Revision including laying as per specification ,compaction in 250 mm thick loose layers and dressing (MORTH specification Cl. by mechanical means using motor grader including 305.3.5), watering upto required OMC including rolling with the use of vibratory roller when fill is at suitable moisture content with desired field density all as per the approved design ,drawing, specification and directed by the Engineer.	Cl. No. 3100 Pg. no. 801
55	Providing and casting RCC in M-40 controlled concrete Crash Barrier with friction slab (For RE Wall portion) as per detailed drawings including necessary scaffolding, centering, formwork, mixing in machine, transporting, placing, compacting, finishing, curing, etc. complete including providing and fixing of inserts if any with all leads and lifts as per drawing & specification and as directed by Engineer, excluding reinforcement.	Cl. No. 1700 Pg. no. 535
56	Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed with all lead & lift.	Cl. No. 408.4 Pg. no. 140 & As per Detailed Specifications
57	Earth work for embankment with effective CBR 5% including breaking clods dressing With all lead and lift and including watering, rolling, and consolidation of subgrade in layers at O.MC. to required dry density including filling the depressing which occur during the process using vibratory roller 8.T. to 10 T. (from borrow area within 5 km lead)	Cl. No. 300 Pg. no. 45

58	Construction of 200 mm compacted coarsed granular subbase (Grade-I crushed B.T materials of 53 mm to 26.5 mm @ 35 %,26.5 mm to 4.75 mm @ 45% ,Below 2.36 mm @ 20 %) by providing close graded material , mixing in a mechanical mix plant at OMC,carriage of a mix material to work site, spreading uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve desire density , complete clause as per 401.	Cl. No. 400 Pg. no. 109
59	Providing and laying wet mix base course macadam 250 mm in Two layer using machine crushed chips as per required gradation mixing with required optimum quantity of water conveying the mix to site and spreading to grade and camber with mechanical paver consolidation by vibratory roller including material, labour, plant and machinery and equipment etc. complete.	Cl. No. 406 Pg. no. 131
60	Providing and applying priming coat with emulsion SS1 grade at the rate of 7.50 kg/ 10 Sq.mt. including cost of asphalt and preparing the surface heating, and applying etc. complete.	Cl. No. 501.8.7.3 Pg. no. 160 Cl. No. 502 Pg. no. 166
61	Providing and laying 80 mm DBM in single layer using crushed stone aggregate BT chips as per required gradation and using emulsion asphalt as a tack coat @ 2.5 kg / 10 sqmt and the VG-30 grade asphalt at 40 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by hot mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete	Cl. No. 505 Pg. no. 174
62	Providing and laying 95 mm DBM in single layer using crushed stone aggregate BT chips as per required gradation and using emulsion asphalt as a tack coat @ 2.5 kg / 10 sqmt and the VG-30 grade asphalt at 40 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by hot mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete	Cl. No. 505 Pg. no. 174
63	Providing and laying 40 mm Bitumen concrete using crushed stone aggregate BT chips as per required gradation and the VG-30 grade asphalt at 52 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by drum mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete	Cl. No. 507 Pg. no. 188
64	Providing and laying 50 mm Bitumen concrete using crushed stone aggregate BT chips as per required gradation and the VG-30 grade asphalt at 52 kg/MT)by total weight of mix hot laid process using hot mix plant including heating and mixing asphalt & materials by drum mix process transporting the mix and laying by paver finisher including consolidation with vibratory roller including cost of material, labour, machinery equipment and fuel , oil , lubricant for plant and machinery using contractor's own plant and machineries etc. complete.	Cl. No. 507 Pg. no. 188
65	Mastic Asphalt (Providing and laying 6 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine-grained hard stone chipping of 6 mm nominal size	Cl. No. 516 Pg. no. 225

	at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 1000C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515.).	
66	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, 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.	Cl. No. 601 Pg. no. 255
67	Construction of un-reinforced, dowel jointed, plain cement concrete pavement with M-40 grade concrete over a prepared sub base with cement , 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 electronic sensor 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, admixtures as approved, curing compound, finishing to lines and grades as per drawing as per IRC 15 2011.	Cl. No. 602 Pg. no. 263 & Cl. No. 1700 Pg. no. 535
68	Facility Informatory Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet I 4mm ACP (Aluminum composite Panel); size 80 x 60 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint; reflectorised with High Intensity Prismatic Grade retro reflective sheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.6mtr long stand post of Iron Angle 75 x 75 x 6mm / 65 NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with best quality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 Cms. for each leg including excavation, curing etc. complete under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting.	Cl. No. 800 Pg. no. 325
69	Providing & Fixing Village name boards made out of 2mm. Aluminium sheet / 4 mm ACP (aluminium composite panel), size 90 x 60 cms rectangle per the design of IRC - 67 - 2012 Pre treated with phosphating process & acid etching : coated with one coat of epoxy primer and two coats of best quality epoxy paint reflectorised with high intensity prismatic grade retro reflective sheeting of type-4 as per ASTM D-4956 and latest M.O.S.T Specification, 3.3 M long (2 no's) Stand post and frame fabricated from suitable size iron angle of 75 x 75 x 6mm/ 65 NB circular MS pipe as required and frame fabricated from suitable size iron angle of 35x35x3mm; painted with best quality epoxy coating in black and white bends the details of symbol or inscription / numerals for each board shall be as per the instruction for of Engineer-in-charge, The fixing at site shall be in 1;2;4 CC block of size 45 x 45 x 60cms. for each leg. including excavation curing etc. comp. under the supervision of engineer in charge. A warranty for 7 years for the retro reflective sheeting from original manufacturer and certified copy of three years outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor.(B) Class-B type-4 retro reflective sheeting.	Cl. No. 800 Pg. no. 325

70	Regulatory/ Mandatory Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 60 cms. Dia Circle as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.6mtr long stand post of Iron Angle 75 x75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 Cms. for each leg including be in 1:2:4 CC block of size 45 x 45 x 60 Cms. for each leg including excavation, curing etc. complete under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting.	Cl. No. 800 Pg. no. 325
71	Providing and fixing Cautionary Sign Board made out of 2mm aluminium sheet/ 4 mm ACP (aluminium composite panel), size 90 x 90 x 90 cms equilateral triangle, as per the design of IRC-67-2012. Pre treated with phosphating process and acid etching coated with one coat of epoxy primer and two coats of best quality epoxy paint, reflectorized with high intensity prismatic grade retro reflective sheeting of type-4 as per ASTM D-4956 and as per the latest M.O.S.T. specification, 3.6 Mt. long stand post and frame fabricated from suitable size iron angle of 75 x 75 x 6mm / 65 NB circular MS pipe as required and frame fabricated from suitable size iron angle & 35 x 35 x 3mm; painted with best quality epoxy coating in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 cms for each leg, including excavation curing etc. complete under the supervision of Engineer-In-Charge. A warranty for 7 years for the retro reflective sheeting from original manufacturer and certified copy of three years outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor.(B) Class-B type-4 retro reflective sheeting.	Cl. No. 800 Pg. no. 325
72	STOP Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet I 4mm ACP (Aluminium composite Panel); size 90 cms. Octagonal as per design of IRC-67-2012. Pre-treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint; reflectorised with High Intensity Prismatic Grade retro reflective sheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.6mtr long stand post of Iron Angle 75 x 75 x 6mm /GSNB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with best quality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 Cms. for each leg including excavation, curing etc. complete under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting.	Cl. No. 800 Pg. no. 325
73	Hazard Marker Sign :-Providing and fixing sign boards made out of 1.5mm aluminium sheet / 3mm ACP (Aluminum composite Panel); size 90x30 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer	Cl. No. 800 Pg. no. 325

	and two coats of best quality epoxy paint ;reflectorised with Micro Prismatic Grade retro reflective sheeting of Type-11 as per ASTM D 4956 and latest M.O.S.T.Specifications; 1.8mtr long stand post of 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with best quality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 cms. for each leg.including excavation, curing etc. complete under the supervision of engineer in charge. A warranty for 10 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting.	
74	Chevron sign :-Providing and fixing sign boards made out of 1.5mm aluminium sheet / 3mm ACP (Aluminum composite Panel); size 60x50cm rectangular as per design of IRC-67-2012. Pre treated with phospheting process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.3 mtr long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35x35x3mm; painted with bestquality epoxy coatings in black and white bends. the details of symbol or inscription / numerals for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg including excavation, curing etc.complete under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (A) Class-B Type-4 Retro Reflective sheeting	Cl. No. 800 Pg. no. 325
75	Painting Two Coats on crash barriers (Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces).	Cl. No. 1906 Pg. no. 614
76	Providing & fixing ordinary Kilometre stone of precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including letter & paints etc. complete (For N.H., S.H. & M.D.R.)	As per Detailed Specifications
77	Providing and casting in situ controlled cement concrete M-30 for Kerb/ kerb blocks including formwork curing and finishing, complete	Cl. No. 409 Pg. no. 142
78	Providing and laying of Extruded Biaxial Polypropylene Geogride 30 KN as per clause no 3102.8 and approval design and specification with accesories like tie strips,nuts & bolts and loops/lugs for joining reinforcing elements with the facia ,pannels and overlaps and other protective elements as per detailed specification.	Cl. No. 700 Pg. no. 297
79	Providing fusion bonded Epoxy coating not less than 175 micron thickness and up to 300 micron to reinforcement bars as per IS-13620-1993/ASTM-775 M including testing of coating at plant and all taxes (A) 10mm to 16mm dia bar	Cl. No. 700 Pg. no. 445
80	Providing fusion bonded Epoxy coating not less than 175 micron thickness and up to 300 micron to reinforcement bars as per IS-13620-	Cl. No. 700 Pg. no. 445

	1993/ASTM-775 M including testing of coating at plant and all taxes (B) 20mm to 32 mm dia bar	
	ELECTRICAL SPECIFICATION For ROB	
81	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.	As per Electric Item Detailed Specifications
82	Supplying following size of Light duty "A" Class G.I . Pipe & erecting as directed by Engineer-in-charge. (B)50 mm dia	As per Electric Item Detailed Specifications
83	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) 3 & 1/2 core 70 Sq. mm (D) 2 to 4 core 16 Sq. mm (A) 3 core 35/50 Sq. mm	As per Electric Item Detailed Specifications
84	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. LT Panel 1 & 2 (16 sqmm 4 core) @ 4 Nos. each (D) 35/50 sqmm (A) 1.5/ 2.5/4/6 Sq.mm , (C) 16/25 Sq.mm (d)35/50 Sq. mm	As per Electric Item Detailed Specifications
85	Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (A) 4 core 10 Sq. mm(B) 3 1/2 core 70 Sq. mm (35 Sq. mm 1/2 ore) (C) 4 core 16 Sq. mm. (D)3 1/2core 50Sq.mm (25 Sq.1/2mmcore)	As per Electric Item Detailed Specifications
86	Providing & erecting approved make street light / wall mounting junction box compression moulded from DMC (thermoset plastic) vertical sliding cover having locking with square head stud loop in / loop out in built terminal suitable for four core cable, waterproof of I.P. 54 protected with clamp or bolt nut & earth bolt of following size. [A] 200mm x 127mm x 83 mm	As per Electric Item Detailed Specifications
87	Providing Street Light pole bracket consisting of medium class MS pipe of 4.2 cms. Out side dia complete with suitable sleeve tubing 45 cms. long M S. pipe (Medium Class). Suitable for 76.5 mm /80mm / required size of pole top having sufficient fastners for fixing the brackets and having spread of 1.5.Rmt. length with 110 deg.with vertical plane & suitable welded stays, reducer and with check nuts 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 1.5 Mtr [B] Double Arm Bracket 1.5 Mtr	As per Electric Item Detailed Specifications
88	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 %. (A) Street Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection (iv) above 90 to 120 watts (Cat-3) (CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ BridgeLux (U.S.A.) make LED used for luminaire. (Each fittings required LM-79 & LM-80 (g) above 90 to 120 watts The Engineer incharge may select any wattage capacity between the ranges shown.) (A) Street Light (IP-65), Surge protection -	As per Electric Item Detailed Specifications

	4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (v)above 120 to 160 watts	
89	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 With Suitable foundation (Included) as per details given by manufacturer considering site requirement. (I) 10 Mtr. Long 70 mm Top X 175 mm bottom dia, 4 mm thickness with 275mmX275mmX16mm base plate, 4-M24 Bolts and 750mm long with necessary G.I. J Bolts .Approx Pole weight 145 kg.	As per Electric Item Detailed Specifications
90	Supplying and erecting Flexible PVC insulated multistrand multicore 1.1 kv grade ISI marked copper wires of following size to be erected as directed. e) 1.50 Sq.mm 3 core round PVC sheathed	As per Electric Item Detailed Specifications
91	Pipe type earthing with 40 mm dia 2.5 mtr long 'B' grade G.I. pipe with necessary coupling buch buried in specially prepared earth pit & G.I. earth wire of 8 SWG erected & connected as directed (Each for every three pole)	As per Electric Item Detailed Specifications
92	For using salt and charcoal / coke as required for pipe type earthing.	As per Electric Item Detailed Specifications
93	Providing and erecting HOT deep Galvanised iron strip wire 8 to 16 SWG.	As per Electric Item Detailed Specifications
94	Supply & erecting in earthpit of minimum bore dia. 225 mm size ASH or approved make Saf Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made pf corrosion free G.I.Pipes having Outer pipe dia of 80 mm having 80-200 Micron galvanising, Inner pipe dia of 40 mm having 200-250 Micron galvanising, connection terminal dia of 14 mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications.[A]For electrical installation up to 440 V Length of pipe - 1 Mtr Back filling compound- 1 Nos. of Bag of 15 Kgs. For LT panel 1 & 2 * 2 Nos. Each	As per Electric Item Detailed Specifications
95	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 out side 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. (B) 75 X 60 X 45 cm section pillar fabricated from 16 Gauge MS Sheet with angle iron legs 45 cm long made from 35 X 35 X 5 mm thick MS angle..	As per Electric Item Detailed Specifications
96	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	As per Electric Item Detailed Specifications

	internally supported on both side, with internal and outside looking arrangement with look 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 out side 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. (B) 60 X 30 X 45 cm section pillar fabricated from 16 Gauge MS Sheet with angle iron legs 45 cm long made from 35 X 35 X 5 mm thick MS angle.	
97	Providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240V A.C. system and having breaking capacity 10 KA to be erected in existing box. Confirming to IS 8828/1996 with ISI Mark.	As per Electric Item Detailed Specifications
98	Providing & erecting 415V MCB Four Pole Switch for Lighting Load (B curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (a) 6 to 32 Amp.	As per Electric Item Detailed Specifications
99	Supplying and erecting bakelite sheet 12mm thick HYLAM make on existing angle iron frame.	As per Electric Item Detailed Specifications
100	Supplying & erecting approved make Digital time switch having lithium cell 6 years operative and operate battery backup 1 channel day clock with 14 memory programme, suitable to operate on 240V + 5%, 16A with, floating contacts Minimum switching setup time 1 minimum & LCD display. Also comprised permanent ON/OFF switching. Programming switches & housed in fire proof thermoplastic enclosure & transparent cover erected as required with necessary connection erected as directed.	As per Electric Item Detailed Specifications
101	Supplying & erecting power contactor for time switch complete erected and connected as per direction Cat III [C] 4 pole 440V 16 Amp. [A] 2 Pole 250V 12 Amp.	As per Electric Item Detailed Specifications
	Under space Development For ROB	
102	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M30 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.	As per Detailed Specifications
103	Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length, 30cm height and 15cm thick of M25 grade concrete 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.	Cl. No. 400 Pg. no. 142
104	Planting Flowering Plants and Shrubs in Central Verge in 5m width, as instructed by Engg in charge.	As per GWSSB Specifications
105	Providing and fixing 1.20 Metre high fencing with 2.0 Metre long M.S. Angle posts 40mm x 40 mm x 6 mm and oil painting 3 coats fixed at 2.5 Mt, C/c. with five Horizontal lines and two diagonals of galvanised steel barbed wire weighting 9.38 Kg. per 100 Meter, strained and fixed to posts with G.I. staples including fixing the posts in ground with 0.5 M x 0.5 M x 0.5 M. block in C.C 1:5:10 etc complete.	As per Detailed Specifications

