Hindustan Prefab Limited

(A Govt. of India Enterprise)

Jangpura, New Delhi – 110014

Name of Work: - "Construction of 02 Nos. Type-IV Quarters for AR Bn at Kohima (Nagaland)".

LIST OF SPECIFICATIONS & PREFERRED MAKES

NIT NO: HPL/PM(C)/TC/AR/2018-19/109 Dated: 26.02.2019

ISSUED TO M/s: .....

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LIST OF PREFERRED MAKES FOR CIVIL WORKS

Sl. No.	Material description	Approved Manufacturer / Brand Name
1.	TMT bars – Fe 500 grade (Ductile or Super Ductile) having Ultimate Strength at least 15% higher than Yield Strength	Primary / Main producers like SAIL, Rashtriya Ispat Nigam Ltd., TISCO, Jindal Panther, Shyam Steel
2.	Cement (OPC/PPC) as per IS:8112 and IS:12269/IS:1489(Part-I &II) (PPC shall be from reputed manufacturer having annual production of at least one million tons or more)	Jaypee Cement, J.K. Cement, Shree Ultra Cement, Ultra Tech, A.C.C., Birla, Lafarge, Dalmia.
3.	Ceramic/glazed Tiles	Kajaria, Johnson, Somany, orient of approved design, colour and shade.
4.	White Cement	Birla White, J.K. White or equivalent.
5.	Primers, paints (Low VOC) (i/c water proofing cement paint) etc.	Nerolac, Asian, Burger, ICI Exterior paint of Apex Ultima of Asian or Premier Exterior Emulsion of Dulux.
6.	Putty	Birla, J.K. Putty or equivalent.
7.	Wash Basin and WC PAN	Parryware, Hindware, Johnson, Cera. (as per Cat No. mentioned in the BOQ items)
8.	Clear glass	Modi Guard, Saint Gobain, AIS
9.	G.I. pipes and accessories	Tata, Jindal, Prakash Surya, APL Apollo, NVR GI pipe fittings.
10.	Centrifugally Cast Iron Spun Pipes & fittings	Neco, Electro steel, SKF.
11.	DI Pipes & fittings	Kesoram, Electro steel.
12.	Brass / CP Brass fittings	Parryware, Hindware & Jaquar (as per Cat No. mentioned in the BOQ items)
13.	Aluminium sections (Anodising by approved anodizing firm)	Hindalco, Jindal, Indian Aluminium Co.
14.	Water proofing compound	WEBER, FOSROC, PIDILITE, CICO,dr fixit, BASF
15.	Chemical admixtures and construction chemicals	FOSROC, PIDILITE, dr fixit, BASF
16.	Stainless steel sink	Neelkanth, Nirali, Jayna,
17.	Particle board i/c laminated	BHUTAN, ECO BOARD
18.	Plastic W.C. seat cover	Parryware, Hindware, Johnson (as per Cat No. mentioned in the BOQ items)
19.	Stoneware pipes & gully traps	Perfect, Taya
20.	UPVC Window	Fenesta, Ewin, Rehau
21.	PVC tanks	Sintex or As approved by Engineer-in-Charge.
22.	Mirrors	Saint Gobain & Modi Guard
23.	CP waste & flush pipes	As approved by Engineer-in-Charge.
24.	PVC flushing cistern.	Parryware, Hindware, Johnson. (as per Cat No. mentioned in the BOQ items)
25.	Tile Fixer / Adhesive	FOSROC, PIDILITE, dr fixit, BASF or As approved by Engineer-in-Charge.
26.	Vitreous Floor Tiles	Johnson, Kajaria, SOMANY
27.	Ply board / Block Board	Green Ply, Kitply, Century
28	PPR pipes	SFMC, HPMC, prime

LIST OF PREFERRED MAKES FOR ELECTRICAL WORKS

Sl. No.	DESCRIPTION	MANUFACTURER'S NAME
1.	MCB / RCCB / RCBO / DB	ABB/LEGRAND (Lexic)/ Schneider/ Standard
2.	Industrial outlet	L&T (Hager)/ABB/LEGRAND (Lexic)/ Schneider/ Standard
3.	MCCB (Thermo magnetic/Static)	ABB/L&T/Schnieder/Siemens/GE Power
4.	SWITCH FUSE UNIT WITH HRC FUSES	L & T / ABB/Schnieder/Siemens
5.	CONTRACTORS/ RELAYS	L&T /SIEMENS/ABB/ Schneider
6.	Current Transformers	Kappa/ Pragati/ AE / G&M
7.	Voltage Transformers	Kappa/ AE / G&M
8.	Ammeters/ Voltmeters and metering equipments	L&T/SIEMENS/AE/Neptune
9.	Selector Switches	Kaycee/Salzar/L&T
10.	LED lights	L&T /Bajaj/Jaquar/ PHILIPS
11.	Change Over Switches	GE/L&T/HH ELCON/ABB/HPL
12.	PVC insulated Copper conductor wires	FINOLEX/Polycab/Rallison/ Henlay/ Skytone/ Havels
13.	Telephone Wires and cables	FINOLEX/Polycab/Skytone/ Havells
14.	Telephone Coaxial cable	FINOLEX/Polycab/Boton/Skytone/ Havells
15.	Switches and Sockets outlets (Conventional piano type)	ANCHOR/SSK/MK/North West/Crabtree/Havells
16.	Switchs and Sockets outlets (Modular type)	ANCHOR/SSK/MK/North West/Crabtree/Havells
17	PVC/XLPE INSULATED 11 KV/1.1 KV CABLES	CCI/ FINOLEX/ POLYCAB/SKYTONE/HAVELLS/
18.	CONTROL CABLES/ WIRES	CCI/ FINOLEX/ POLYCAB/SKYTONE/HAVELLS/
19.	LUGS	DOWELLS/ 3D/C.C.I./ 3M
20.	CABLE GLANDS	SIEMENS/COMET/GRIPPWEL
21.	PVC Conduits and accessories	AKG/BEC/CAP/SEIKO/POLY PACK/ ATUL ISI MARKED
22.	Light fitting	PHILIPS/BAJAJ/ Jaquar/ Wipro/Surya/Polycab
23.	HPMV/HPSV/Halogen Lamp Fitting Equivalent LED	PHILIPS/ BAJAJ/ Wipro/Surya/ Polycab
24.	Ceiling Fans/Exhaust Fans/ Air Circulators	CROMPTON/USHA/HAVELLS

