

ITEM WISE SPECIFICATION-1

NAME OF WORK: - CONSTRUCTION OF PROP.TWO LANE ROB IN LIEU OF LC NO 34B AT RLY. KM 29/4-29/5 BETWEEN MORBI - NAVLAKHI STATION ON WKT- NLK SECTION ON MORBI - NAVLAKHI ROAD. UNDER SWARNIM JAYANTI MUKHYA MANTRI SAHERI VIKAS YOJANA.

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	Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle	Cl. No. 201, Pg. no. 37
2	Demarkation 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 sides 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
3	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
4	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). Prestressed / Reinforced cement concrete grade M-20 & above	As per Detailed Specifications
5	Empty boring through all sorts of strata for providing 1.20 Mt. diameter R.C.C. bored piles to required depth required depth including providing necessary casing pipe with all plants and equipments as required complete.	Cl. No. 1100 Pg. no. 457
6	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
7	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
8	Providing and laying controlled cement concrete M 40 for R.C.C. bored piles of 1.20M dia. including ramming , vibrating and finishing excluding cost of T.M.T reinforcement etc. complete.	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
9	Excavation for foundation in sand gravel, clay, soft, soils and murrum etc. including soring strutting and dewatering as necessary and dis posing off the	Cl. No. 304, Pg. no. 59

	excavated stuff as directed (A) up to 3.00 mt depth and lead upto 100m for 10 Cum	
10	Static Load testing of foundation piles including loading with necessary kentledge or any other suitable method as directed.	IS-2911, Cl. No. 1105,1113
11	Dynamic Load testing of foundation piles including loading with necessary kentledge or any other suitable method as directed.	IS-2911, Cl. No. 1105,1113
12	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
13	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
14	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
15	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
16	Providing and casting in situ controlled cement concrete M-35 for R.C.C. return as per drawings including centering shuttering, scaffolding where necessary, laying vibrating, curing and finishing complete. complete as per specification.(1) Piers (2) Abutment (3) RCC return 0.0m TO 5.0 m height 5.0m TO 10.0 m & Above	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
17	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-45 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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
18	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-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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
19	Providing and fixing in position of steel grade FE-500D (TMT) for 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
20	Providing and fixing in position of steel grade FE-550D (TMT) for 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
21	Providing and fixing in position steel bar for pier, Retaining wall ,pier cap ,Dirt wall,pedestal & seismic arrester 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

22	Providing and fixing in position steel bar for pier, Retaining wall, pier cap, Dirt wall, pedestal & seismic arrester 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
23	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
24	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
25	Providing and casting in situ controlled cement concrete M-35 for R.C.C. work in superstructure including centering, shuttering scaffolding, ramming, vibrating curing and finishing complete. (A) T-Beam and Deck slab type of superstructure (II) Main and cross Girder	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
26	Providing and casting in situ controlled cement M 40 for R.C.C. work in superstructure including centring shuttering scaffolding, ramming, vibrating curing and finishing complete.	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
27	<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"> Detailed fabrication and erection drawings & launching methodology will be prepared by the contractor and got approved from Railway. 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. The payment shall be made on the theoretical weight of main components and gusset plates only. 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
28	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. 1900 Pg. no. 585, As per Detailed Specifications Of part 2 & part 3 (A) Technical Specification

29	Providing and casting in situ or precast controlled Cement Concrete M-50 for prestressed concrete work in Super structure including centering, shuttering, curing, scaffolding, ramming, vibrating, finishing, launching or shifting complete. (I) Solid Slab. (II) Deck Slab. (III) Main Girders. (IV) Diaphragm or cross girder.	Cl. No. 2305 Pg. no. 676 Cl. No. 1800 Pg. no. 565 Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
30	Providing and placing in position FE 500D 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
31	Providing and fixing in position steel bar reinforcement For Super Structure & Crash barrier, Crash barrier with friction slab of steel grade FE-550 D (TMT) including cutting, bending, hooking, tying, welding etc., complete as per detailed drawing and specification.	Cl. No. 1600 Pg. no. 527
32	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
33	Providing and fixing in position fully moulded restrained elastometric Bearings as per detailed drawings.	Cl. No. 2000 Pg. no. 623
34	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
35	Carrying out load test of super structure as directed including all necessary materials plant equipment, instruments, labour and arrangements for test directed.	Cl. No. 2300 Pg. no. 675 IRC SP:51
36	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
37	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
38	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
39	Providing and casting in situ controlled cement concrete M-35 for approach slab including formwork curing and finishing complete.	Cl. No. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535

40	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
41	Providing and fixing in position steel bar reinforcement For Approach slab & kerb of steel grade FE-550 D (TMT) including cutting, bending, hooking, tying, welding etc. complete as per detailed drawing and specification.	Cl. No. 1600 Pg. no. 527
42	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
43	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
44	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
45	Providing G.I. 100mm diameter water spouts including necessary iron gratings as per drawings..	Cl. No. 2700 Pg. no. 751
46	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
47	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. 723
48	Providing and fixing marble slab including engraving and painting complete.	As per Detailed Specifications
49	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 IRC SP:102 With its Latest Amendment) with concrete Panel (M35) as fascia, casting & erection of panels	Cl. No. 3100 Pg. no. 801