106	Excavation for pipe line trenches for water supply, sewerage line, manhole etc. all with shoring and strutting if required as per required gradient and line including safety provisions using site rails and stacking excavated stuff including up to all required lead cleaning the site etc. complete for all lifts and strata as specified. a) In all sorts of soil and soft murrum. Up to 1.50 mt Depth	Cl. No. 304, Pg. no. 59
107	Excavation for pipe line trenches for water supply, sewerage line, manhole etc. all with shoring and strutting if required as per required gradient and line including safety provisions using site rails and stacking excavated stuff including up to all required lead cleaning the site etc. complete for all lifts and strata as specified. a) In all sorts of soil and soft murrum. 1.50 mt to 3.0 mt Depth	Cl. No. 304, Pg. no. 59
108	Refilling the pipeline trenches incl. ramming, watering, consolidating disposal of surplus stuff as directed within a radius of 3 km. Refilling as directed	Cl. No. 301.3.12, Pg. no. 49
109	Providing and supplying D. I. K-9 grade pipes for following nominal bore diameter with internal cement mortar lining including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, Unloading, conveyance to departmental stores, stacking etc. complete. (A) (Pipe Dia 200mm) . (B) 250mm Dia. (c) 300mm Dia.	As per GWSSB Specifications
110	Manufacture, Supply & Delivery of Ductile Iron Flange socket spigot bends, tees, reducers or any other specials as per BS-EN-545/1995 Class-A series K12 suitable for use with D.I. Pipes manufactured as per IS:8329/1994 delivery of specials is to be made to GWSSB store or site of works any where in Gujarat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, octroi etc. complete. With external bitumen & zinc coating & internal cement mortar lining, Socket & Spigot (Type 80 to 300mm Dia)	As per Detailed Specifications
111	Manufacture, Supply & Delivery of Electric Resistance Welded (Up to 400mm)/Submerged Arc Welded (Above 400mm) M.S. Pipe having beveled ends plate or coil conforming to IS-3589-2001 or its latest revision/ amendment for following thickness outside diameter at GWSSB store or site anywhere in Gujarat State including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading conveyance to Departmental stores, stacking etc. all complete. (Pipe OD 323.9mm) .	As per Electric Item Detailed Specifications
112	Lowering, laying and jointing C. I. S & S Spun pipes suitable for Tyton joints /Mortar lined D. I. Pipes of various classes with Ci / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including hydraulic testing etc. comp. (Pipe Dia 200mm) (C) 300mm Dia.	As per Detailed Specifications
113	Lowering, laying, jointing & welding in position to correct line & level M.S. Pipe with Outsides 3 LPE coating & inside solvent free liquid epoxy lining on pedestal or chairs upon prepared formation or prepared bedding in trenches the rates include conveyance from store to site of work loading, unloading, heat shrink sleeve jointing hydrotesting etc. complete.	As per GWSSB Detailed Specifications
114	Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts including setting and joining the pipes in C.M. 1:2 watering and laying (To level of slopes of I.S. 458 / 1971 Class NP4	Cl. No. 2900 Pg. no. 783

	casted by vertically vibrated technology of following internal diameter. (a) 450mm dia.	
115	Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and inside and outside 20mm thick plastering in C. M. 1:3 necessary 100 mm coping with reinforcement in R.C.C.M. 200 fixing C. I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete as per latest CPHEEO manual. (excl. excavation). Manhole type "B" as above but upto 1.5 m depth	As per Detailed Specifications
116	Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and inside and outside 20mm thick plastering in C. M. 1:3 necessary 100 mm coping with reinforcement in R.C.C.M. 200 fixing C. I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete as per latest CPHEEO manual. (excl. excavation). Extra depth beyond 1.5m but upto 4.0m depth for type "B" manhole above.	As per Detailed Specifications
117	Providing and filling sand below R.C.C. Raft in Layers including ramming and watering complete.	As per Detailed Specifications
118	Providing and Casting in situ controlled Cement Concrete M-30 for R.C.C. Raft and cutt-off walls including necessary shuttering laying, vibrating, ramming and curing complete.	Cl. No. 1700 Pg. no. 535
119	Grouting with cement slurry with cement @ 5 kg/Sqm between the box segments after completion of pushing including cost of all materials, labour etc. complete	Cl. No. 2806 Pg. no. 769
120	<p>Casting and installation of single/twin RCC box of all sizes with or without common web section including design of pushing scheme, thrust bed, casting of all RCC components, with specified grade of controlled concrete, pushing it in correct position and alignment below Railway track/Road following all measures of track safety by "Box pushing technique" as per approved drawings/scheme, with or without surcharge in all types of soils with disposal of surplus earth away from vent up to 1 Km, fixing arrangement for all services & utilities including parapetwalls on both sides, wearing course, foot paths, plaques, drainage arrangements etc. and all other incidental works to complete the ROB/RUB/Canal crossing in all respect as per specifications to the satisfaction of Engineer-in-Charge.</p> <p>Note:</p> <p>1. The rate includes all items of work/supplies for complete job in all respects except "cost of Reinforced cement concrete, cement, reinforcement & shuttering" of (i) main RCC Box; (ii) Thrust Bed; (iii)</p>	Directed By Engineer In-charge as per RDSO Guideline.

	<p>Footpath (iv) Parapet wall and (v) wearing Course only, which shall be paid extra under relevant items of USSOR.</p> <p>2. In case Drag Sheet and/or Rail Cluster are to be used as per approved scheme and design, the same shall be paid extra under relevant item.</p> <p>3. The payment for this item shall be made for the clear inner cross section area of the parent RCC Box/Boxes and barrel length i.e. clear inner volume of parent RCC Box/Boxes.</p>	
121	<p>Insertion of temporary Reliving girder in place of formation involving dismantling of track, removal of ballast and neatly stacking for future use, excavation & installation of CC crib or wooden crib at both ends as per approved Girder by contractor's crane, tools & plants, filling of design in one or more traffic blocks, excavation for creating space for insertion of girder as required, placement of earth/sand filled bags at different stages as required, linking of track and connecting with the approaches, ballasting, boxing and packing approach sleepers to make track fit for 20 kmph to the satisfaction of Engineer in charge. RH /Temporary girder of length above 16.3m and up to 26.00 using Road crane capacity of 80 MT</p> <p>Note:</p> <p>1. The CC Cribs as required and Temporary Girder shall be supplied by Railways at available location.</p> <p>2. Transportation of Temporary Girder to site shall be paid separately under relevant item.</p> <p>3. The charges for wooden sleepers/blocks required for matting and bearing as per approved design shall be paid extra as per relevant item.</p> <p>4. In case bridge timber / channel sleepers are required to be laid on girder, the same shall be paid separately under relevant item.</p>	Directed By Engineer En- charge as per RDSO Guideline.
122	<p>Removal of temporary girder, crib on both ends and placing temporary girder on crib / cess away from Railway track as directed by engineer at site under traffic block; filling of Railway's earth by ramming, pulling ballast from stack / adjoining track / same track, laying track, linking with approach track and packing of ballast for opening track at 20 kmph speed, boxing & dressing of cess, ballast profiling etc. Note: If earth is to be brought by contractor from outside, the same will be paid separately. RH /Temporary girder of length above 16.3m and up to 26.00 using Road crane capacity of 80 MT</p>	Directed By Engineer En- charge as per RDSO Guideline.
123	<p>Loading, transportation, unloading and stacking relieving girder (a) For five km.</p>	As per Detailed Specifications
124	<p>Loading, transportation, unloading and stacking relieving girder (B) For each additional one km. Or part thereof</p>	As per Detailed Specifications
125	<p>Providing & laying weep hole in Abutments, and returns by using P.V.C(10kg) pipe of 100mm including laying in proper grade and jointing the completed as per detailed specification.</p>	Cl. No. 1409, Pg. no. 515

126	Providing and laying - Fitter Media 600mm thick directed at the back of abutments, returns and wing walls as per detailed specifications.	As per Detailed Specifications
127	Providing and casting in-situ controlled cement concrete M-30 for thickness as per drawing wearing coat laid as directed including tamping, vibrating finishing curing and filling in joints with bitumen complete.	Cl. No. 1700 Pg. no. 535
128	Supplying premoulded bituminous joint filler i.)12 mm thick	As per Detailed Specifications
129	Providing flood gauge marks on substructure as per design including painting complete.	As per Detailed Specifications
130	Providing, laying and jointing in true line and level 160 diameter 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 160 mm diameter x 210 mm length x 196 mm height 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.	Cl. No. 2700 Pg. no. 751
131	Providing and fixing post and pipe railing as per detailed drawing including 3 coats of painting to steel works complete.	As per Detailed Specifications
132	Dismantling of Flexible Pavements (Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately)	Cl. No. 202, Pg. no. 39
133	Supply and Fabrication with Erection and painting with 2 coat of enamel paint with zinc oxide at site of structural steel as per the approved drawings of Staircase, Railing, height barrier, grating, Front shield, Rear Shield, Cutting edge Plates cover or other works using ISMB, ISA, ISMC, MS/ Chequered Plates, flat, square bars, pipe, square pipe, etc. including welding, cutting, wastage, etc. complete with contractor's own Mild steel confirming to IS 2062-2011 Grade E250, BR quality with all welds, rivets, nuts bolts, etc. with contractor's own materials, fabrication, machinery, templates, fixtures, equipments, tools and plants, transportation, skilled/unskilled labour, all leads and lifts, descent, loading, unloading etc. complete and as per approved drawings & specifications by approved vendors only. The rate is inclusive of transportation of Structural Steel / fabricated components to site by contractor's own means at his cost. The structural steel to be used shall be procured from the approved manufacturer only. Work has to be done as per drawings and specifications approved by Authority.	As per Detailed Specifications
134	Providing and fixing PUF Insulated continuous sandwich panels for roofs of total thickness not less than 30 mm made out from continuous line method. Panel shall have 0.5 mm thick pre coated GI sheet on both side of Polyurethane foam with external face being corrugated in shape for GI and PU foam both material. The crest height of the panel shall be of 35mm minimum with 250mm c/c pitch. The Precoated sheet shall be of	Directed By Engineer En-charge as per RDSO Guideline.

	<p>minimum 240 mpa steel grade confirming to IS 14246:1995 and shall have zinc coating of 120 gsm as per IS:277 , 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 micron.The PPGI Sheet shall have protective guard film of minimum 25 microns to avoid scratches while transportation.The roof panels are laid over a frame work of trusses, columns and purlins fixed using 90mm self drilling bolt with rubber washer including all types of flashings. PU Foam must be self-extinguishing, fire retardant type having minimum density of 40 Kg/Cu.mt.(+, - 2 Kgs) including 0.25mm craft paper edging,self tapping screws of required length and No.etc complete as per structural design and direction of Engineer-in-charge.</p>	
135	<p>Direction (Junction) Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 244x122 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 4.0mtr (2 No.) long stand post of Iron Angle 75 x 75 x 6mm/ 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 50x50x5mm; painted with best quality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2. :4 CC block of size 45 x 45 x 60 Cms. for each leg including excavation, curing etc. complete under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting</p>	<p>Cl. No. 800 Pg. no. 325</p>
136	<p>Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specifications including setting the pipes in C.M. 1:2 watering and laying (to level or slopes) of class NP3 of following internal diameters.(iii) 600mm dia. (more than 10 ton)</p>	<p>Cl. No. 2900 Pg. no. 783</p>
	ELECTRICAL SPECIFICATION For RUB	
137	<p>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 out side 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.</p>	<p>As per Electric Item Detailed Specifications</p>
138	<p>Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 25 KA. at 415 V, having normal current rating up to 25 A to 100A. with Fixed thermal & magnetic release</p>	<p>As per Detailed Specifications</p>

	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.	
139	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.(iv) 100 Amps. FP (100 mA Sensitivity)	As per Detailed Specifications
140	Supplying and erecting triple pole & neutral 440V/ 500V panel mounting Aluminium Busbars with four equal Nos. of bus having current density not more than 0.8 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 busbar,erected in existing cubical panel with necessary connections. (B) Suitable for 200 Amp. Capacity	As per Detailed Specifications
141	Providing & erecting 415V MCB Four Pole Switch for Lighting Load (C curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (a) 6 to 32 Amp.	As per Detailed Specifications
142	Smart 4G Timer, Supply of IoT based 4G Smart Streetlight Control & Monitoring System having a Smart Panel comprising of 3 Phase IoT Streetlight Smart 4G Timer with 16x2 LCD to display RSSI, relay status, RTC time & diagnostics., Controller works on 3-phase & also on any available 1-Phase., Controller with 8-hour battery backup during external power failure. External power failure alert immediately to cloud., 110-630 V AC @ 50-60 Hz – 3 phase operating range., Standby power consumption <3W., Smart 4G Timer with RS232 port for DLMS Energy meter., Smart 4G Timer must be compatible with any make / brand of DLMS (RS232) Energy Meter., DI: 4 Nos. (3 Contactor / Latch detection, 1 for Door Sensor.), DO: 3 Relays for Independent control each phase (R, Y, B) with 1 extra spare relay., Smart 4G Timer with dual SIM functionality for connectivity backup., 4G M2M SIM 3-Year communication included., Local configuration via WiFi / BLE for maintenance or during force majeure., GPS chip inbuilt of Smart 4G Timer for auto location tracking & astronomic schedule location., 50 programmable schedules., Astronomic scheduling with monthly offsets., Smart 4G Timer has inbuilt timer stores schedules locally & also stores schedule execution logs locally, syncs to cloud whenever connected to cloud., Auto-scheduler overrides manual operations., Monitoring & alerts for MCB trips., Over/under voltage, current, overload, power factor & short circuit protections with alerts via Dashboard, App, SMS, WhatsApp & Email., Contactor / Latch chattering protection & alerts., Smart 4G Timer with neutral failure protection and alert., Bulit-in Watchdog for anti-jamming., Smart 4G Timer must send Regular "heartbeat" on software for CCMS status., Accelerometer for tamper & panel movement detection & alerts., Smart 4G Timer must be tested from an NABL Lab for Surge Test @ 6 KV (IEC 61000-4-5), ESD Test @ 4 KV (IEC 61000-4-2), EFT @ 2 KV (IEC 61000-4-4), Conducted Emission @ 150 KHz-30 MHz (CISPR11), Damp Heat Test (40 Deg C @ 95% RH) 2 cycles of 12+12 hours (IS: 9000 (Part 5/Sec.2):1981 latest) with all test passing criteria as “Temporary degradation or loss of function or performance which is self-recoverable”., FOTA functionality required for upgrades., Smart 4G Timer sends & stores online/offline data of controller & load for lamp burn hours analysis., It stores & syncs	As per Detailed Specifications