25.	LT Panel/ Meter Board	Adlec/Tricolite/ Advance/NSG Power Project/KRYPTON
26.	Transformer (Dry Type)	Kirlosker/Voltamp/Crompton Greaves/ Universal/Recon
27.	HT Panel	ABB/Siemens/Crompton Greaves/ Schenider
28.	D.G. Set	Cummins Jakson/Kirloskar electric/ Mahindra
29.	Any Other Items	On approval of Engineer-in- charge

Note:- In Case, Any Other Item/ Material Required To Complete The Work For Which Makes Are Not Specified Above, The Contractor Shall Take Prior Approval Of The Engineer-In- Charge.

TECHNICAL SPECIFICATIONS (GENERAL)

All works shall be executed as per CPWD Specification 2009 Vol. I & II in general and latest IS Standards .These Specifications cover all types of Building and external development Works.

The lump sum per Sqm rate quoted by the contractor, for the Building works shall include for all materials and labour complete as specified in Specifications and as shown on drawings, including notes thereon and interalia shall also include the following:-

Pre-construction anti-termite treatment to all buildings except Cycle sheds/scooter stands all as specified.

(a) All built-in furniture items such as cupboards, letter boxes, study alcoves, book shelves, display cabinets, peg sets, kitchen fixtures etc. drapery rods, and other miscellaneous items all as shown on drawings and/or as specified here-in-after.

(c) All toilet/sanitary appliances, fittings/fixtures/accessories and connections including all traps (Nahani traps, floor traps, SGSW gully traps, cockroach traps etc) with gratings all as required, as specified and/or as shown on drawings.

(d) Plumbing and Sanitation complete with toilet / sanitary fittings and fixtures including soil, waste & vent pipes, first manholes (one No. each for each toilet & kitchen at ground floor), and SGSW pipe from gully traps to first manholes, vent pipes upto a height of 0.30m above roof slab and vent cowl. All soil/waste pipes shall be taken vertically below GL to a depth as required and shall be provided with a heel rest bend at the lower end and soil pipes shall be connected upto first manhole with required slope. Irrespective of what in shown on drawings, the first manholes shall be constructed at a distance of 3.00 mtr from the respective external face of the wall except

(e) RCC shelves and Stone shelves of any numbers of tiers, RCC Cooking Platforms covered with granite or other stone as specified, Working Platforms, Steel Ladders, Rungs, Trap Doors, Mirrors, Mirrors with Cabinets, Towel Rails, Towel Racks, Corner glass shelves, RCC Jali, Brick Jali, Lofts with loft doors in the DUs and open lofts in garages / car garages / scooter garages / scooter sheds, Steel doors for garages/car garages/scooter sheds, Doors, Windows and Vents complete with wire gauze & glazing and builders hardware, railings, mild steel stands for coolers, grills for openings & windows, glass shelves all as specified and/or as shown on drawings.

(f) Cutting/leaving/forming necessary chases / recesses, holes and sinkings etc wherever required through / in walls, floors, roofs & ceilings and making good in cement mortar (1:3) and finishing to match the adjoining surfaces for the works required in connection with the works included in the schedules for internal water supply, internal electrification works and plumbing etc. and other schedules.

(g) RCC overhead tanks on roofs for storage of water for fire and domestic purposes, staging for rotational moulded HDPE tanks for solar water heater works including 20mm bore G.I. medium grade overflow pipe for these tanks including bringing the same upto nearest sump / outlet of RWP/spouts/poles, 40mm bore G.I. medium grade flush pipe with plug for tanks, 15mm bore G.I. medium grade vent pipe with anti-mosquito rose to be provided with overflow and vent pipes of these tanks all as specified and/or as shown on drawings.

(h) Plinth protection along with flooring at stilt level, platforms, balconies, lobbies, staircases including fire escape staircase, passages, ramps, steps, mumty, fibre glass

sheet roofing, structural glazing etc. all as specified and/or as shown on drawings.

(j) Com. Store, lift well, shafts, parking area, at stilt level all as specified and / or as shown on drawings.

(k) CI/Pressed steel fan boxes with hooks duly painted with two coats of synthetic enamel paint over a coat of red oxide primer all as specified and/or as shown on drawings.

(l) Openings required for Exhaust fans etc. all as specified and/or as shown on drawings.

(m) Coping over parapet walls, PCC Cills with stone cills (stone as specified) for window openings, spouts, flower box etc. all as specified and/or as shown on drawings.

(n) Internal and external finishes to various rooms / components / parts / portions / locations / fittings / fixtures / accessories of the buildings all as shown in schedule of finishes and as specified here-in-after and/or as shown on drawings.

(o) Strengthening measures for the buildings for required Seismic Zone.