	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.	
50	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
51	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. 1500 Pg. no. 519 Cl. No. 1700 Pg. no. 535
52	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
53	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
54	Construction of 200 mm thick 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
55	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
56	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
57	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	Cl. No. 505 Pg. no. 174

	& 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	
58	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
59	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
60	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
61	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
62	Mastic Asphalt (Providing and laying 25 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 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.)	Cl. No. 516 Pg. no. 225
63	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 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.)	Cl. No. 516 Pg. no. 225
64	Construction of dry lean cement concrete Sub- base over a prepared sub-grade or drainage layer with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed	Cl. No. 601 Pg. no. 255

	15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver finisher with electronic sensor, compacting with 8- 10 tonnes vibratory roller, finishing and curing as per clause 601 of specification complete in all respect.	
65	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
66	Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide luminance coefficient on cement road shall be min 130 mcd/m ² /lux and Asphalt road shall be min 100 mcd/m ² /lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.	Cl. No. 803 Pg. no. 338
67	Cat Eye / Road Stud / RPM: Supplying of Molded Twin Shanks Raised Pavement Markers made of polycarbonate and ABS moulded body and reflective panels with micro prismatic lens capable of providing total internal reflection of the light entering the lens face and shall support a load of 13635 kgs. tested in accordance to ASTM D 4280 Type H and complying to Specifications of Category A of MORTH Circular No RW/NH/33023/10-97 DO III Dt 11.06. 1997. The height, width and length shall not exceed 20 mm, 130 mm and 130 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 +/- 5 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 +/- 2 mm and height not less than 30 +/- 2 mm) from the body is to be a minimum value of 500 Kgf. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin based adhesive as per manufacturers recommendation and 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
68	Facility Informatory Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet / 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 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 x 75 x 6mm /	Cl. No. 800 Pg. no. 325

	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 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. (B) Class-B Type-4 Retro Reflective sheeting.	
69	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 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; 3.6mtr long stand post of Iron Angle 75 x75 x 6mm / 65NB Ci rcular 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 t he 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 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 thi rd 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	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, reflctorized 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
71	STOP Sign :-Providing and fixing sign boards made out of 2mm aluminium sheet I 4mm ACP (Aluminium composite Panel); size 90 ems. 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 Circu lar MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted	Cl. No. 800 Pg. no. 325

	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.	
72	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 phospheting process & acid etching; coated with one coat of epoxy primer 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.	Cl. No. 800 Pg. no. 325
73	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
74	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

75	Painting Two Coats on New Concrete Surfaces (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. 1600 Pg. no. 527
80	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 (B) 20mm to 32 mm dia bar	Cl. No. 1600 Pg. no. 527
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 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 Detailed Specifications
83	Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II)with necessary connecting accessories of same material at required depth for laying of cable. below ground / road surface for enclosing cable and back filling the same to make ground as per original.(A)50 mm dia	As per Detailed Specifications
84	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.	As per Detailed Specifications
85	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.	As per Detailed Specifications
86	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. (E) 35/50 Sq.mm.	As per Detailed Specifications
87	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 (d) 4 core 10 Sq. mm	As per Detailed Specifications
88	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 (c) 3 1/2 core 70 Sq. mm (35 Sq. mm 1/2 Core)	As per Detailed Specifications
89	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	As per Detailed Specifications

	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	
90	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.	As per Detailed Specifications
91	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) Steet 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	As per Detailed Specifications
92	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 Detailed Specifications
93	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 Detailed Specifications
94	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 Detailed Specifications
95	For using salt and charcoal / coke as required for pipe type earthing.	As per Detailed Specifications
96	Providing and erecting HOT deep Galvanised iron strip wire 8 to 16 SWG.	As per Detailed Specifications
97	Supplying & erecting in earthpit of minimum bore dia. 225mm size approved make Safe Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 80mm having 80-200 Micron galvanising, inner pipe dia of 40 mm having 200 250 Micron galvanising, connection terminal dia Of 14mm with constant	As per Detailed Specifications

	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 440 V Length of Pipe - 1 Mtr Backfilling compound-1Nos. of Bag of 15 Kgs.	
98	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 Detailed Specifications
99	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 Detailed Specifications
100	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 Detailed Specifications
101	Supplying and erecting bakelite sheet 12mm thick HYLAM make on existing angle iron frame.	As per Detailed Specifications
102	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 Detailed Specifications
103	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 Detailed Specifications
104	Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.	As per Detailed Specifications

105	Planting Flowering Plants and Shrubs in Central Verge in 5m width , as instructed by Engg in charge.	As per GWSSB Specifications
106	Providing and fixing 1.20 Metre high fencing with 2.0 Metre long M.S. Angle posts 40mm x 40 mm x6 mm and oil painting 3 coats fixed at 2.5 Mt,C/c. with five Horizontan 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 postsin ground with 0.5 M x 0.5.M x 0.5 M. block in C.C1:5:10 etc complete.	As per Detailed Specifications

Item No:24 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.

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.42:- 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/roadsurface for enclosing cable as directed by engineer in charge.(A)50 mm outer dia

00 FOREWORD

- 01** 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.
- 02** 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.

03 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 REQUIREMENTS

- 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 accessories (Cl. No. 6.12)

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. 48 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:52 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 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.)

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.