	<p>connectivity logs for configuration of network connections & analytics., PANEL & SWITCHGEAR, The panel includes a Class 1 DLMS energy meter NABL approved with 1-2 months of stored data of daily, hourly, monthly, load survey, instantaneous, events, tamper data & with power events stored in meter memory for audit purpose., Must monitor V, I, KWH, KVA, PF, KVAH, etc., Panel made with 2 mm CRCA sheet with ground mountable stand complete with gland plate, waterproof glands, earthing bolt., IP55, weatherproof panel with RAL7035 powder-coated., Smart 4G Timer must be fitted on removable terminal sockets for easy maintenance., Switchgear includes 3 Nos. 3 pole Contactor / Latch having minimum 50 A Load carrying capacity per phase, all other switchgear & wires: 40 A load carrying capacity., 1 Nos. 4P MCB 10 kA for Incomer & 6 Nos. 1P MCBs 10 kA for Outgoing., Phase-Wise Bypass MCBs required., 4P RCCB 100 mA., door sensor. Also, provide lock & key facility., Panel mount outdoor antenna for GSM, GPS., Canopy design for draining down water., CCMS SMART SOFTWARE, OAuth 2.0 APIs for sending data to Government clouds/software, etc., CCMS Web dashboard with secure password & OTP login., Hosted on trusted cloud, data security, antivirus & attack protection., HTTPS., AES256-bit encryption., Vulnerability Assessment and Penetration Testing (VAPT) certificate for CCMS Software., Streetlight management software for load status, live analytics & reports., Energy meter data tables (kW, kWh, PF, I, V, etc.) available., Utility monthly bill reconciliation & Class 1 accuracy reports for billing, energy monitoring & auditing for streetlight load., Fault detection., Light fault 99% analysis on dashboard using energy monitoring., WhatsApp integration., Hierarchy-wise reporting & alerts., GIS mapping of live connected streetlight control panels, poles & streetlights., MQTT protocol., Smartphone app with local configuration & navigation., Monitoring & reporting of lighting parameters., Facility for media attachments for site photos/videos/work permits/checklists, etc. per Feeder Panel for remote verification., Asset management module for streetlight infrastructure data., Complaint/service task management with history & escalation must be available., Android & iOS App for dashboard analytics, graphs, energy data, alerts., 3 Years CCMS Web Software & Cloud Server Hosting subscription included., Customizable, user-friendly dashboard.,</p>	
143	<p>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. (A)(approved make OEM has to submit test certificate including value of earth resistance of installation duly stamped and signed by agency and officer Incharge has to ensure the value of earthing resistance mentioned in test Certificate) & having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 ohm / meter testing as per IEC 62561-2017, Voltage drop:- < 1 volt at no load & dry form, Sulphur content:- <2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted by Agency. (a) For Electrical Installation up to 440V in normal soil</p> <p>Length of pipe - 1 Mtr, Back filling compound - 1 Nos Bag of 15 Kg.</p>	As per Detailed Specifications

144	Providing & erecting Medium Voltage Danger Notice Board sticker as per language suggested by engineer incharge of standard size as per IS-2551	As per Detailed Specifications
145	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.	As per Detailed Specifications
146	Providing & erecting approved make street light / wall mounting junction box compression moulded from SMC (thermoset plastic) vertical sliding cover having locking with square head stud loop in / loop out in built terminal suitable for four core cable, waterproof of I.P. 54 protected with clamp or bolt nut & earth bolt of following size.(A) 200mm x 127mm x 83 mm	As per Detailed Specifications
147	Supplying and erecting B class galvanised iron pipe 32 mm outside dia 45 cm long duly welded on 20 cm x 20 cm x 3 mm thick M.S. base plate, erected on wall or corner for mounting street light luminaire with necessary hardware materials duly painted.	As per Detailed Specifications
148	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 / required size of pole top having sufficient fasteners for fixing the brackets and having spread of 1.5.mtr. length with 110 deg.with vertical plane & suitable welded stays, reducer and with check nuts 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 1.5 Mtr [B] Double Arm Bracket 1.5 Mtr	As per Detailed Specifications
149	providing and erecting Miniature circuit breaker single pole 0.5A to 2A system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark	As per Detailed Specifications
	Strom water & Pumping Station For RUB	
150	Providing and fixing in position steel bar for RCC Sump reinforcement of steel grade FE-500D (TMT) including cutting , bending, hooking, tying, welding etc., complete as per detailed drawing and specification.	Cl. No. 1600 Pg. no. 527
151	Providing and laying controlled cement concrete M25 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Foundations, Footings, Base of Columns and Mass Concrete.	Cl. No. 1700 Pg. no. 535
152	Providing and laying controlled cement concrete M25 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (D) Columns, Pillar Posts & Struts, upto floor two level.	Cl. No. 1700 Pg. no. 535
153	Providing and laying controlled cement concrete M25 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (C) labs,landing,shelves,Balconies, Lintels,Beams, Girders and Cantilever upto floor two level.	Cl. No. 1700 Pg. no. 535

154	Providing and laying in position FE 500D TMT bar reinforcement including cutting, bending, hooking and tying complete as per detailed drawings for the following. (Pump Room)	Cl. No. 1600 Pg. no. 527
155	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	As per Detailed Specifications
156	Providing 15mm thick cement plaster in single coat on Rough (Similar)side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand)	As per Detailed Specifications
157	Providing 20 mm thick double coat mala cement plaster on outside / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete.	As per Detailed Specifications
158	Providing 10mm thick cement plaster in single coat on Ceiling for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1- cement:3-sand)	As per Detailed Specifications
159	Applying two coats of Birla (white cement based) or Asian (acrylic lapy-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 foreign matter and sand papered smooth.	As per Detailed Specifications
160	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.	As per Detailed Specifications
161	Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete	As per Detailed Specifications
162	Providing and fixing 35 mm thick shutters for Doors, windows and clerestory windows including Indian teak wood frames 10 cm x 7 cm. size including black enamelled iron oxidized fixtures and fastenings including primer coat of approved quality and two coats of oil painting etc, complete. (ii) Fully Panelled.	As per Detailed Specifications
163	Providing and fixing window having extruded aluminum Colour Powder Coated 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	As per Detailed Specifications

	transparent silicon sealant glass fixing to frame as per details etc complete for window.	
164	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	As per Detailed Specifications
165	Supplying and fixing reinforced concrete heavy duty nonpressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specifications including setting the pipes in C.M. 1:2 watering and laying (to level or slopes) of class NP4 of following internal diameters.. (B) 900mm dia. (C) 1800mm dia.	Cl. No. 2900 Pg. no. 783
166	Providing and supplying ISI mark G. I. pipes with Couplings of following class and diameter including all taxes,insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc. complete. (IS -1239) (Heavy Duty). 100mm dia.	As per Detailed Specifications of Pumping Specification
167	Constructing brick masonry road gully chamber 1100mm x 775mm including 500mm x 450mm (C.I. Horizontal grating with frame and vertical grating complete.)	As per Detailed Specifications of Pumping Specification
168	Providing and fixing C.I. Manhole cover 0.60 M. x 0.45M. size having weight not less than 35Kg.	As per Detailed Specifications of Pumping Specification
169	Providing & erecting vertical turbine dewatering pumps set with cast iron body, stainless-steel shafts, stainless-steel impellers, brass joints, complete for operating on three phase power supply of 415 V, 50 Hz, AC Power, with Starter Panel, base plate, foundation bolts, earthing points, dry run protection, G.I. Header connecting the pumps, 150mm dia G.I. Pipe up to nearest catch basin, cable connections from starter panels to pumps, valves, etc, complete as per the approval and direction of the Engineer-in-charge. BHP not less than 50BHP	As per Detailed Specifications of Pumping Specification
170	Supplying and erecting, commissioning and testing diesel generating set 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, feeder gauge, cylinder head to cover, joint cylinder head to exhaust, element lube oil filter, 12/24 volts electric starting equipment complete with standard 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,	As per Detailed Specifications of Pumping Specification

	<p>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, running at 1500 RPM, conforming to IS- 4722- 1968 with voltage regulation +/- 5% of rated voltage from no load to full load. Both the engine and alternator fitted on a common fabricated steel base plate with antivibration mounting engine and alternator both connected to each other by flexible flange coupling and with floor/wall mounted control panel box comprising of voltmeter ammeter, selector switches, ACB / MCCB / MCB of adequate capacity, indicator lamps duly wired with HRC fuses. The alternator & control panel shall be connected with provided suitable capacity armoured cable and complete with Acoustic enclosure (canopy) made out of 18 SWG CRCA Sheet, sound absorbing material Rockwool of 64 density & 100 mm thick conforming to IS:8183 The resin bonded rockwool covered from inside the canopy by perforated sheet with 3/4 mm holes, sound level not more than 75 dB at a distance of 1 mtr, as per PVCT norms. Erection, commissioning and satisfactory testing as per requirement with first filling of fuel, oil, etc. with guarantee of complete system for One year. & with obtaining all necessary certificate from Electrical Inspector. The Capacity and Ratings of DG sets are as below. Continuous Rating of 125 KVA, BHP not less than 154 BHP</p>	
171	<p>Providing & erecting approved make AMF control panel suitable for following size of 3 phase, 415 V., 50 cycles, A.C. diesel generating set complete of scope as detailed below:</p> <p>1) Power module: A pair of electromechanically interlocked contactors (for mains & generator) Overload relay for generator contactor Neutral contactor for mains and generator Power socket for connections.</p> <p>2) Control and metering module: Line voltage monitor. Generator voltage monitor Ammeter 3 items attempt start facility. Air circuit breakers/MCB/MCCB of suitable rating for auto/manual operation. Auto/manual switch. Emergency stop push buttons. Manual start push button. frequency meter. Engine hour meter. Two earthing studs.</p> <p>3) Protection module: The engine shutdown in the unlikely event of Low lube oil pressure High cylinder head temperature. V belt failure.</p> <p>AMF Control Panel for 100 KVA/125 KVA 3 phase DG Set</p>	As per Detailed Specifications of Pumping Specification

Item No.27:- Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene (conforming to IS14930II) with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground/road surface for enclosing cable as directed by engineer in charge. (A)50 mm outer dia

FOREWORD

- 00** 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.
- 01** This specification requires reference to the following specifications.

	IS:14930 Pt.-I	General requirements of Conduit system for Electrical and Communication installation
	IS:14930 Pt.-II	Particular requirements of Conduit system for Electrical and Communication installation
	IS:2530	Method for test for Polyethylene moulding materials and polyethylene compounds.
	IS:7328	HDPE materials for moulding and extrusion
	IS:12063	Classification of degrees of protection provided by enclosures of electrical equipment
	IS:11000(Pt-2/Sec1)	Glow-Wire Test and Guidance, Test Methods for Fire Hazard Testing
	ASTM D 1693	Test method for environmental stress – cracking of ethylene plastics
	ASTM D 638	Standard test method for tensile properties of plastic
	ASTM D 790	Test method for flexural properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
	ASTM D 2240	Standard Test method for Rubber property
	ASTM D 648	Standard Test method for deflection temperature of plastic under flexure load in the Edgewise Position.

02 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 of Signalling 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 Signaling 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
- 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
- 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.

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

LIST OF TEST

- ❖ Compression Test
- ❖ Impact Test
- ❖ Banding Test
- ❖ Oxidation induction Test
- ❖ Resistance to flame propagation Test
- ❖ Anti-rodent Test
- ❖ External influences Test

Mode of Measurement and Payment:

The item shall be measured & paid as finished work in **Running meter**.

Item No:43 -Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.

1.0 WORKMANSHIP

- 1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter all clots of earth shall be broken.
- 1.2. As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris brick bats mortar dropping etc. and filled with earth in layers not exceeding 20 cms. each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the ends of crow-bars, where rammer cannot be used.
- 1.3 The plinth shall be similarly filled with earth in layers not exceeding 20 cms adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- 1.4 The finished level of filling shall be kept to shape intended to be given to shape.
- 1.5 In case of large area the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

2.0. Mode of Measurements & Payment

- 2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- 2.2. The rate shall be for a unit of **cubic meter** basis.

Item No. 52:- Providing and fixing marble slab including transporting, engraving and printing all complete. (ii) Size 75cm x 60cm x 4cm As per Drg and Engineer in-charge.

1. Marble plate shall be white and of approved quality and shall be of size as mentioned in the item. Lettering shall be done by V-shape engraving and shall be filled with black paint of approved quality, letting shall be done as directed by the Engineer-in-charge. The Marble plate shall be fixed in neat cement at a place as directed by the Engineer-in-charge. Cement shall conform to relevant IS Specification.
2. **Measurement shall be per number of marble plate fixed.**
3. Unit rates includes cost of all material labour and tools to complete the work

Item No:56 Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed with all lead & lift.

1. This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction of widening carriageway in accordance with requirements of these specifications and the lines, grades and cross sections shown in the drawings or as indicated by the Engineer.
2. After the site has been cleared the limits of excavation/ box cutting the road surface shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer.
3. Box cutting shall be carried out in conformity with the directions laid here in under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from box cutting/ excavation are satisfactorily utilized as directed.
4. The contractor shall not excavate outside the limits of box cutting. Subject to the permitted tolerances, any excess depth/ width excavated beyond the specified levels/ dimensions on the drawings shall be made good at the cost of the contractor with suitable material of characteristics similar to that removed and compacted as directed.
5. Cutting shall be done in proper grade & camber as per measurements given. Care must be taken that all 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).
6. The stuff received from the cutting shall be used for filling and correcting side slopes of bank as directed by the Engineer in charge.
7. The measurement of box cutting shall be taken on level basis & level shall be taken at 10 mt. interval. Volume shall be computed in **cubic meters** by average area method.
8. The payment shall be made on Cum. basis.
9. The rate includes cost of all labour, machineries required, cost of carting the cutting stuff with all lead and lift and leveling the dumping ground etc. complete.

Item No. 76: - Providing & fixing ordinary Kilometer stone of precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including letter & paints etc. complete (For N.H., S.H. & M.D.R.)

1. Kilometer stone shall be of approved quality and shall be either black Rajula stone or of precast 1:2:4 R.C.C. as specified in the item.
2. The size manner of fixing painting and lettering of K.M. stone specification as per I.R.C. 8 (Type design for Highway kilometer stones.) The fixing of K.M. stone shall be carried out in ordinary concrete of grade specified in the item using broken metal field metal or gravel The measurement for payment shall be made per **numbers** of K.M. stone fixed in position.