(p) Numbering of blocks and dwelling units by providing numbered ceramic tiles at two places for each block and at one place for each dwelling unit respectively all as specified in note No.16 here-in-after.

(q) Excavation and earth work including preparatory works, surface excavation and surface dressing required for Building portion and around area covered upto outer edge of plinth protection for each block including clearing of all vegetation, bushes, shrubs, grass etc of any girth / height except trees having girth of more than 30 cm. when measured at 1 meter above existing ground falling in this area all as specified and/or as shown on drawings.

(r) Dressing and levelling of site upto 3 metres from the outer edge of plinth protection around for each block.

(s) All fittings, fixtures, accessories, built in furniture items, doors, windows and ventilators and other items shown in plan of any dwelling unit shall be provided in all such similar dwelling units on all floors without any extra cost to the Govt.

6 All Reinforced cement concrete work e.g. in footings, walls, columns, beams, slabs, etc. shall be concrete. Mixing of concrete shall be as per IS: 456.

7. Unless otherwise specified, unit rates of all items will include for all materials and labours complete all as specified and/or shown on drawings. Contractor's special attention is drawn to the fact that all the provisions including use of materials or labours or both, specified in the specifications and/or shown on drawings but not specifically included in the description of the relevant items shall be deemed to be included in the lump sum amount quoted by the contractor and nothing extra shall be admissible on this account.

8. The lump sum quoted by the tenderer for the works shall be deemed to include for construction of various buildings by providing all relevant items of works shown on drawings, notes therein and/or as specified in specifications including these notes complete for entire completion of works including the internal plumbing and internal electrical works of Buildings complete as per specs and drawings unless otherwise specifically stated elsewhere in the tender documents.

SCHEDULE OF ITEMS FOR BUILDING WORKS

Sl. No.	Description
1.	Earth work in excavation in foundation trenches or drains (not exc. In width or 10 Sqm on plan) including dressing of sides and ramming of bottoms, lift up to 1.5M including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 Mt. Hard/Dense Soil, all types of strata.
2.	Filling with 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 lead upto 50m and lift upto 1.5M.
3.	Providing and laying in position cement concrete to specified grade including the cost of centering and shuttering all works up to plinth level. a) 1:3:6 (1 Cement: 3 Course sand: 6 graded stone agg.20mm nominal size. b) 1:4:8 (1 Cement: 4 Course sand: 8 graded stone agg. 40mm nominal size.
4.	Providing and laying in position specified grade of reinforcement concrete including the cost of centering, shuttering and finishing all works up to plinth level (All RCC work to be carried out as per IS 456 with 43 grade cement). 1:1.5:3 (1 cement : 1.5 Course sand : 3 graded stone agg. 20mm nominal size)
5.	a) Providing and laying boulder soling under floor of 15 cm. thick b) Providing and laying sand under floor 10 cm. thick including consolidation.
6.	Brick masonry in foundation and plinth in for all floors. a) Cement Mortar 1:5 (1 Cement : 5 coarse sand)
7.	Reinforced cement concrete work in piers (any thickness) including attached plasters, buttresses plinth and string courses, fillets, columns, pillars, piers, abutments, post and struts, beams suspended floors and roofs having slope up to 15 landings balconies, shelves, lintels bands, window sills, facia lofts and cup boards etc. upto two floor level, including cost of centering and shuttering, finishing and reinforcement and plastering (All the RCC works to be carried out as per IS 456 with 43 grade cement). a) 1:1.5:3(1 cement: 1.5 coarse sand: 3 graded stone agg. 20mm nominal size) for all floors.

8.	Reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete for all floors as per IS 456. Thermo-mechanically Treated bars.
9.	Making plinth protection of width 900 mm and 50mm thick of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20mm nominal size) over 75mm thick bed of dry broken stone 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top smooth also for approaches.
10.	Solid brick masonry in super structure 230 mm thick for all floors. a) In Cement Mortar 1:5 (1 Cement : 5 coarse sand)
11.	115 mm thick half brick work in super structure for Partition walls all floors. a) In Cement Mortar 1:4 (1 Cement: 5 coarse sand).
12.	a) Providing and fixing of decorative doors of puma wood for entrance (including chowkats) complete as per drawing including fittings for all floors. b) Providing Flush door shutter of 35mm thick complete with all, fittings of approved qualities as per drawings. c) Providing and fixing PVC door shutter of 35mm thick with all necessary fittings as per drawing.
13.	Providing and fixing of MS grills of required pattern in frames of windows etc. with MS Flat of 4mm thick x 30mm width as per drawings.
14.	Providing steel work/wooden work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position as per drawing. (Including glass panels wherever required).
15.	Cement concrete flooring 1:2:4 (1 Cement: 2 Coarse sand: 4 graded stone agg.) finished with a floating coat of neat cement including cement slurry. 52mm thick with 20mm nominal size stone aggregate and metallic hardener in two layers top layer 12mm thick with cement concrete hardener consisting of mix 1; 2 and glass strips (In Cycle stand/Scooter Sheds)
16.	Cement plaster skirting upto 15 cm. height with CM (1:3) with floating coat of neat cement 18mm thick.
17.	. Providing and laying Ceramic glazed floor tiles 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in all colours, shades, except White, Ivory, Grey, Fume Red Brown laid on 20mm thick bed of Cement Mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigments etc.,