3. Unit rate for kilometer stone include the cost of all materials, labour, tools, fixing, finishing curing lettering and painting as directed by the Engineer-in-charge.

Item No.102: Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M30 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 INTERLOCKING CONCRETE BLOCK PAVEMENT

1.1. Scope

Rubber dye Interlocking Concrete Block Pavement (ICBP) shall consist of a surface layer of appropriate sized concrete paving blocks paved and compacted over a thin bedding sand layer of specified grading, which is spread over a properly constructed and profiled base course and is bounded by properly installed edge restraints. The joints shall be filled by fine sand of specified grading. The work shall include supplying laying and paving of blocks including all materials, labour and equipment and performing all operations in connection with the laying of ICBP as per these Specifications.

1.2. Materials

1.2.1. The Concrete Paving Block shall conform to the relevant IS standard.

1.2.2. Bedding sand : Bedding sand shall conform to the grading given in

Table 1500.6.

1.2.3. Joint filling sand : Joint filling sand shall conform to grading given in

Table .

TABLE : GRADINGS FOR BEDDING AND JOINT FILLING SAND

IS Sieve Size (mm)	Per cent Passing	
	For Bedding Sand	For Joint Filling Sand
10.00	100	100
4.75	90-100	90-100
2.36	60-95	75-100
1.18	15-34	55-90

0.60	25-60	35-59
0.30	5-20	8-30
0.15	0-10	0-10
0.075	0-5	0-5

1.3. Buffer

Buffer of specified quantity of paving blocks (of the same shape, size and thickness) required for normal maintenance of paved area as specified by the Engineer, shall be supplied and stored for replacement as and when needed. Normally this will be 5 per cent of the blocks used in the paved area.

1.4. Block Thickness

For rural roads catering to heavy vehicles, the minimum thickness of paving blocks shall be 60 mm for traffic up to 100 vehicles per day, and 80 mm for projected traffic from 100 to 200 vehicles per day.

1.5. Dimensions and Tolerances

The dimensions and tolerances of paving blocks shall conform to the Specifications given in Table 1500.7. Aspect ratio is the ratio of length to thickness of blocks. Chamfer is the bevelled edge, provided on the top surface of a block. Plan area is the horizontal area bounded by the vertical faces. Wearing surface area is the horizontal area bounded by the vertical faces, minus the area reduced due to the presence of chamfer.

TABLE : DIMENSIONS AND TOLERANCES FOR PAVING BLOCKS

S. No.	Dimension	Recommended Values	Tolerance Limit
(1)	Width W	To be specified by Manufacturer	±2 mm
(2)	Length L	To be specified by Manufacturer	±2 mm
(3)	Thickness T	60 to 80 mm	±3 mm
(4)	Aspect Ratio L/T	Maximum : 4.0	±0.2
(5)	Chamfer (Arris)	Maximum : 5 mm Maximum : 7 mm	±1 mm
(6)	Plan Area	Maximum : 0.03 m ²	+0.001 m ²
(7)	Wearing Face Area	Minimum 75% of Plan Area	-1%
(8)	Squareness	Nil	±2 mm

1.6. Compressive Strength

1.6.1. The average 28 days compressive strength of 8 blocks shall be 30 MPa and strength of individual block shall not be less than 26 MPa.

1.6.2. The 28 days compressive strength of paving blocks tested as per relevant IS specification shall be determined as explained hereinafter.

1.6.2.1. Compression testing machine of adequate capacity shall be used for testing of blocks. The steel bearing plates shall have a minimum thickness of 25 mm. The surface area of the bearing side of the plate should be such that no edge of the bearing plate is less than 10 mm from the outer edge of the paving block being tested.

1.6.2.2. In case the testing surface of the paving block departs from a plain surface by more than 0.05 mm, capping using suitable materials shall be adopted for testing as per IS:516.

1.6.2.3. The blocks shall be stored for 24 ± 4 hours in water maintained at a temperature of $(20 \pm 5)^{\circ}\text{C}$ before testing. The dimensions and plan areas of the block shall be determined. The bearing plates of the testing machine shall be wiped clean. The specimen shall be clamped between the plates in such a way that the axes of the specimen are vertically aligned with those of the bearing plates.

1.6.2.4. The load shall be applied without shock and increased continuously at a rate of $15 \pm 3 \text{ N/mm}^2/\text{minute}$ until no greater load can be sustained by the specimen or delamination occurs. The maximum load applied to the specimen shall be noted.

1.6.2.5. The apparent compressive strength of individual block shall be calculated by dividing the maximum load (N) by the plan area (mm^2). The corrected compressive strength shall be calculated by multiplying the apparent compressive strength by the appropriate correction factor from Table . The strength shall be expressed to the nearest 0.1 N/mm^2 .

**TABLE : CORRECTION FACTORS FOR THICKNESS AND CHAMFER OF
PAVING BLOCK FOR CALCULATION OF COMPRESSIVE STRENGTH**

Paving Block Thickness (mm)	Correction Factor for	
	Plain Block	Chamfered Block
60	1.00	1.06

80	1.12	1.18
----	------	------

1.6.2.6. Water Absorption: The water absorption being the average of five blocks shall be not more than 6 per cent by mass.

1.7. Edge Blocks

The edge blocks shall have equivalent cube compressive strength not less than 30MPa. The road kerbs provided on the edges of the road also serve the purpose of edge blocks. In case the end kerbs are not provided, 300 mm x 300 mm x 150 mm of M30 grade concrete edge blocks or other suitable size as per drawings or direction of the Engineer shall be provided.

1.7.2. Subgrade

The Subgrade shall conform to these Specifications. The soaked CBR of subgrade soil shall not be less than 4 per cent.

1.8. Sub-base

The sub-base shall be 100 mm thick granular layer conforming to Clause 401 or 100 mm thick WBM Gr.I conforming to Clause 405 of these Specifications. In case the subgrade soil is clayey, the sub-base shall be extended over the full formation width for proper drainage.

1.9. Base Course

A minimum 100 mm thick layer of granular/stabilized base course shall be provided. The base course layer shall be extended at least 300 mm beyond the edge restraints. The material shall conform to Clause 402 of these Specifications.

1.10. Bedding Sand

Bedding sand conforming to Table 1500.6 shall be uniformly laid to a compacted thickness of 25 mm for 60 mm thick blocks and 30 mm for 80 mm thick blocks. Bedding sand shall be unloaded in small piles regularly placed over the base course and shall preferably have a moisture content of about 6 per cent which will facilitate its spreading and compaction. Bedding sand shall be screened in a uniform layer over the base course. The screed can be guided to level by tensioned string lines set above the base course. At the time of screening, the thickness of sand must allow for the amount by which it will be subsequently compacted which is normally about 25 per cent more than the compacted thickness. Screening shall not proceed beyond about 1 m ahead of the planned end of block paving for the day. Sand shall preferably be compacted with a manual, fabricated plate compactor and the level shall be readjusted using the screed. The surface profile of the

screened bedding sand shall match that required for the completed pavement.

1.11 Paving pattern

The pattern in which blocks are to be paved shall be decided in advance from the two choices or their derived forms available. There are the herringbone and stretcher patterns.

1.11.1

Beyond large these patterns are the same as adopted for brick paving. All shapes of blocks are not amenable to the above paving patterns. For paving in trafficked areas, herringbone pattern shall be adopted for ensuring better performance. Paving shall commence and progress from starting line only wherever possible. Paving shall commence adjacent to or against edge restraint.

1.12. Paving and Compaction of Blocks

Blocks shall be placed at the correct angle to the start line to achieve the final orientation of the laying pattern. For curved or unfavorably oriented edge restraints, a string line shall be established to permit fast, easy laying such that it is not required to force a block between the blocks already paved. Control over alignment, laying pattern and joint width can be assisted by the use of chalked string lines set at about 5 m intervals. Nominal joint width of 2 to 4 mm shall be maintained by holding the paving unit lightly against the face of the adjacent block and allowing it to slide into position. Cutting paving units for filling the paving gaps occurring against edge restraints etc. shall be deferred until sufficient work has progressed to allow reasonably continuous operation. When space does not permit the use of cut pieces of blocks, premixed or dry packed concrete shall be used. After a section has been paved, compaction shall be effected by using vibrating plate compactors in the following sequence of operations:

- (i) Vibrate the blocks with 3 passes of the plate vibrator of adequate capacity.
- (ii) Spread a thin layer of fine joint filling sand on top of the paved blocks and sweep it into the joints, using suitable brooms.
- (iii) Vibrate the sand into the joints by making 3 passes of the compactor.
- (iv) Sweep off the excess sand from top of blocks.

As a guide to the characteristics of typical vibrating plate compactors, standard compactors have a weight of 90 kg, a plate area of 0.3 m^2 and apply a centrifugal force of 1500 kg. Heavy duty compactors weigh between 300 to 600 kg, have a plate area of about 0.5 to 0.6 m^2 and apply a centrifugal force in the range of 2000-3000 kg. Use of heavy duty compactors is desirable for trafficked pavements.

1.12.1. Trial length : The contractor shall lay a trial length of 30 m and get it inspected and approved by the Engineer before proceeding with the regular paving work. The trial length shall be rectified/relaid if

found deficient in any respect. The procedure demonstrated in the laying of trial length shall be followed while executing the main construction work.

1.13. Opening to Traffic

The pavement can be opened to traffic as soon as the construction work is completed.

1.14.1. Transverse profile : When measured by a camber template, the transverse profile shall not deviate by more than 10 mm from the design profile.

1.14.2. Longitudinal profile :When measured by a 3m straight edge, the longitudinal profile shall not deviate by more than 12 mm from the design profile.

1.15. Acceptance Criteria

From each lot of 500 blocks, 5 blocks shall be selected at random for water absorption and compressive strength tests. In case the number of blocks in the lot is less than 500, a minimum 1 per cent of the blocks delivered to site shall be tested for water absorption and strength. The blocks shall be first tested for water absorption and these shall meet the requirement of Clause 1.5.2.6 of these Specifications. The same five blocks (or minimum 1 per cent) shall be tested for strength and shall conform to the strength as per Clause 1.5.1 of these Specifications.

The paved surface shall meet the tolerances for lines, levels, and grades etc. as given in Section of these Specifications.

1.16. Measurements for Payment

The measurement of the paved area shall be in **square meters** measured from the inner edge of edge restraints on one side of the pavement to the inner edge of the edge restraints on the transverse side of the pavement. The measurement of the edge restraints shall be in number of units or in cubic meters.

1.17. Rate

The contract unit rate shall include the cost of blocks, cost of stacking, transportation to site and paving including supply and application of bedding sand and joint filling sand. The rate shall include full compensation for labour, tools, plant, equipment, testing and all incidentals to the work, including all royalties, taxes, storage rents wherever necessary, and all leads and lifts.

Item No. 105: - Providing and fixing 1.20 Metre high fencing with 2.0 Metre long M.S. Angle posts 40mm x 40 mm x 6 mm and oil painting 3 coats fixed at 2.5 Mt./c. with five Horizontal lines and two diagonals of galvanised steel barbed wire weighting 9.38 Kg. per 100 Metre, strained and fixed to posts with G.I. staples including fixing the posts in ground with 0.5 M x 0.5 M block in C.C 1:5:10 etc complete.

16.17 BARBED WIRE FENCING WITH ANGLE IRON POSTS

16.17.1 Materials

G.I. Barbed wire shall be as per IS 278 and angle iron shall be as per subhead – 10.00.

16.17.2 Spacing of Posts and Struts

The spacing of posts shall be 2.5 m centre to centre, unless otherwise specified or as directed by the Engineer-in-Charge to suit the dimensions of the area to be fenced. Every 15th, last but one end posts and corner post shall be strutted on both sides and end post on one side only.

16.17.3 Fixing of Posts and Struts

Pits 50 x 50 cm and 50 cm deep or as directed shall first be excavated true to line and level to receive the posts. In the case of struts, pits 50 x 50 x 50 cm deep or as directed shall be excavated to suit the inclination of the strut so that it is surrounded by concrete by not less than 15 cm at any point. The pits shall be filled with a layer of 15 cm thick cement concrete 1:3:6 (1 cement: 3 fine sand: 6 graded stone aggregate 40 nominal size). The posts and struts shall then be placed in the pits, the posts projecting 1.2 m or to the specified height above ground, true to line and position. The cement concrete 1:5:10 shall be filled in up to 15 cm for posts and 25 cm for struts below ground level at the base of the concrete so that the posts are embedded in the cement concrete block of size 50x50x50 cm and strut in block of size 50x50x50 cm. The concrete in foundations shall be watered for at least 7 days to ensure proper curing. The remaining portions of pits shall be filled up with excavated earth and the surplus earth disposed off as directed by the Engineer-in-Charge and site cleared.

16.17.4 Fixing G.I. Barbed Wire

The barbed wire shall be stretched and fixed in specified number of rows and two diagonals. The bottom row should be 14 cm above ground and the rest at spacing of 2.5 cm centre to centre. The diagonal shall be stretched between adjacent posts from the top wire of one post to the bottom wire of 2nd post. The diagonal wire will be inter woven with horizontal wires by fixing the odd rows of wires first, then the diagonal cross wires and lastly even rows of wires. The barbed wire shall be held by tearing the holes of 10 mm dia in the post and tied with G.I. wire, turn buckles and straining bolts shall be used at the end post, if so specified.

16.17.5 Measurements

1.20-Meter-high fencing with 2.0-Meter long M.S. Angle posts 40mm x 40 mm x 6 mm and oil painting 3 coats fixed at 2.5 Mt. C/c shall be measured in **Running Meter**.

16.17.6 Rates

The rate shall include the cost of labour and materials involved in all the operations described above but excluding the cost of post struts turn buckle straining bolts and excavation and concrete in foundation for which separate payments shall be made under respective item. Angle iron post shall be paid as per similar item of subhead Steel work of CPWD Specification 2019 Vol-I. No extra payment shall be made for making holes in angle and nothing shall be deducted on account of holes.

Item No. 110: - Manufacture, Supply & Delivery of Ductile Iron Flange socket spigot bends, tees, reducers or any other specials as per BS-EN-545/1995 Class-A series K12 suitable for use with D.I. Pipes manufactured as per IS:8329/1994 delivery of specials is to be made to GWSSB store or site of works any where in Gujarat including all taxes, loading, unloading, carting, stacking, insurance, inspection charges, octroi etc. complete. With external bitumen & zinc coating & internal cement mortar lining, Socket & Spigot (Type 80 to 300mm Dia)

In general the work shall be carried out as per the standard specifications of JMC/R&B/P.W.D./C.P.W.D./GWSSEB/Standard, relevant drawings and as per the instructions of Engineer in Charge.

Contractor shall supply all labourers, materials, etc. required for Providing, Supplying Conveyance to site, Ductile Iron Flange socket spigot bends, tees, reducers or any other specials as per BS-EN-545/1995 Class-A series k12 suitable for use with D.I. Pipes manufactured as per IS: 8329/1994 delivery of specials is to be made to Store or site of work including all required accessories, Connection complete .including required size etc. comp. or directed by engineer incharge. and shall maintain them as long as required and directed.

The rate for this item includes cost of all materials, labour, plants taxes like transportation, octroi, vat, **all taxes, insurance, transportation, freight charges, Octroi, inspection charges, loading unloading, conveyance to stores/Site** and everything required to execute this item etc. complete (satisfactory completion of this item) and maintain till minimum one year from completion of the work and as directed by engineer in charge.

The measurement for payment shall be made on **kg.** Basis.

Item No. 112: - Lowering, laying and jointing C. |. S & S Spun pipes suitable for Tyton joints / Mortar lined D. |. Pipes of various classes with CI / MS specials of following diameters in proper position, grade and alignment as directed by Engineer-in-charge including hydraulic testing etc. comp..

Material:

The material in general shall be conforming to IS:1387:1993.

Method for Brinell Hardness test of material shall conform to IS:1500:1983.

Sampling criteria for the various tests, unless specified in this specification shall be as laid down in IS 11606:1986.

Pipe shall be suitable for push on joint rings conforming to IS:5382:1985 and IS:12820:1989.

EPDM (Ethylene Propylene Diene Monomer) rubber gasket shall conforming to IS:5382:1985 with ISI mark.

Manufacture :

Ductile Iron Pipes with internal cement mortar lining and external Zinc coating with finishing layer of Epoxy (70 Micron) ; manufactured, tested and duly marked in strict accordance with & confirming to IS 8329:2000 (as per

latest amendment); suitable for push on jointing , along with one number Rubber Gaskets for each length of pipe (EPDM Gasket as per IS 5382:1985)

The metal used for the manufacture of pipe shall conform to the appropriate as grade specified in IS 8329:2000. It shall be prepared at the discretion of the manufacture in a cupola, an active mixer or other suitable furnace or any other suitable standard method.

The pipes shall be stripped with all precautions to avoid warping shrinkage defects, detrimental to their good quality. The pipes showing shall be sound and free from surface or the defects. Pipes showing shall imperfections which result from the method of manufacture and which do not affect their serviceability shall not be rejected on that account alone. Minor defects arising out of manufacturing process may be rectified with the consent of the purchaser.

The pipes shall be such that they could be cut, drilled or machined. In case of dispute the pipes may be accepted provided hardness measured on the external unmachined surface does not exceed 230 HBS.

Pipes centrifugally cast shall be heat treated in order to achieve the necessary mechanical properties and to relieve casting stresses; accordance with IS:13655:1993.

If necessary, the pipes may be subjected to reheat treatment to ensure that Brinell hardness does not exceed the specified value.

In case of push-on joint, the spigot ends shall be suitably chamfered for smooth entry of pipes in the socket fitted with the rubber gasket. Socket and Spigot dimensions including chamfer must be checked and a test certificate to the effect shall be submitted for each and every pipe without which payment will be released for the same.

The socket dimensions shall be perfectly suitable for Rubber Gaskets conforming to IS 12820:1989.

The socket and spigot dimensions including chamfer shall be strictly as per Table-2 of IS:8329:1994.

Sampling:

Sampling criteria for the various tests, unless specified shall be as laid down in IS 11606:1986.

Vendor List :

Jindal SAW Ltd.

Electrotherm India Ltd.

Shri Kala Hasti Pipes Ltd. (LANCO)

Mechanical Test:

Mechanical tests shall be carried out during manufacture. One tests shall be conducted for every batch of production. Total no. of pipes for each batch would be as per Clause 10.1 of IS 8329:2000.

Ring Test and Tensile Test :

Two test pieces obtained by cutting rings or bars from the spigot end of two pipes selected for testing except for pipes manufactured under controlled cooled process described in 10.1.1 when tested in accordance with the methods specified in IS: 8329 shall satisfy the requirements mentioned in it.

Brinell Hardness Test :

When tested in accordance with IS:1500:1993, the Brinell Hardness shall not exceed 230 HB on the external unmachined surface.

Retest :

If any piece representing a lot fails in the first instance two additional tests shall be made on test pieces selected from two other pipes from the same lot. If both the results satisfy the specified requirement, the lot shall be accepted. Should either of these additional test pieces fail, the lot shall be deemed as not complying with IS: 1536:1989 and shall be liable for rejection.

In the event of lot not found conforming to this standard, the same may be reoffered for inspection after reheat treatment.

Hydrostatic Test :

All Pipes shall be tested hydrostatically at the pressure specified in Table 1 of IS 8329:2000 as appropriate. To perform the test, the pressure shall be applied internally and shall be steadily maintained for a period of minimum 10 seconds during which pipes may be struck moderately with a 700 g hammer. The pipes shall withstand the pressure test and shall not show any sign of leakage, sweating or other defects. As far as possible the hydrostatic test shall be conducted before coating the lining of pipes.

Works Test Requirements :

Socket and spigot pipes shall withstand hydrostatic test pressure as specified in relevant IS codes.

Sizes and mass :

The range of nominal diameter, DN, of pipes and flanges is as follows:

100, 150, 200, 250, 300, 400, 450, 500, 600, 700, 750 and 800 mm or as specified in Schedule-`B`

NOTE :

Nominal diameter is a number used to classify pipes and corresponds approximately to their clear internal diameter.

Working lengths `L` of socket and spigot pipes.

(a) Socket and Spigot Pipes: 5.5 and 6.0 m.

NOTE:

Approximately 90% of the ordered quantity of pipes ranging from 100 mm Dia and above shall be of 5.5 mts.

Dimensions and mass of uncoated socket and barrel of the pipes shall conform to IS:8329.

Mass for sockets and pipes barrels as specified in IS 8329 shall have density of Cast as 7050 Kg/Mt³.

Tolerance :

Tolerance in Diameter :

The tolerance of external diameter of Barrel for all type of pipes unless specified shall be as per Table-7 of Clause 15.1.1 of IS:8329:2000.

For requirement of interchangeability all pipes should be within the tolerance specified. Push-On flexible joints may need closer tolerance for its effective performance.

Tolerance on Ovality:

Pipes shall be as far as possible circular internally and externally. The tolerance for out of roundness of the socket and spigot ends in the jointing zone for Push-on joint are given in Table below:

In case of oval spigot ends for push-on joints (DE), the minor axis is permitted to be less than the minimum allowable diameter by the value given below provided the mean diameter DE measured by circumferential tape, comes within the minimum allowable dimensions of DE (Table-2) after applying the tolerance:

Table Allowable Ovality for Push-on Joint Pipes

Nominal Diameter DN mm	Allowable Difference Between Minor Axis and DE min mm
1	2
80 to 300	1.0
350 to 600	1.75
700	2.0
750 to 800	2.4

Tolerance on Thickness

The tolerance on the wall thickness 'e' and of pipes shall be as follows :

Dimensions	Tolerance in mm
Wall thickness	- (1.3 + 0.001 DN)
*. No limit for the plus tolerance is specified.	

Tolerance on length

The tolerance on length of pipes shall be as follows :

Type of Casting	Tolerance in mm
Socket and spigot end	+ 100

Permissible Deviation from a Straight Line :

The pipes shall be straight. When rolled along two gentries separated by approximately two-thirds the length of the pipe to be checked, the maximum deviation from a straight line in mm shall not be greater than 1.25 times the length 'L, in meters of the pipe, thus:

$$f_m \leq 1.25 L$$

Where

f_m = maximum deviation from straight line, and

L = length of the pipe.

Tolerance on Mass

The permissible tolerance on standard mass of pipe shall be +8 percent for sizes up to and including 200 DN and + 5 percent for sizes above 200 DN

The pipes of heavier mass than the maximum shall be accepted provided they comply in every other respect with the requirements of the specifications.

Coating : Pipe shall be supplied with internal and external coating.

External protection:-

Each pipe shall be coated externally with external Zinc coating with finishing layer of Epoxy (70 Micron) ; manufactured, tested and duly marked in strict accordance with & confirming to IS 8329:2000 (as per latest amendment).

Coating shall not be applied to any pipe unless their surface is clean, dry and free from rust.

The pipes shall be coated by spraying process in which metallic zinc material is heated to a molten state and projected in small droplets.

The coating material shall set rapidly with good adherence and shall not scale off.

The metallic zinc coating shall cover the outside diameter of the pipe end and shall be free from such defects as bare patches or lack of adhesion.

Damaged area of zinc coating caused by handling are acceptable provided that the damaged is less than 5 cm²/m² of coated surface and provided that the minor dimensions of the damaged area do not exceed 5 mm.

The average mass of zinc coating shall be not less than 130 g/m² with a local minimum of 110 g/m².

Internal Coating:

When the pipes are to be used for conveying sewage water the inside coating shall not contain any constituent soluble in such water or any ingredients which could impart any taste or whatsoever to the sewage water and suitable washing of the mains.

All the pipes must be supplied with internal cement mortar of Ordinary Portland Cement lining strictly conforming to provision of IS:8329:2000.

Cement used for centrifugal lining must be of the best brand available conforming to relevant Indian Standard.

The sand used for preparation of mortar shall have controlled granulametric distribution from fine to coarser elements, it shall be clean and free from dust, clay or any kind of impurities.

The water used for preparation of the mortar shall not contain substances deteriorous to the mortar nor to the water as it is eventually intended to transport in the pipe.

The mortar of the lining shall be composed of cement, sand and water.

The mortar shall be thoroughly mixed and shall have a consistency which results in dense and homogeneous lining.

Condition of the interior surface of the pipe before application of the lining.

All foreign bodies, loose scale of any other material which could be detrimental to good contract between the metal and the lining shall be removed from the surface which the lining is to be applied.

The inner surface of the pipe shall also be free of any metal projections likely to project beyond 50% the thickness of the lining.

Application of the lining.

The mortar of the lining is cast centrifugally inside the pipes.

Apart from the inner surface of the joint, the parts of the pipe coming into contact with transported water shall be entirely covered with mortar.

The mortar shall be free of any cavities or visible air bubbles, and care shall be taken to ensure maximum density at all points. The centrifuging the pipe shall be controlled so that segregation of the sand in the lining is reduced to a minimum.

Once centrifuging is finished, the lining shall be cured at temperatures greater than 0 degree C. Any loss of water from the mortar by evaporation shall be sufficiently slow that hardening is not impeded.

Repairs to damaged or defective areas are allowable. The damaged mortar shall first be removed from these areas. The defective part shall be repaired by using, for example, a trowel within fresh mortar so that a continuous lining having a constant thickness is again obtained.

For the repair operation, the mortar shall have a suitable consistence. If necessary, additives may be included to obtain good adhesion against the side of the existing under-aged mortar.

Thickness of the lining.

The normal thickness of the lining and the minimum permissible mean and local values are given in the table.

At the pipe ends, the lining may be reduced to values below the minimum thickness. The length of the chamfer shall be as

small as possible but. In any case, shall be less than 50 mm.

Determination of lining thickness

The thickness of the lining will be checked on the freshly centrifuged mortar by the insertion of a steel pin, or on the hardened mortar by means of a non-destructive method of measurement.

The thickness of the lining shall be measured at both ends of the pipe in at least one section perpendicular to the pipe axis. In each, section, which shall be at least 200 mm from the pipe end measurements shall be taken at four points spaced at 90

The values for the thickness of the lining shall be reported to the nearer 0.1 mm.

The lining thickness measured at any one point in the pipe shall not be smaller than the minimum value given in the table.

The arithmetic means of the four measurements in each section shall not be less than the minimum mean value specified in the IS:8329:2000.

Surface condition of the hardened lining

The surface of the cement mortar lining shall be uniformly smooth. Only isolated grains of sand are allowed to appear on the surface of the lining.

The lining shall not be friable and shall be free from corrugations or ridges that could reduce the thickness of the lining to less than the minimum value at one point, as specified in the table.

On contraction of the lining, the formation of cracks cannot be avoided. These cracks, together with other isolated crack which may result from manufacture or any develop during transportation, are acceptance up to a width of 0.8 mm.

The structure of the lining is related to the centrifuging process.

On the inner surface of the lining, a thin layer of fine sand and cement is formed which may extend up to approximately one quarter of the total thickness of the mortar.

Thickness of the lining

The thickness of the lining shall be inspected on at least one pipe per section and per centrifuging installation, for each diameter manufactured, which is as per Table-15, Clause B-5 of IS 8329:2000.

Appearance of the lining

Each pipe shall be inspected for the appearance of the lining with special reference to the surface condition and the finish of the ends.

Any repairs considered to necessary after this examination shall be carried out in accordance with the method described in Clause B-4 of IS:8329:2000

Table-Thickness of the cement mortar lining

All dimensions are in millimeters

DN	Thickness		Maximum Crack Width/Radial Displacement
	Nominal Value	Tolerance	

1.	2.	3.	4.
80 to 300	3.0	-1.5	0/8
350 to 600	5.0	-2.0	1/0
700 to 1200	6.0	-2.5	1/2
1400 to 200	9.0	-3.0	1/5

NOTE:- Fittings ends may have a chamfer of maximum length 50 mm.

Marking:

Each pipe shall have cast, stamped or indelibly painted on it the following appropriate marks:

- (a) Manufacturer's name, initials or identification mark;
- (b) The nominal diameter;
- (c) Class reference;
- (d) Mass of pipe;
- (e) The last two digits of the year of manufacture.
- (f) Name of the purchaser: GUDC.
- (g) ISI Certification Mark.

Marking may be done On the socket faces of pipe centrifugally cast in metal mould.

Lowering and Laying

The materials shall be carted from any stores to the site by the contractor very carefully. The handling while carting the pipes, specials, valves etc. shall be done carefully. Damaged material will not accepted by GUDC.

The surplus materials, after the work is over shall be immediately carted by the contractor to the stores and he shall have to obtain the receipt from the stores.

In case of heavy pipes, specials etc. lowering shall be done with the help of the chain-pully block.

Specials and sluice valves shall be fixed in position and right to the plump and perfectly water tight. The pipe and specials shall be laid in such a way that socket shall receive the spigot in the bottom of the socket perfectly. No curve shall be negotiated in the socket unnecessarily.

At the end of the day's work, no joints shall be kept open without spun yarn properly caulked, preferably all the joints should be filled in with lead by the close of day's work. All open ends shall be closed by wooden plugs or C.I. plugs or jute bags as directed by the Hydraulic Engineer. Wooden plugs/C.I. plugs/Jute bags are to use by the contractor at his own cost.

The pipes shall be laid out along the side of the trench with each pipe in its proper position for laying with an extra pipe after every 20 mt. to allow for cutting if necessary where the trench prop is inadmissible, the pipes shall be stacked in heaps at each or sufficient to fill in the length. Small pipes below 100 mm. diameter may be stacked in heaps at every 30 mt. As far as possible, pipes shall be laid straight in rising or falling gradient. It should be possible to empty the pipe readily and completely.

The socket end of the pipe shall be facing up hill. All the pipes shall be used in standard lengths as far as possible cut lengths may be used only where necessary to make up the extra length. All the pipes shall be first inspected for any damage and

cracks. No cracked or damaged pipes shall be used. The pipes shall be thoroughly cleaned with brushes to remove any accumulated stones or soil inside and the inside of socket and the outside of the spigot shall also be cleaned similarly.

The pipes shall then be lowered on to the trench and the spigots neatly placed in to the sockets for full length and properly supported. The pipes shall be carefully packed under Neath so that they shall bear properly throughout their whole length. The entire pipe length shall be supported on the trench bed evenly throughout item includes tyton joints also.