	complete
18.	Providing and fixing glass strips in joints of terrazzo / cement concrete floors, 40mm wide and 6mm thick. (In Cycle stand/Scooter Sheds)
19.	Providing and laying Ceramic glazed tiles in skirting 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make laid on 12mm thick bed of Cement Mortar 1:4 (1 Cement : 4 Coarse sand) including pointing the joints with white cement and matching pigments etc., complete
19.(a)	White glazed tiles of minimum thick 5mm skirting rises of steps and dado on 12mm thick cement plaster 1:3 (1 Cement : 3 coarse sand) and joined with cement slurry and matching pigment etc.
(b)	Providing Non skid tiles in bath room and WC as per drawing.
20.	Cement plaster : a) **For external** : 18mm thick cement plaster in two coats consisting of 12mm thick base coat in 1:4 (1 cement : 4 coarse sand) with water proofing compound and 6mm thick second coat 1:3 (1 cement : 3 coarse sand) with waterproofing compound. b) **For internal** : 12mm thick in 1:6 (1 cement : 6 coarse sand) c) **For ceiling etc**.: 6mm thick in 1:3 (1 cement : 3 coarse sand)
21.	a) Distempering with oil bound washable of approved brand and manufacture to give an even shade with priming coat of cement primer inside complete as per drawings. b) Distempering outside snowcem with primer complete as per drawing. c) Painting with white cement.
22.	Applying priming coat : a) With ready mixed pink or grey primer of approved brand and manufacture on wood work (hard and soft wood). b) With ready mixed zinc chromate yellow primer of approved brand and manufacture on steel galvanized iron/steel works.
23.	Painting with ready mixed paint of approved brand and manufacture in all shades to give an even shade. a) New Steel work (three or more coats) b) New wood work (three or more coats)
24.	Providing and fixing white vitreous china wash basin 450 x 300 mm with

	brackets painted white 15 mm C.P. brass pillar taps C.P. brass chain rubber waste pipes of standard pattern 32mm dia. Complete including cutting and making good to the walls wherever required as per drawings.
25.	Providing and fixing G.I. pipe "M" grade complete with all fittings and clamps including and making good the walls etc. (Internal work and external work) complete as per drawings. a) 15mm nominal bore. b) 20mm nominal bore.
26.	Providing & fixing C.P. brass bob cock of approved quality weight upto 400 gms. a) 15mm nominal bore.
27.	Providing & fixing C.P. brass stop cock of approved quality. a) 15mm nominal bore.
28.	Providing and fixing kitchen sink including making all connection including cost of fittings. a) Stainless steel sink of size 600x450x200 with drain board including waste pipes etc.
29.	Providing and laying 100mm dia Rigid PVC Pipes of "S" (grey colour) minimum thickness 2.6mm and working pressure 4 Kg/Sq.Cm complete with necessary fittings and cement solvent joints.
30.	Providing and fixing PVC bends 450 and 900 with sockets suitable for pipes complete with cement solvent. a) 100mm dia as per drawing.
31.	Providing & fixing Nahani trap 100x25 including all grating PVC pipes complete as per drawing.
32.	Providing and fixing CP brass shower rose with 15 or 20mm inlet complete of ISI mark. a) 100mm dia.
33.	Providing and fixing PVC reducing sockets (on size lower at one end, both end socketed) suitable for pipes complete with cement solvents. a) 110x100mm dia
34.	Providing and placing in terrace (at all floor level) polyethylene water storage tank of approved brand and cover and suitable locking arrangements and making necessary holes for inlet and outlet but without fittings and base support for tank but including floating valve (1000 ltrs. Capacity each).
35.	Providing and placing white vitreous china water closet squatting pan (Type WC

	pan) with 100mm "P" or "S" trap, 10 ltrs. Low level flushing cistern (of approved make) with fittings and clamps 20mm over flow pipes with specials and mosquito proof coupling of approved principal design including pair of foot rest. a) Orissa pattern W.C. pan of size 600 x 450 mm with PVC flushing cistern and PVC flush pipes and over flow pipe.
36.	Providing and fixing 40mm dia railing to stair made with square /round bar embedded in cement concrete (1:2:4) as per drawing fixing in position with necessary fixtures complete with all labour and materials.
37.	Providing and fixing G.I. pipe railing 90 cm high with MS square bar (solid) 16 x 16 at 150 mm etc. with two MS flat 25x6 mm welded with top hand rail or GI pipe 40 mm "L" grade dia including painting and fixing in position all complete as per drawing.
38.	Providing drip course all around projected roof slab/mazia and all similar items 25x20 mm dia of 1:3 CM.
39.	Providing cup boards with shutters etc. Complete in all respects as per drawing.
40.	Providing & laying of CI pipes 4" dia for all out let of water from wash basin, bath and kitchen etc.
41.	Providing and fixing mirror of size 450x600mm including fitting etc. complete as per drawing.
42.	Providing and fixing RWP 100mm dia PVC pipes with fittings etc. complete.
43.	Providing and fixing 20mm dia Nickel plated MS pipes as curtain rod with nickel chrome plated brackets.
44.	Providing and fixing collapsible steel gates top hung consisting of channel pickets, pivoted flat bars, top and bottom runner, brass handle as specified complete in all respect.
45.	Providing and fixing peg stays of stainless steel B/R.
46.	Frosted glass for kitchen/WC/Bath.
47.	Providing and fixing glass strip 40mm wide, 4mm thick in joints of floor.
48.	ANTI TERMITE TREATMENT : Deleted
49.	ROOF TREATMENT AGAINST WATER PROOFING : **Inaccessible Roof**: Providing and laying APP (Atactiv Polypropylene Polymer) five layer, 3-4 mm thick membrane reinforced with polyester / fibre glass matt. The membrane to be laid over a coat of bitumen primer by using butane torch and finally painted with Aluminium paint. The laying of the membrane to be done as