MODE OF MEASUREMENTS AND PAYMENTS :

The rate for this item includes the cost of all the materials like all the jointing material like rubber gasket for making joints. The rubber gasket joints shall be done only at the joints with specials and fittings. The item includes the rubber gasket for making joints.

The rate shall include all the charges like loading, stacking, handling, laying, jointing and hydraulic testing.

The rates shall be quoted for all the materials and labour necessary for completion of this item except the cost of D.I. fittings specials and valves. Any variation in cost of necessary materials due to any reason shall not at all be accepted i.e. price variation due to any reasons will not be accepted.

The measurement shall be paid per meter length of pipe line laid, jointed, tested and measured along the center line and shall be paid according to the inner diameter of the pipes at the rates quoted by the contractor in price-bid.

Item No. 115: - Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and inside and outside 20mm thick plastering in C. M. 1:3 necessary 100 mm coping with reinforcement in R.C.C.M. 200 fixing C. I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete as per latest CPHEEO manual. (excl. excavation). Manhole type "B" as above but upto 1.5 m depth

MATERIALS :

Water shall conform to M-1, Cement Conform to M-3, Stone coarse aggregate of 20 mm nominal size shall conform to M-5A Grit shall conform to M-5, Steel reinforcement shall conform to M-11 . Brick shall conform to M-9, Cement mortar of specified proportion shall conform to M-7, The cast iron steps shall conform to M-27. " Manhole cover with frame of required size and weight shall be procured by the contractor. Supply of manhole frame and cover shall be paid separately under respective item.

1. WORKMANSHIP :

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

Excavation :-

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

Concrete work :-

The bed concrete in C.C. 1:3:6, Coping in C.C. 1:1.5:3 and benching concrete in proportion C.C. 1:2:4 (1 Cement : 2 coarse sand : stone aggregate of 20 mm nominal size) by volume with necessary centering and shuttering work shall be provided.

It shall be placed, deformed and or vibrated and cured as directed by Engineer-in-charge.

REINFORCEMENT :

All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed No. 1 binding wire not less than 1 mm in size and by using stay block or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to lag between supports nor displaced during concrete or any other operation of the work. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings.

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

In case bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall however, comply with relevant anchorage requirements.

Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm in such a manner that they do not slip over each other at the time of fixing and concreting.

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

When permitted or specified on the drawings joints of reinforcement bars shall be butt welded so as to transmit their full stresses. Welded joints shall preferably be located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work.

PLASTER WORK :

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae efflorescence and other foreign matter by water or by brushing. Smooth surface shall be roughened by wire brushing not hard by racking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface. Trimming of projections on brick / concrete surface where necessary shall be carried out to get an even surface.

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

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surface of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float accordingly excessive troweling or over working the

float shall be avoided. All corners, rises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, rises, junctions etc. shall be carried out with proper templates the size required.

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

In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster the edge of the old work shall be scraped clear and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly get together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or rises. It shall not be closed on the body of features such as plaster bends and cornices not at the corners or rises. Horizontal joints in plaster work shall not also occur on walls and copings these invariably leads to leakage. No portion of the surface shall be depth out initially to be packed up later on.

POINTING :

The flush pointing work shall be carried out with cement mortar of required proportion by volume. Before pointing to be started the joints shall be raked to such depth that the average of new mortar measured from the sunk surface of the finished pointing or from the edge of the brick shall be average 10 mm.

The mortar shall be pressed into the raked out joints with a pointing trowel according to the type of pointing specified in item or as directed. The mortar shall not spread over the corners of finished work i.e at fixing of C.I. Steps and M.H. cover.

RCC WORK :

Vertical shaft of manhole shall be in RCC M-30 pre-cast.

The entries and exits of main sewers as well as house service sewers requires careful detailing because the issue of puncturing the walls for insertions of especially house service sewers later on is impossible. These shall be managed as detailed below.

The cone portion shall be separately cast and its design standardized with respect to the diameter of its base.

The vertical shaft is best pre-cast to have a better quality control of raw materials and workmanship, which is otherwise very suspect in local situations of every manhole.

The shaft itself shall be made of rings with lap joints of the annular rim and duly jointed at site by cement mortar or elasto-polymers. The varying heights of the manhole are obtained by choosing the bottom ring deeper than the fractional height needed there and filling up the bottom floor after placing the ring such that the invert level of the sewer is obtained thereby.

This ring shall have a vertical inverted U cut out in casting itself to insert the sewer pipes and caulk the annular space using cement concrete with cement-based water proofing admixtures. The dimensions of the U cut out shall be standardized to match the OD of proposed sewers and a clear cover of 50 cm all round for caulking.

The position of the vertical inverted U cut outs will normally be 180 degrees apart in plan but in cases of junction manholes and drop manholes it may be at differing angles in plan and needs to be precast suitably and shall not be chiseled out in the field.

For insertion of the house service sewers into the manholes, it is necessary to have a precast ring section below the corbel portion, with holes at 45 degrees to the public sewer line to facilitate insertion of three house service sewers on each side of the public sewer axis. Usually the house service sewers shall be 110 mm or 160 mm UPVC 4 kg/sqcm (as detailed in sewer laying section). Accordingly, the height of the ring shall be 250 mm and 300 mm to permit filling of the annular interspaces between the sewer and the opening with cement concrete of at least 50 mm around the finished sewer.

Trimming of projections on brick / concrete surface where necessary shall be carried out to get an even surface

FIXING OF POLY PROPYLENE STEPS AND MANHOLE COVER

During the construction of masonry wall of the manhole the cement mortar of required proportion shall be used for embedding the Poly propylene steps in the wall masonry. The spacing of steps in the masonry shall be 300 mm center to center in the staggered position in the vertical direction with two staggered rows at 385 mm center to center in the horizontal direction. The top of the manhole shall not be more than 300 mm above the first step from top of manhole frame and cover and the center line of two staggered rows shall be the center line of the shorter side of manhole frame in the roof of chamber.

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

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

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

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

Manhole frame shall be firmly and securely laid on top of shafts of conical tops in

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

OTHER REQUIREMENTS

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

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

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

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

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

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

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

Cement : 3 fine sand) and steel trowel smooth.

Channels shall be in semicircular in the bottom half and a diameter equal to the sewer. Above the horizontal diameter, the side shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be suitably rounded off. The branch channels shall also be similarly constructed with respect to the benching but at their junctions with the main channel an appropriate fall suitably rounded off in the direction of flow in the main channel shall be given.

For conical shaft of manhole necessary conical portion shall be treated from 750 mm below the bottom of concrete of slab for fixing of manhole cover and frame.

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

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

MODE OF MEASUREMENTS & PAYMENTS :

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

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

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

The depth of manholes shall be the distance between the top manhole cover and the invert level of the main drain. The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item as directed above.

The item include :-

- (i) Bed concrete slab concrete and coping with necessary reinforcement.
- (ii) Providing and fixing polypropylene steps.
- (iii) Carting, conveying and fixing of manhole frame cover with necessary concrete and finishing.
- (iv) Refilling with necessary watering and consolidation.
- (v) Excavation with shoring is required.
- (vi) Leveling coarse concrete
- (vii) Disposal of surplus soil
- (viii) Curing for 14 day

Item No. 116: - Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and inside and outside 20mm thick plastering in C. M. 1:3 necessary 100 mm coping with reinforcement in R.C.C.M. 200 fixing C. I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type design complete

as per latest CPHEEO manual. (excl. excavation). Extra depth beyond 1.5m but up to 4.0Mdepth for type "B" manhole above.

MATERIALS:

Water shall conform to M-1, Cement Conform to M-3, Stone coarse aggregate of 20 mm nominal size shall conform to M-5A Grit shall conform to M-5, Steel reinforcement shall conform to M-11 . Brick shall conform to M-9, Cement mortar of specified proportion shall conform to M-7, The cast iron steps shall conform to M-27. " Manhole cover with frame of required size and weight shall be procured by the contractor. Supply of manhole frame and cover shall be paid separately under respective item.

2. WORKMANSHIP :

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

Excavation :-

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

Concrete work :-

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

REINFORCEMENT :

All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed No. 1 binding wire not less than 1 mm in size and by using stay block or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to lag between supports nor displaced during concrete or any other operation of the work. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings.

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

In case bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The cold twisted steel bars shall be used without hooks at the ends. Deformed bars without hooks shall however, comply with relevant anchorage requirements.

Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm in such a manner that they do not slip over each other at the time of fixing and concreting.

As far as possible bars of full length shall be used. In case this not possible overlapping of bars shall be done as directed.

The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

When permitted or specified on the drawings joints of reinforcement bars shall butt welded so as to transmit their full stresses. Welded joints shall preferably located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work.

PLASTER WORK :

The surface shall be cleaned of all dust, loose mortar droppings, traces of algae efflorescence and other foreign mortar by water or by brushing. Smooth surface shall be roughened by wire brushing not hard by racking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface. Trimming of projections on brick / concrete surface where necessary shall be carried out to get an even surface.

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

The plaster about 15 x 15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surface of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel of wooden float accordingly excessive trowel ling of over working the float shall be avoided. All corners arises angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arises junctions etc. shall be carried out with proper templates the size required.

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

In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommending the plaster the edge of the old work shall be scraped clear and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly get together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners of arises. It shall not be closed on the body of features such as plaster bends and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on walls and copings these invariably leads to leakage. No portion of the surface shall be depth out initially to be packed up later on.

POINTING :

The flush pointing work shall be carried out with cement mortar of required proportion by volume. Before pointing to be started the joints shall be racked to such depth that the average of new mortar measured from the sunk surface of the finished pointing or from the edge or the brick shall be average 10 mm.

The mortar shall be pressed into the racked out joints with a pointing trowel according to the type of pointing specified in item or as directed. The mortar shall not spread over the corners of finished work i.e at fixing of C.I. Steps and M.H. cover.

RCC WORK :

Vertical shaft of manhole shall be in RCC M-30 pre-cast.

The entries and exits of main sewers as well as house service sewers requires careful detailing because the issue of puncturing the walls for insertions of especially house service sewers later on is impossible. These shall be managed as detailed below.

The cone portion shall be separately cast and its design standardized with respect to the diameter of its base.

The vertical shaft is best pre-cast to have a better quality control of raw materials and workmanship, which is otherwise very suspect in local situations of every manhole.

The shaft itself shall be made of rings with lap joints of the annular rim and duly jointed at site by cement mortar or elasto-polymers. The varying heights of the manhole are obtained by choosing the bottom ring deeper than the fractional height needed there and filling up the bottom floor after placing the ring such that the invert level of the sewer is obtained thereby.

This ring shall have a vertical inverted U cut out in casting itself to insert the sewer pipes and caulk the annular space using cement concrete with cement-based water proofing admixtures. The dimensions of the U cut out shall be standardized to match the OD of proposed sewers and a clear cover of 50 cm all round for caulking.

The position of the vertical inverted U cut outs will normally be 180 degrees apart in plan but in cases of junction manholes and drop manholes it may be at differing angles in plan and needs to be precast suitably and shall not be chiseled out in the field.

For insertion of the house service sewers into the manholes, it is necessary to have a precast ring section below the corbel portion, with holes at 45 degrees to the public sewer line to facilitate insertion of three house service sewers on each side of the public sewer axis. Usually the house service sewers shall be 110 mm or 160 mm UPVC 4 kg/sqcm (as detailed in sewer laying section). Accordingly, the height of the ring shall be 250 mm and 300 mm to permit filling of the annular interspaces between the sewer and the opening with cement concrete of at least 50 mm around the finished sewer.

Trimming of projections on brick / concrete surface where necessary shall be carried out to get an even surface

FIXING OF POLY PROPYLENE STEPS AND MANHOLE COVER

During the construction of masonry wall of the manhole the cement mortar of required proportion shall be used for embedding the Poly propylene steps in the wall masonry. The spacing of steps in the masonry shall be 300 mm center to center in the staggered position in the vertical direction with two staggered rows at 385 mm center to center in the horizontal direction. The top of the manhole shall not be more than 300 mm above the first step from top of manhole frame and cover and the center line of two staggered rows shall be the center line of the shorter side of manhole frame in the roof of chamber.

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

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

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

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

Manhole frame shall be firmly and securely laid on top of shafts of conical tops in

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

OTHER REQUIREMENTS

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

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

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

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

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

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

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

Channels shall be in semicircular in the bottom half and a diameter equal to the sewer. Above the horizontal diameter, the side shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be suitably rounded off. The branch channels shall also be similarly constructed with respect to the benching but at their junctions with the main channel an appropriate fall suitably rounded off in the direction of flow in the main channel shall be given.

For conical shaft of manhole necessary conical portion shall be treated from 750 mm below the bottom of concrete of slab for fixing of manhole cover and frame.

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

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

MODE OF MEASUREMENTS & PAYMENTS :

Payment shall be made on the basis as per **number** of masonry manholes chambers constructed with all constructing materials labours, refilling curing, finishing providing and fixing C.I. steps, constructing laying half round gutter fixing

R.C.C. manhole cover etc. complete in all respect for incomplete item. Payment will be made on part rate basis.

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

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

The depth of manholes shall be the distance between the top manhole cover and the invert level of the main drain. The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item as directed above.

The item include :-

- (ix) Bed concrete slab concrete and copping with necessary reinforcement.
- (x) Providing and fixing polypropylene steps.
- (xi) Carting, conveying and fixing of manhole frame cover with necessary concrete and finishing.
- (xii) Refilling with necessary watering and consolidation.
- (xiii) Excavation with shoring is required.
- (xiv) Leveling coarse concrete
- (xv) Disposal of surplus soil
- (xvi) Curing for 14 day

Item No.117:- Providing and filling sand below R.C.C. Raft in Layers including ramming and watering complete.

1. The sand to be used for filling shall be coarse, granular, clean, free from dust and deleterious matters obtained from a source as approved by the Engineer-in-charge. Sand between returns shall confirm to I.S.: 383.

2. After the bottom plug has been laid and tested for leakage the level of its top shall be ascertained and recorded and the well shall be filled with sand under water in suitable layers not exceeding 30 cm 'at a time and each layer well compacted by rodding to maximum density up to the level of the underside of the plug as per detailed drawing or as directed by the Engineer-in-charge.

3. Sand between returns and below raft foundations shall be filled in suitable layers not exceeding 30 cms. at a time and each layer shall be well compacted.

4. Mode of measurement shall be the total cubical content (**in Cum.**) or the area covered by sand filling.

5. The unit rate includes the cost of materials, labour, and tools and plant required to complete the work.

Item No.123: - Loading, transportation, unloading and stacking relieving girder (a) For Five km.

The item also include transportation, Loading, unloading and stacking of Relieving Girder

1 The contractor shall arrange for his own vehicles / Trailers, T & P (like Cranes etc.), labour; fuel etc in completing the work. The rate/s accepted against the tender shall also include all charges for taxes, royalties and such other charges. Railway is not liable to pay any amount other than what has been accepted. Railway shall not arrange for supplement such as material lorry, Dip lorry, Labour for safety measures etc.

2 The contractor shall remain in touch with Railway's officials; these Relieving Girder are to be stacked at locations as directed by Engineer in charge at site.

3 During transportation, no damage to Relieving Girder and any other materials carted by contractor should take place.

4 Fittings are to be deposited at decided by Engineer in charge.

5 All the materials have to be duly accounted for by the contractor as per the quantities mentioned in challans. inclusive of all tools and plants, machinery, crane, trailer, truck, labourers, all types of taxes Loading, transporation, unloading and stacking of Relieving Girder, including all type of fittings from Present Location of Reiliving girder to Site (VAPI RUB) or as desired by Engineer in charge to RUB site and after completion of Work RUB, the transporting the Relieving girder back to Railway as directed by Railway authority from VAPI RUB site or directed by engineer in charge with contractor's own tools, all tools and plants, labours, vehicle, , machinery, crane, trailer, truck, all types of taxes any other mechanical means etc. complete as per directed by Engineer in charge and special condition of contract. Nothing extra shall be payable on whatsoever account i.e. hike in petroleum products.

The item shall be measured & paid as finished work in **M.Tonne** slippage of girder.

Item No.124: - Loading, transportation, unloading and stacking relieving girder (B)For each additional one km. Or part there of

This work shall consist of Loading, transportation, unloading and stacking relieving girder (B)For each additional one km. Or part there of as per relevant detailed specification of **Item No.123** of this contract .

The item shall be measured & paid as finished work in **M.Tonne/km.**

Item No.126:- Providing and laying - Filter Media 600mm thick directed at the back of abutments, returns and wing walls as per detailed specifications.

Well graded pebbled or metal of 40 mm. to 63 mm. size shall be used, the grading and tolerances of metal of pebbles shall be as under:-

Sr. No.	No. of Size Range	Sieve designation	Percentage by wight passing through the
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			sieve
1.	63 mm to 40 mm	90 mm	100-00
		63 mm	85-100
		50 mm	35-70
		40 mm	00-15
		20 mm	00-05

The size shall be 40 mm. to 63 mm. where in tolerance limit for over size shall be upto 15% and that for lower size should be upto 15% and below 20 mm. it shall be allowable upto 5%. The filter Material shall be tightly placed to a thickness of not less than 600 mm. and provided over the entire surface behind abutments, wings or return walls to the full height as shown on drawing and as directed.

2. Materials shall be first stacked in boxes of 2 m. x 1.½ m. x 0.5 m. size on fairly level ground and measured for cross checking the adequacy of the quantity required.

3. The filter media behind abutment and return wall shall consist of three layers, the first layer of rubble of required size, the second layer of stone aggregates of 40 to 63 mm size and the third layer of coarse sand. The total thickness of the filter media shall not be less than 600mm as specified in the item.

4. The measurement for payment shall be made as finished work on **Sq.m.** basis

5. The unit rate includes the cost of materials, scaffolding labour and tools to complete the work.

Item No.128:- Supplying premoulded bituminous joint filler i.)12 mm thick

1. Open joints shall be constructed at the location as directed by the Engineer-in-charge using a wood strip metal (plate or other suitable material which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete, at the joints, shall be well finished. Reinforcement shall not extend across an open joint.

2. When preformed filler is to be provided, the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting the slab, care shall be taken to prevent the former

being displaced. After the work is completed, the exposed face of the joint shall be cleaned of all loose material sticking to it.

3. The material used for filling expansion joint shall be bitumen impregnated felt. Impregnate felt shall conform to the requirement of IS; 1838, and shall be got approved from the Engineer-in-charge. The joint shall consist of large pieces and assembly of small places to make up the required size shall be avoided.

4. The expansion joint shall be measured in **Square metres**. Thickness of the expansion joint will be 20 to 25 mm. Width of expansion joint shall be equal to full depth of the slab.

5. The rate shall include the cost of all materials, labour, equipments & incidental charges for fixing the joints complete in all respects as per these specifications and as shown on the drawing.

Item No.129:- Providing flood gauge marks on substructure as per design including painting complete.

1. The width of the flood gauge shall be 60 cm. and will have caneri yellow background colour. The flood gauge marking will be in 10 cm. thick strips of alternative black and white colour. The width of the strip shall be as under :-

- (a) At every 10 cm.. 15cm. width
- (b) At every 1/2m. 25 cm. width in black
- (c) At every meter .. 35 cm. width in white

The lettering shall be in black colour and of 10 cm. height. The lettering shall show every metre and 1/2 m. level. The lettering shall show levels based on either GST B.M. or Arbitrary B.M. as furnished by Engineer-in-charge.

- 2. All the painting work shall be done in 3 coats. The paint shall be of approved make.
- 3. The measurement for payment shall be on **Sqm.** basis.
- 4. The unit rate includes the cost of materials, labour, painting, equipment if any to complete the work.

Item No.131: - Providing and fixing post and pipe railing as per detailed drawing including 3 coats of painting to steel works complete.

1.0. MATERIAL

1.0. STRUCTURAL STEEL

1.1. Square pipes

The square pipes shall be of 40 mm size weight of the square pile shall not be less than 2.30 kg / mt .For horizontal members 20 mm size of square pipes shall be used weigh of which shall not be less than .60 kg / mt.

1.2. All structural steel shall confirm I S 226 – 1985. The steel shall be free from the defects mentioned in IS 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale rust pits or other defects affecting the strength and durability

2.0. OIL PAINTS

2.1. Oil paint shall be of specified color and as approved by the Engineer in charge The ready mix paints shall only be used however, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved strainer will be allowed in such a case the contractor shall ensure that the shade of the paint so allowed shall be uniform

2.2. All paints shall meet with the following general requirements

2.3 The paint shall not show excessive setting in a freshly opened full can and shall easily be redistricted with a paddle to a smooth homogeneous shade

2.4. The paint shall show no curdling levering caking or color separation and shall be free from lumps and skins

2.5. The paint shall not skin within 48 hours in a three quarters filled closed container

2.6. The paint shall dry to a smooth uniform finish free from roughness grit unevenness and other imperfections

2.7. Ready missed paint shall be used exactly as received from the manufacturers and other imperfections

2.8. Enamel paints shall satisfy in general requirements in specification of oil paints Enamel paint shall confirm to I S 2933-1975

3.0. WORKMANSHIP

3.1. The railing shall be so welded that welding spots does not appear on the surface. All welding spots shall be grinded by a machine grinder to give a smooth surface

3.2. The railing shall be fabricated in true shape and angles meeting the shape of the location where it is to be fitted

3.3. When railings are supplied by the contractor test certificate of the manufacturers shall be obtained according to IS 226-1975 and other relevant Indian standards

3.4. The railing shall be fitted in position as mentioned in drawing and as directed by Engineer in charge. after railing is fitted in wall or concrete by means of hold fasts etc the wall of concrete shall be finished with necessary cement mortar work etc complete

4.0. PAINTING WITH COLOUR

4.1. Material required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums. Kegs. etc. in sealed and unbroken condition.

4.2. All materials not in actual use shall be kept properly protected lids of containers shall be kept in closed and surface of the paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin

4.3. The material which have become state or flat due to improper and long storage shall not be used

4.4. the paint shall be stirred thoroughly in its container before puring into small containers

4.5. While applying also the paint shall be continuously stirred in smaller container,

4.6. No left over paint shall be put back into stock tins When not in use the container shall be kept properly closed

4.7. If for any reason thins is necessary the brand of thinner recommended by the manufacture shall be used

4.8. The surface to be painted shall be thoroughly cleaned and dusted All rust dirt and grease shall be thoroughly removed before painting is started No painting on exterior or other exposed part of the work shall be carried out in wet damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

4.9. Application of paint

4.9.1. Brushing operations are to be adjusted to the spreading capacity advised by the manufacturers of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternatively in apposite direction two or three times and then finally brushing lightly in a direction at right angles to the same in this process no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

4.9.2. Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand paper and loose particles brushed off before next coat is applied. Each coat shall very slightly in shade and shall be got approved from Engineer in charge before next coat is started.

4.9.3. Each coat shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc.

4.9.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall be used for painting work.

5.0 MODE OF MEASUREMENT & PAYMENT :

5.1. The unit rate of M S Railing shall include the cost of all materials, tools and plant required for fabrication, fitting the same to specified position as per drawings, finishing, painting with three coats including priming coat, etc., and all other incidental expenses for producing M S Railing work to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

5.2. The rate of M S Railing shall include the cost of all labour, materials, tools and plant, scaffolding and all incidental expenses as described herein above.

5.3. The plaster work shall be measured for its **length and height**, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter.

5.4. The payment will be made on **Running meter** basis of the finished work.

Item No.133: Supply and Fabrication with Erection and painting with 2 coat of enamel paint with zinc oxide at site of structural steel as per the approved drawings of Staircase, Railing, height barrier, grating, Front shield, Rear Shield, Cutting edge Plates cover or other works using ISMB, ISA, ISMC, MS/ Chequered Plates, flat, square bars, pipe, square pipe, etc. including welding, cutting, wastage, etc. complete with contractor's own Mild steel conforming to IS 2062-2011 Grade E250, BR quality with all welds, rivets, nuts, bolts, etc. with contractor's own

materials, fabrication, machinery, templates, fixtures, equipments, tools and plants, transportation, skilled/unskilled labour, all leads and lifts, descent, loading, unloading etc. complete and as per approved drawings & specifications by approved vendors only. The rate is inclusive of transportation of Structural Steel / fabricated components to site by contractor's own means at his cost. The structural steel to be used shall be procured from the approved manufacturer only. Work has to be done as per drawings and specifications approved by Authority.

Scope of work: Supply and Fabrication with Erection and painting with 2 coat of enamel paint with zinc oxide at site of structural steel as per the approved drawings of Staircase, Railing, height barrier, grating cover or other works using ISMB, ISA, ISMC, MS/ Chequered Plates, flat, square bars, pipe, square pipe, etc. as per instruction of Engineer in charge at site.

1. The work shall be carried out as per specifications/conditions mentioned at clause no.2.4.

2.4 GENERAL GUIDLINES AND SPECIFICATIONS FOR SUPPLY OF REINFORCEMENT AND STRUCTURAL STEEL

2.4.1 SUPPLY OF STEEL FOR VARIOUS WORKS:

Supply of steel to various specifications as required under various schedules in the contract are governed by the Technical specifications and Special Conditions specified hereunder.

All steel shall be supplied by the Contractor at the site of work and stacked, stored, protected and maintained by him at his cost till they are put into use. Any temporary structure required for storage of steel etc., has to be provided by the Contractor at his cost and should be removed after completion of the work.

For supply and use of steel in various works, relevant IRS Codes Specifications, IS, IRC Specifications and Railways/MORTH specification will be applicable or relevant. The decision of R&B DIVISION shall be final and binding to the contractor.

2.4.2 SPECIFICATIONS FOR STEEL:

2.4.2.1 The steel supplied by the contractor must satisfy any of the following material specifications as required for the work along with other concerned specifications.

- (i) The reinforcement steel shall be Thermo mechanical Treated bars of grade Fe 500D conforming / satisfying to IS 1786 (Up to date).
- (ii) The structural steel shall be conforming to IS 2062 (Up to date) as specified as per RDSO Drawing. It shall have Sub quality 'B0'/'BR' & Grade E250 (Fe 410 W) as mentioned in the tender schedule and the requirements of IRS B1-2001 shall be fulfilled for all components for all spans. 12 mm thick & above plates are fully killed and fully normalized / controlled cooled as mentioned in the tender schedule. 'B0'/'BR' sub quality indicate the requirement of impact test at room temperature and should conform to Charpy Impact Test at room temperature in accordance with relevant I.S. Code.

- (iii) Relevant other IS and IRS Specifications with regard to properties, testing and use of the above steel items also shall govern.

2.4.2.2 The contractor shall produce the manufacturers test certificate for each lot of supply satisfying the requirements of relevant IS specifications and at the specific frequency as laid down.

2.4.2.3 The Contractor shall arrange to carryout additional tests on physical properties of steel for every 40 metric tonne (t) of steel, and for every change in lot / batch for reinforcement steel and structural steel, Contractor shall submitted test report from manufacturer at his cost. R&B DIVISION reserve to right for carry out additional test if need arise. No extra payment will be made for conducting such tests and the agreement rate is inclusive of above testing charges.

2.4.3 PROCUREMENT OF STEEL:

2.4.3.1 All Reinforcement steel (TMT bars) and Structural Steel shall be procured as per specification mentioned in BIS's documents – IS: 1786 and IS: 2062. Independent tests shall be conducted, wherever required, to ensure that the materials procured conform to the Specifications.

These steel shall be procured only from those firms, which are Established, Reliable, Indigenous & Primary Producers of Steel, having Integrated Steel Plants (ISP), using iron ore as the basic raw material and having in-house iron rolling facilities, followed by production of liquid steel and crude steel, as per Ministry of Steel's (Government of India) guidelines.

However, only certain isolated sections of structural steel, not being rolled by ISPs, can be procured from the authorized re-rollers of ISPs or authorized licensee of BIS having traceability system and who use billets produced by ISPs with the approval of Engineer.

2.4.3.2 The contractor shall have to submit the cash memo and challans along with the lot / batch of steel purchased in token of proof of purchase of steel from reputed dealers. Steel shall be approved by Engineer only after production of necessary certificates before use in works.

2.4.4 REINFORCEMENT AND STRUCTURAL STEEL:

2.4.4.1 Payment for supply of all types of steel shall be made for the quantity required / used as per the drawings issued from time to time. No payment will be admissible for quantity supplied in excess of the required quantity as per drawings. However, contractor will be permitted to

take the excess quantity back by his own means, but no claim for payment for transportation so involved will be admissible. No payment will be made for more supply of steel at the site / excess used in Construction. No payment will be made for steel used in temporary or enabling works unless explicitly provided for in the Schedules. Steel for enabling/temporary works shall be arranged by the Contractor at his own cost.

2.4.5 STAGE PAYMENTS FOR STRUCTURAL STEEL:

2.4.5.1 No Advance Payment shall be made. However, stage payment for manufacturer of steel girders shall be made as per Bills of Quantities by the R&B division, Valsad / Railway for steel physically brought to workshop/site by the contractor.

2.4.5.2 Stage payment for steel will be released subject to the following conditions:

- (i) The steel shall be delivered at site and properly stored under covered sheds in measurable stacks and separately maintained for various sizes, sections and dates of supply.
- (ii) The quantities of steel shall be brought to the site/ Factory only in such instalments that would facilitate smooth progress of work and consumed in reasonable time.
- (iii) Proper accountable in the Steel Register is to be maintained in the prescribed format at the site for the receipt and use of the steel.
- (iv) Ownership of such steel shall be deemed to vest with the R&B division, Valsad / Railway.
- (v) Before releasing the stage payment, the contractor shall insure the steel at his own cost in favour of R&B division, Valsad/ Railway against theft, misuse, damages, fire etc.
- (vi) The Stage payment will be made, only when the Engineer or his authorized representative certifies that the said quantity of steel is received at site and entered in the register and that in his opinion the steel is actually required in accordance with the contract.
- (vii) No Stage payment is permitted for steel required for temporary and enabling works.