	per the specifications provided by the firm and by authorized applicator of the manufacture. Ten years guarantee to be given for the effectiveness of water proofing treatment. **<u>The approved Firms</u>** : **Bitumat, Shalimar, Pidilite, Soprema, General Membrane, Tamko, STP.** **<u>Accessible Roof</u>**: Providing and laying APP (Atactic Polypropylene Polymer) five layer, 3-4 mm thick membrane reinforced with polyester / fibre glass matt. The membrane to be laid over a coat of bitumen primer by using butane torch and finally overlaid with concrete screed mortar. The laying of the membrane to be done as per the specifications provided by the firm and by the authorized applicator of the manufacture. Ten years guarantee to be given for the effectiveness of water proofing treatment. **<u>The approved Firms</u>**: **Bitumat, Shalimar, Pidilite, Supreme, General Membrane, Tamko, STP.** The copy of the order issued by the contractor to the authorized applicator for doing the above work should be submitted to the NPCC Ltd. for approval before starting the roof treatment against water proofing.
50.	Providing and fixing full way wheel valve of 20mm size as per the drawing and direction of Engineer-in-charge.
51.	Providing and fixing full way wheel valve of 20mm size as per the drawing and direction of Engineer-in-charge.
52.	Providing and fixing towel rail and sop dish of stainless steel of approved quality as per drawing.
53.	Providing and fixing internal electrification with insulated copper wire in PVC casing and capping/conduit wiring. The building should be earthed as per CPWD norms. The complete work of internal electrification is to be carried out by license holder supervisor, as per drawing & BOQ attached. All the fittings like panel board, main switch gear, bus bars and distribution switches with MCB etc. as detailed in BOQ. All the fixtures should be of ISI mark as specified in BOQ.
54.	Construction of septic tank with soak pit with all necessary fittings as per drawing attached and direction of Engineer-in-charge for 30 users per block.
55.	Providing and laying sewerage line from the outlet of the building to the inlet of septic tank with SW pipe of 100/150 mm size with necessary manhole chambers

	etc. as per CPWD specification. The SW pipe should be joined with cement mortar and necessary fittings as per specification and direction of Engineer-in-charge.
56.	Providing and laying water supply line as per site condition from PVC water tank to main water supply line with G>I. pipe of 32mm dia from main line to bottom of the building and with 25mm dia from bottom of building to PVC tank at top with necessary wheel valve, inspection chambers, reducers/sockets as per the requirement and CPWD specification.
57.	Providing and laying of 70 Sq.mm armoured cable aluminium 3.5 Core, 11000 V ISI mark from electric pole to the block constructed while digging in earth 2 ft. deep and 1.5 ft wide and covering of cable with sand and bricks as required as per CPWD specification. The armoured cable has to be passed through 80mm dia G.I. Pipe attched with electric pole of 6 mtr. length and should pass through G.I. Pipe before putting connection to the block having length 1.5 mtr. with elbow etc. to properly earthed.
58.	Surface dressing / levelling of the ground including removing vegetation and in-equalities and removal of rubbish upto a distance of 50 mtr. Outside the periphery of the area cleared.

NOTE:

1. Works to be executed as per Drawing duly approved by Assam Rifles.
2. Above Specification/nomenclature is only for reference.
3. In case of difference in specifications mentioned between this NIT and the approved drawing of Assam Rifles, superior specification hold good for execution.

HINDUSTAN PREFAB LIMITED

(A GOVERNMENT OF INDIA ENTERPRISE)

SCHEDULE OF ITEMS FOR ELECTRICAL WORKS

Sl. No.	Description
.	**POINT WIRING**
1.	Wiring for light point/fan point/exhaust fan point call bell point with 1.5 Sq.mm PVC insulated copper conductor cable in surface/recessed PVC conduit as required including 5/6 amp Piano type switch C.I. cover plate etc. complete.
2..	Wiring for twin control light point with 1.5 Sq.mm PVC insulated, copper conductor, cable in surface/recessed PVC conduit with 2 way, 5/6 amps piano type switch etc. as required.
3.	Wiring for 3 pin 5/6 amps light plug point on same switch board including providing and fixing 3 pin 5/6 amp socket outlet and 5/6 amp piano type switch connection etc. as required.
4.	Wiring for light plug with 2x1.5 Sq.mm PVC insulated copper conductor single core cable in surface/recessed PVC conduit along with 1 no./ 2.24 mm dia bare copper wire for loop earthing as required.
5.	Wiring for light power plug with 2 x 4 Sq.mm PVC insulated copper conductor, single core cables in surface/recessed PVC conduit along with 1 no. 2.24 mm dia bare copper wire for loop earthing as required.
6.	Wiring for Ckt. Wiring with 2x2.5 Sq.mm PVC insulated, copper conductor, single core cables in surface/recessed PVC conduit complete as required.
7.	Wiring for sub main with 4x6 Sq.mm PVC insulated copper conductor single core cables in surface / recessed PVC conduit complete as required.
8.	Wiring for sub main with 4x16 Sq.mm PVC insulated copper conductor single core cables in surface / recessed PVC conduit complete as required.
9.	Supplying and fixing metal box of 100 mm x 100 mm x 60 mm deep (nominal size) on surface or in recess with suitable size phenolic laminated sheet cover in the front including providing and fixing 3 pin 5/6 amps socket outlet and 5/6 amps tumbler / piano type switch, connections, painting etc. as required (for light plugs).
10.	Supplying and fixing metal box of 180mm x 100mm x 60 mm deep (nominal size) on surface or in recess with suitable size phenolithic laminated sheet cover