2.4.5.4 Any Stage payment found to be made against the materials brought to the site in excess over the actual materials consumed in work shall be recovered from the contractor dues.

2.4.6 OTHERS:

2.4.6.1 Reinforcement steel and structural steel, shall be stored in such a way so as to avoid distortion and to prevent deterioration by corrosion. All steel used should be free from loose Mill scale, loose rust, paints and oil covering / coating etc.

2.4.6.2 Steel material, for which stage payment has been availed by the Contractor, shall be property of R&B DIVISION, Valsad / Railway and will be issued to contractor by Engineer whenever required for the work. Contractor will be solely responsible for guarding against theft / misuse of the consignment due to any cause what so ever. The stage payment will be made, only when the Engineer certifies that in his opinion that the materials are actually required in accordance with the contract. It is the responsibility of the agency to ensure that steel as per the requirement is brought to site as per approved drawings / requirements.

- 2.4.6.3 The contractor shall be bound to store the materials at site of work earmarked for the purpose by the Engineer and shall not remove from the site nor use for any other purposes than exclusively for execution of the work for which the materials are intended for. Safe guarding of the materials is the responsibility of the contractor even if the material is deemed to be owned by the R&B DIVISION,Valsad / Railway and insurance etc., have been arranged by the contractor.
- 2.4.6.4 Contractor shall remove from site any steel materials rejected by the Engineer within reasonable time as specified by him.
- 2.4.6.5 Before the test pieces are selected, the Contractor shall furnish copies of the mill records of the reinforcement steel giving number of coils in each cast with sizes and identity marks to enable identification of the material with the bill produced.
2. This item includes Height Barrier, base plate for electrical pole/Roof trusses , Z-type sheet piling etc. with contractor's own mild steel of various rolled section including I beam and channels as per drawing/ details given by the Engineer in charge and assembling etc. All the mild steel sections shall be procured by the contractor and shall conform to IS 226 of 1975. The fabrication of steel work will be done strictly as per Indian Railway Unified standard specification Vol-I(2010) to the extent applicable to this work.
3. Weight of the structural member to be fabricated and erected will be worked out based on the length of different structural steel members shown in the Railways final fabrication drawing and book weight of the section actually used.
4. **No separate payment for nuts and bolts and other fittings/fastenings shall be made and the rate is deemed to have been included, while taking measurement weight of the same shall not be accounted for.**
5. In case the structural sections and nuts, bolts specified in the approved R&B division, Valsad /Railway's fabrication drawings are not available, the tenderer/s will be at liberty to use alternate sections with the approval of the R&B division, Valsad/ Railway Administration in each case. However, it may please be noted that no extra payment for the difference in weight on account of the use of alternate higher section will be paid. The payment will be made for the weight of the steel sections as per approved final fabrication drawings. Only difference of weight on account of use of alternative heavier sections can however be allowed, for payment, subject to certification by the main producer that the prescribed sections are not being manufactured. The rate includes making the surface good for application of one coat of approved quality enamel paint with zinc oxide and two or more coats (to achieve good and even surface) of good quality synthetic enamel paints , transportation , labour, T&P, welding, bolting and riveting , erection etc. complete.
6. The contractor has to produce the test certificate for the steel brought to site and for test check same may be sent for testing. In case the testing material does not conform to the relevant IS Specifications, it will be summarily rejected. The cost of all such tests is to be borne by the contractor. The contractor at his own cost shall do one test per 50 MT of steel or part thereof from approved Govt. Laboratory.

7. The weight shall be calculated as per the standard unit weight of the section as per the ISI Handbook. If any extra quantity of steel over and above shown in the drawing and over the standard scale laid down has been used by the contractor or for any other reasons such as wastage or bad workmanship, the cost of this excess will not be paid by the R&B division. The overlap shall be paid only if the length of section exceeds the standard length available in market.
8. The rate quoted by the contractor includes all labour, T&P, machinery, taxes, electricity etc.

9. **MODE OF PAYMENT/MEASUREMENT**

The payment shall be made on the pro rata basis i.e. actual work done at site and **Kg** shall be the basis of the measurement. No payment shall be released under this item unless the test certificate produced by the contractor and the same is got approved by the Engineer in Charge

Item No.155: 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

1.0. Materials

M-1. Water

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

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

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

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

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

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

M-3. Cement

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

M-6 Sand

6.1 Sand shall be natural sand, clean, well graded hard strong, durable and gritty particles free from injurious amounts of dust, clay kankar nodules, soft or flaky particles shale, alkali salts organic matter, loam, mica or other deleterious substances and shall be got

approved from the Engineer-in-Charge. The sand shall not contain more than 8 percent of silt as determined by field test, if necessary the sand shall be washed to make it clean.

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

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

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

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

Cement Mortar

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

11.2. Proportion of Mix

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

11.3. Proportion of Mortar :

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

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

M-15. Bricks

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

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

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

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

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

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

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

2.0. The crushing strength of the bricks shall not be less than 35 Kg/Sq. Cm. The average water absorption shall not be more the 20 percent by weight Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV) 1976.

2.1. Workmanship

2.2. The relevant specification of Item No. 81 shall be followed except that the bricks to be used shall be conventional bricks and proportion of cement mortar shall in C.M. 1:6.

3.0. Mode of measurements & payment

3.1. The relevant specification of Item No. 81 shall be followed.

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

Item No.156: Providing 15mm thick cement plaster in single coat on Rough (Similar)side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand)

1.0. Materials & workmanship

The relevant specifications of Item No. 82 shall be followed except that the proportion of mortar is C.M. 1:3.

2.0. Mode of measurements & payment

2.1. The mode of measurements and payment shall be the same as for Item No. 83

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

Item No.157: Providing 20 mm thick double coat mala cement plaster on outside / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trovel including scaffolding curing etc. complete.

1.1. Materials & workmanship

The relevant specifications of Item No. 82 shall be followed except that the proportion of mortar is C.M. 1:4 and C.M. 1:2.

2.3. Mode of measurements & payment

2.4. The mode of measurements and payment shall be the same as for Item No. 84

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

Item No 158: Providing 10mm thick cement plaster in single coat on Ceiling for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand)

1.2. Materials & workmanship

The relevant specifications of Item No. 82 shall be followed except that the proportion of mortar is C.M. 1:3.

2.5. Mode of measurements & payment

2.6. The mode of measurements and payment shall be the same as for Item No. 85

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

Item No.159: Applying two coats of Birla (white cement based) or Asian (acrylic lapy- 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 foreign matter and sand papered smooth.

1.0. Materials

Water shall be conform M-1. The acrylic emulsion paint shall conform to I.S.: 5411-1969 (Part-I).

2.0. Workmanship

The painting work shall be of Birla or Asian acrylic lappy (Putty) and two coats of primer of approved brand & manufactures on new wall surface to give an even shade.

2.1. Scaffolding : Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface : The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.

2.2.1. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Preparation of Mix :

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

2.4. Application :

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

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

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

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

2.5. Precautions :

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

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

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

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

2.6. Protective measures : The surface of doors, windows, floors, articles, of furniture etc. and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

3.0. Mode of measurements and payment

3.1. All the work shall be measured in the decimal system as under:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual item shall be worked out to the nearest 0.01 sq.m.

All the work shall be measured in sq.mt. Deductions for jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. each in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 sq.mt. each in area and for openings exceeding 0.5 sq.mt. and not exceeding 3.0. sq.mt. each in area, deductions and additions shall be made as under.

3.2. No deductions shall be made for ends of joists, beams, posts, etc. and openings not exceeding 0.5 sq mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

3.3. No deductions for openings exceeding 0.5 sq.mt. but not exceeding 3 sq.mt. each shall be made as follows and no addition will be made for reveals, jambs, soffits etc. of these openings :

(a) When both the faces of walls are provided with finish, deduction shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of .50% of area of opening on each face shall be made from total area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3..4 In case of area of openings exceeding 3 sq.mt. each, deductions shall be made for openings but jambs, soffits, sills shall be measured.

3.5. No deductions shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

3.6. Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas:

- (a) Corrugated steel sheets..... 14%
- (b) Corrugated A.C. sheets..... 20%
- (c) Semi corrugated A.C. Sheets..... 10%
- (d) Nainital pattern roof (Plain sheeting sheets)..... 10%
- (e) Naintial pattern roof (with corrugated sheets)..... 25%

3.7. Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area.

3.8 Extra payment shall be done on ceiling and sloping roofs.

3.9. The rate shall include the cost of ail materials, labour, scaffolding, protective measures etc. involved in all the operations described above.

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

Item No.160: Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including throughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.

1.0. Materials

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

2.0. Workmanship

2.1. Scaffolding : Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface : The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.

All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of pairs mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.3. Preparation of Mix :

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

2.4. Application :

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

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

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

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

2.5. Precautions :

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

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

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

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

2.6. **Protective payment** : The relevant specifications of Item No.87 shall be followed.

3.0. Mode of measurements and payment

3.1. The relevant specifications of Item No.86 shall be followed.

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

3.3.

Item No.161: Finishing wall with weather proof exterior emulsion paint on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials etc. complete.

General

This work shall consist of painting the walls with exterior emulsion paint of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

MATERIALS

1.0 Exterior Emulsion Paint

Exterior emulsion paint shall be of specified colour as approved by Engineer in charge the ready mixed exterior emulsion paint shall not be allowed, If however ready mix exterior emulsion paint of specified shade or tint is not available white ready mixed paint with approved Steiner will be allowed in such case the contractor shall ensure that the shade of the paint so allowed shall be uniform exterior emulsion paint shall meet with the following general requirements

1. exterior emulsion paint shall not show excessive setting in freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The exterior emulsion paint shall show no curdling, livering cracking or colour separation and shall be free from lumps and skins.
2. The exterior emulsion paint as received shall brush easily possess good leveling properties and show no running or sagging tendencies.
3. The exterior emulsion paint shall not skin within 48 hours in a three quarters filled closed container
4. The exterior emulsion paint shall dry to a smooth uniform finish free from roughness grit unevenness and other imperfections
5. Ready mix exterior emulsion paint if allowed for specified shade, shall be used exactly as received from the manufacturers and generally according to their instruction and without any admixtures whatsoever.

2.0 WORKMAN SHIP

2.1 Scaffolding :

Where scaffolding is required, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (joola) may be used for distempering. Where ladders are used, pieces of old gunny bags

3.0 Application coat :

The exterior emulsion paint shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

3.1 For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the exterior emulsion paint, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of the exterior emulsion paint shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

3.2 Sufficient quantity of the exterior emulsion paint shall be mixed to finish one room at a time.

4.0 MODE OF MEASUREMENT & PAYMENT :

4.1. The unit rate wall painting with exterior emulsion paint shall include the cost of all materials, tools and plant required for mixing, cleaning brushing sand papering & painting with all required specials and Lapi

compound, finishing as per direction of the Engineer-in-charge, and all other incidental expenses for producing pipe line work of specified diameter to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

4.2 The rate of Wall painting with exterior emulsion paint shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.

4.3. The Wall painting with exterior emulsion paint shall be measured for its length and Height limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter.

4.4. The payment will be made on **square Meter** basis of the finished work.

Item No.162: Providing and fixing 35 mm thick shutters for Doors, windows and clerestory windows including Indian teak wood frames 10 cm x 7 cm. size including black enamelled iron oxidized fixtures and fastenings including primer coat of approved quality and two coats of oil painting etc, complete. (ii) Fully Panelled.

1.0. Materials

Teak wood

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

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

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

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

29.5. First class teak wood

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

29.6. Second Class Teak Wood:

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

Glass

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

38.2. Sheet Glass

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

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

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

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

38.3. Plate Glass:

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

38.4. Obscured Glass:

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

38.5. Wired Glass:

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

Fixtures and fastenings

43.1. General:

43.1.1. The fixtures and fastenings, that is butt hinges tee and strap hinges sliding door bolts, tower bolts, door latch, bath-room latch, handles door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specification.

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

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

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

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

43.2. Holdfasts:

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

directions

43.3. Butt hinges:

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

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

43.4. Siding door bolts (Aldrops):

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

43.5. Tower bolts (Barrel Type):

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

43.6. Door Latch:

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

43.7. Bathroom Latch:

43.7.1. Bathroom latch shall be similar to tower bolt.

43.8. Handle:

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

43.9. Door Catch:

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

43.10. Door Stoppers:

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

43.11. Wooden Door Stop with hinges:

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

43.12. Casement Window Fastener:

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

43.13. Casement stays (Straight Red Stay):

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

43.14. Ventilator Catch:

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

43.15. Pivot:

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

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

2.0. Workmanship

2.1. The relevant specifications of Item no. 87 I shall be followed except that the 35 mm. thick shutters full glazed for doors, windows and clear story windows including oxidized aluminum butt hinges with necessary screws.

2.2. Glazing:

2.2.1. The glass panels shall be embedded in putty and secured to the rebate by wooden beads, or moulding shape and size as approved with counter sunk screws of suitable size.

2.2.2. The glass panels shall be properly cut to fit the rebates of the frames and sashes fully with a slight minus margin of about 1.5. mm. on all sides. Before glazing, the frame shall be primed and prepared for painting so that wood may not draw oil out of putty. The rebate shall be putted to an extent to provide bedding all round the glass.

2.2.3. The glass shall then be bedded in putty and fitted to frames with wooden heads or moulding as directed and secured with counter sunk screws. The screws shall be spaced not more than 100 mm. from each corner and not more than 200 mm. apart.

2.2.4. The size of the rebate in the frame and size and shape of beads of moulding shall be as per detailed drawings or as directed. The beads or mouldings shall have mitred corners.

3.0. Mode of measurement and payment

3.1. The relevant specifications of Item no. 89 shall be followed.

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

Item No.163: Providing and fixing window having extruded aluminum Colour Powder Coated 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.

This work shall consist of Providing and fixing window having extruded aluminum Colour Powder Coated 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. including all materials, labours, equipment's & other necessary tools & plants required as per site & instruction of Engineer in charge.

The item shall be measured & paid as finished work in **sq. meter**.

Item No.164: 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

1.0. Materials

Water

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

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

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

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

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

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

Lime Mortar

2 Proportion of Mix:

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

2.1Preparation of mortar;

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

2.3 Storage:

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

2.4 Use:

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

3.0 Cement Mortar

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

3.2 Proportion of Mix

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

3.3 Proportion of Mortar :

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

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

4.0 Polished Kotah Stone

4.1 Polished kotah stone shall have the same specification as per rough kotah stone except as mentioned below

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

5.0 Workmanship

5.1 Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free from chippings and giving 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.

5.2 Bedding for the Kota stone slabs shall be of cement mortar 1:6 (1 cement : 6 coarse sand) or

L.M. 1:1.5 of average thickness 20 mm given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall then be spread on an area sufficient to receive one kota stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden a 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 dado. The junction between the wall and floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed

5.3 The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set

properly

5.4 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.

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

6.0 Measurement & payment

6.1 The rate shall include the cost of all materials and labour involved in all the operations described above. The kota stone flooring shall be measured in square meters correct to two places decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado plaster and no deduction shall be made nor extra paid for any opening in floor of areas up to 01 sq.

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