	in the front including providing and fixing 3 pin 15/16 amps tumbler/piano type switch, connections, painting etc. as required (For power points).
11.	Supplying and fixing 20 amps, 240 volts, SPN industrial type, socket outlet, with 2 pole and earth, metal enclosed plug top along with 20 amps G-series, SP MCB, in sheet steel enclosure on surface or in recess with chained metal cover for the socket, outlet, and complete with connections, testing and commissioning etc. as required.
	SWITCH BOARDS, DBS & CABLES
12.	Supplying and fixing MCB type TPNDB 4 way prewired in recess or on surface complete as required with copper bus bars, N link etc. and following.
13.	Supplying and fixing MCB type TPNDB 8 way prewired in recess or on surface complete as required with copper bus bars, N link etc. and following.
14.	Providing and fixing of 63A (Category A) TPNSFU with HRC fuses complete as required including supplying and fixing of suitable angle iron frame.
15.	Supply, installation, testing and commissioning of cubical type wall/floor mounted TPN distribution board with aluminium bus bars, wiring, connections, painting etc. complete as required with following switch gear and accessories as per approved drawing and design. I/c 125A TPLNFSU-with HRC fuses o/g 40A TPN-MCB-125 A4P change over switch.
16.	Supply, installation, testing and commissioning of cubical type wall/floor mounted TPN distribution board with aluminium bus bars, wiring, connections, painting etc. Complete as required with following switch gear and accessories as per approved drawing and design. I/c 400 A TPNSFU with HRC fuses O/g 125 A TPNSFU 63A TPN
	CABLES
17.	Supply and installation of 1.1 KV grade PVC insulated sheathed and armoured Al. Conductor cable of following size as per IS : 1554 (Part-I) I) 3.5 x 50 Sq.mm Note: Length of the cable required shall be as per actual site requirement.
18.	Laying/fixing of 1.1 KV grade PVC insulated sheathed and armoured Al. conductor cable in ground or on wall/ceiling complete as required. I) 3.5 x 50 Sq.mm
19.	Supplying and laying cable and termination with brass compression gland and

	crimped cable and sockets. i) 3.5x50 Sq.mm
	EARTHING
20.	Providing earthing station with G.I. plate 600 x 600 x 6mm watering pipe, masonry enclosure C.I. cover plate etc. complete as required including salt and Charcoal.
21.	Providing and fixing G.I. earth strip 25 z 5mm in 40mm dia G.I. pipes in ground.
22.	Supplying and laying 25x5mm G.I. strip in 40mm dia G.I. pipe from earth electrode as required.
23.	Providing and fixing 6 SWG dia, G.I. wire on surface or in recess for loop earthing along with the existing surface/recessed conduits/sub main wiring/cable as required.
24.	Supplying and drawing 2.24 mm copper loop earth wire in conduit.
	INSTALLATION OF LIGHT FITTINGS, FANS AND FIXTGURES
25.	Supply, installation, testing and commissioning of prewired, fluorescent fittings of all types complete with all accessories and tubes etc. directly on ceiling/wall, including connections with 1.5 Sq.mm PVC insulated, copper conductor, single core cable as required.
26.	Supply, installation, testing and commissioning of prewired, fluorescent fittings of all types complete with all accessories including supplying and fixing ball and socket nos. down rod of 20mm dia x 1.6 mm thick steel conduit upto 30 cm length painting and wiring the down rods and connections with 1.5 Sq.mm PVC insulated, copper conductor, single core cable as required.
27.	Supply, installation, testing and commissioning of ceiling fan and regulator, including wiring the down rod of standard length (upto 30 cm)m with 1.5 Sq.mm PVC insulated, copper conductor, single core cable including cartage and numbering etc. as required.
28.	Supply, installation, testing and commissioning of exhaust fan upto 450mm sweep in the existing opening, including making the hole to suit the sizes of the above fan, making good the damage.
29.	Supply, installation, testing and commissioning call bell, buzzer and piano type bell push, suitable for D.C. / A.C. single phase 230 Volts complete as required.
30.	Supply, installation, testing and commissioning, erection of wall bracket/ ceiling fitting of all sizes and shapes containing up to two GLS lamps per fitting, complete with all accessories including connections etc. required.

SPECIFICATIONS FOR CIVIL WORKS

Notes:

1.1 These notes are applicable to all specification of the items of work as mentioned on scheduled of quantity and required during process of works.

1.2 The work shall be carried out according to CPWD detailed specification 1996 Volume I to VII with upto date corrections unless otherwise specified in these specifications whether specifically mentioned in the Schedule of quantities or not. No extra in any form will be paid unless it is definitely stated as an item in the Schedule of Quantities.

All mandatory tests specified in CPWD specifications 1996 Vol. I to VI with upto date corrections slips and revised CPWD Specifications 2002 for mortar, cement concrete and RCC shall be tested from the approved laboratories as desired by the Engineer-in-charge and expenses viz. testing charges, including cartage, conveyance etc. whatsoever shall be borne by the Contractor. If after any such test and in the opinion of the Engineer-in-charge any work or portion or work is found to be defective and unsound the contractor shall pull down and re-execute the same at his own cost. Defective materials shall be removed from the site.

1.3 The work shall be carried out simultaneously with the electrical, sanitary and other services and in cooperation with other contractor for the above services. The work shall be carried out till it is completely satisfactory along with the completion of essential portions of the other services. The building contractor shall keep the other contractors informed well in advance of the proposed programme of the work and shall give adequate notice to enable them to carry out their part of the work so that the building work is not hindered. The contractor shall further cooperate with the other contractors in respect of any facilities required by them e.g. holes in shuttering for sanitary pipes, electric conduits, fan hooks etc. etc. However, nothing extra shall be admissible to him for such reasonable assistance and facilities afforded to other contractors and the building contractor shall, be deemed to have taken these factors into consideration while quoting his rates.

1.4 The work shall be related to the drawings which the contractor is presumed to have studied. Nothing extra will be paid for any item on account of its shapes, size, location or other difficult circumstances, even if the schedule makes no distinction in its description provided the item is shown in the drawings.

1.5 The sources of materials stated in the specifications are those from which materials are generally available. However, materials not conforming to specification shall be rejected even if they come from the stated sources. The contractor should satisfy himself that sufficient quantity of materials of acceptable specification is available from the stated or other sources and should tender accordingly.

1.6 Definition of work as related in the specifications specified means specified in CPWD specifications or in specifications of any standard code, similar documents mentioned herein and forming part of tender documents.

I.S. – Shall mean a standard specification issued by the Indian standard Institution with upto date correction as on date.

Schedule – Shall mean the schedule of quantities / items for execution of work.

Site Engineer – Engineer appointed by employer for day to day work supervision and coordination of the project.

Approved, accepted, allowed – shall mean approved in writing by the Engineer-in-charge.

Structural Consultant – shall mean the firm or person(s) appointed by the Engineer-in-charge.

Instructed, directed or required – means as instructed by the Engineer-in-charge.

17. The requirement of these specifications shall be fulfilled by the contractor without extra charge i.e. the item rates quoted shall be deemed to have taken these specifications in to account.

2. GENERAL

2.1 OFFICE AND W.C. ACCOMMODATION AND TESTING ROOM

The Contractor shall provide at his own expenses adequate close accommodation for his workmen and keep the same in good order in conformity with the bye-laws laid by the local bodies. Similarly the contractor shall also provide adequate office accommodation for S.E. including toilet facilities, fan, light and furniture. This may be slightly modified to suit site conditions with approval of the site Engineer. These structure shall be removed on the completion of work at contractors own cost. All materials shall belong to the contractor. A testing room as required will also be provided. Location of contractor’s own office accommodation, accommodation for his workmen and office accommodation for the Site Engineer shall be approved by the Engineer-in-charge.

2.2 DRAWINGS INSTRUCTION, MEASUREMENTS:

All work shall be done according to the drawings and instruction of the Engineer-in-charge and the Contractor shall arrange to test materials and/or portions of sufficiency.

2.3 CLEARING THE SITE:

The site described and shown on the plans within 6 meters all around building, shall be cleared from all obstruction, loose stones and materials, rubbish of all kinds as well as brush wood. All holes or hollows whether originally existing or produced by removal of loose stone or brush wood shall be carefully filled up, well rammed and levelled off as directed. Also the contractor shall dress the site 6 meters all round the building after completion, maximum cutting or filling being 30 cms. No extra shall be paid for this.

2.4 MEASURING MATERIALS:

Materials requiring measuring shall be measured separately in boxes of appropriate size before being mixed.

2.5 TEMPORARY PROTECTION:

All trenches walls newly laid concrete or other work requiring protection either from inclement weather or accidental injury shall be protected by means of tarpaulin or in other way so as to keep the work immune from damage. Nothing extra shall be allowed on this account.

2.6 QUALITY OF WORK:

Material, tools and plants and workmanship shall be the best of the several kinds obtainable in the market and as approved by the Engineer-in-charge.

2.7 SAMPLE:

Sample of each class of work required shall be submitted by the contractor for the approval of the Engineer-in-charge and after such approval these sample shall be deposited at a place chosen by the Engineer-in-charge. The contractor will be required to perform all work under this contractor in accordance with these approved samples.

3. SCOPE OF WORK:

3.1 All work mentioned in schedule of Quantities & Rates as described in particular specifications are included in the scope of this account.

4. EARTH WORK:

4.1 EXCAVATION OVER AREAS AND IN TRENCHES IN SOIL

In firm soil the sides of excavation shall be kept vertical upto depth of 2m from the bottom. For greater depth, excavation profile may be widened or the sides sloped or shorted up, depending upon the nature of soil as ordered by Engineer in writing. It shall be responsibility of contractor to take complete instructions from the Engineer in writing, regarding the extent and manner of stepping, sloping or shoring to be done for excavations, where ever necessary.

4.2 The excavation shall be done from top to bottom, undermining and under pining shall not be allowed.

4.3 The bed of excavation shall be formed to required level, slope or grade and shall be made firm by watering and ramming. The sides of excavation shall be dreaded or trimmed. Soft defective spots shall be dug out and filed with concrete of the same mixes that of base concrete or approved dry filling as directed by Engineer.

4.4 If the excavation is done to a depth greater than that shown in the drawings or directed, the excess depth shall be made good by contractor at his own expense with concrete of the same proportion as base concrete.

4.5 STACKING OF EXCAVATED MATERIALS:

All excavated materials will remain the property of the owner and the rate of excavation includes sorting out of useful materials for back filling, plinth filling or levelling sports or other use and stacking the same on site in convenient places in such a way as not to cause obstructions in free movement of men, animals and vehicles or encroach on the area required for construction purpose.

All excavation materials certified as surplus and not useful by the Engineer shall be removed by the contractor from the site in an approved manner.

4.6 EARTH FILLING IN TRENCHES UDNER FLOORS:

Earth used for filling shall be free from stone shingles or boulder salts, organic or owner foreign matter. Earth from excavation of the same area shall be used for filling unless such earth contains deleterious material, salt determining earth.

4.7 FILLINGS:

All space around foundations shall be cleaned of all debris brick bats etc. and shall be refilled to original surface with approved soil in layers 15 cm to 20 cm in thickness, watering and well rammed with iron rammers wherever feasible and with bult ends of crowbars wherever rammers cannot be used. The filling shall be done after concrete

or masonry is fully set and is done in such a way not to cause under thrust on any part of the structure.

In case of filling under floors, the finished level of filling shall be kept to slope, intended to be given to the floor.

No excavation or foundation shall be filled in or covered until all measurements of excavation, masonry, concrete and other works below ground level are jointly recorded.

5. MEASUREMENTS

5.1 Excavation shall be measured and paid as per drawings, dimensions, concrete (bed concrete where so specified) at the lowest levels in regard to length, breadth and depth which shall be computed from the concerned excavation level and ground level taken before excavation where the ground is not uniform. In case the ground is fairly uniform, the depth of cutting shall be measured in the normal manner.

Where, working space is necessary such as for basement walls requiring external treatment, an additional working space of 60 cm from each external face of the wall shall be measured and paid to extra. Excavation on account of slips or falls shall not be measured.

5.2 All excavation shall be measured in successive stages of 1.5 m deep starting the connecting level.

6. SAND FILLING IN PLINTHS:

Sand shall be clean and free from dust, organic and foreign matter corresponding to grade zone IV to V, 100mm thick sand filling shall be done in a manner similar to earth filling in floors except that consolidation shall be done by flooding with water. The surface of consolidated sand shall be dressed to required level or slope.

7. ANTI TERMITE TREATMENT

Deleted

7.1 The method of application for different locations shall be as given in respective paras IS code / CPWD specification.

7.2 The contractor shall obtain approval of the Engineer for the chemicals he proposes to use in the work out of those specified in Para above. A record of chemicals obtained in sealed containers shall be maintained in the material register.

7.3 The entire work pertaining to anti termite’s treatment shall be carried out by a specialist firm who is a member of Indian Pest Control Association.

7.4 In order to facilitate for watch of satisfactory fulfilment necessary account of chemicals used for said post construction treatment is to be maintained and to be verified by Engineer-in-charge. Guarantee bond for 10 (Ten) years to be submitted on Rs.100/- stamp paper as per Performa.

PLAN AND REINFORCED CONCRETE.

8. MATERIALS

8.1 CEMENT

Ordinary Portland cement shall conform to IS 269-1967. Portland pozzolana cement shall conform IS: 1489-1967. The cement shall be supplied by the contractor. However only port land cement shall be used in the work throughout.

8.2 STEEL REINFORCEMENT

Tor steel and mild steel reinforcement be arranged by the contractor (Thermo Mechanically Treated).

8.3 WATER

Water shall be clean, free from injurious deleterious material, portable in nature and shall confirm to IS specification.

8.4 FINE AGGREGATES

Aggregate most of which passes 4.75 mm sieve is known as fine aggregate. The sum of percentage of all deleterious materials shall not exceed 5%. Fine aggregate when used for places where reinforcement is used shall not contain any materials acidic in character which is likely to attack steel reinforcement. Fine aggregate shall be either sand or crushed stone dust. Further, sand shall be of following two varieties.

8.5 FINE SAND

Fine sand shall be natural river sand having grading within the limit of grading zone IV (refer table given in CPWD specification-1967). The maximum quantity of silt shall not exceed 8% as a guide.

8.6

8.7 COARSE SAND

This shall be crusher stone dust of approved quality having grading within the limits of grading zone III (refer table given in CPWD specification-1967). The maximum quantity of silt shall not exceed 8% from an approved source.

8.8 COARSE AGGREGATES:

Unless otherwise specified, coarse aggregate for all cement concrete work shall be broken or crushed stone conforming to IS:383-1970. They shall be hard, strong, dense, durable, clean and free from veins and adherent coatings and free from in

furious amounts of disintegrated pieces, vegetation and other deleterious substances. As far as possible, flaky and elongated pieces shall be avoided. All coarse aggregate shall be contained from nearest quarry approved by HPL for use in this work.

8. GRADED COARSE AGGREGATE

Grading shall be within the limit given in the following tables.

IS Sieves Designation	Percentage passing for graded aggregate of nominal size		
	40mm	20mm	12.5mm
80mm	100	-	-
63mm	-	-	-
40mm	95-100	100	-
20mm	30-70	95-100	100
12.5mm	-	-	90-100
10mm	10-35	25-55	40-80
4.75mm	0-5	0-10	0-10

8.9 WATER PROOFING COMPOUND

Integral cement water proofing compound shall conform to the requirement of IS-2645-1975.

8.10 CEMENT CONCRETE

Cement concrete shall be of specified grade or volumetric mix as indicated. Cement concrete and reinforced cement concrete shall be provided in accordance with IS: 456-197.

8.11 CONCRETE MIX PROPORTIONING:

Where concrete is specified by its grade i.e. characteristics compressive strength determination of proportions of aggregates and water to attain required strength, shall be made by designing then concrete mix (design mix concrete) or by adopting a normal concrete mix (nominal mix concrete as indicated).

8.12 VOLUMETRIC MIX CONCRETE

For volumetric mix concrete, the proportion of cement and aggregate are defined by bulk. Volumetric mix shall be designated as 1:2:4, 1:1.5:3 etc. the figures denote the relative proportions of cement, fine aggregate in dry condition and graded coarse aggregate respectively. If fine aggregate is moist, necessary allowance shall be made for bulking. To determine bulk, 50 Kg of cement shall be taken as equal to 0.035 Cum Quantities of fine and coarse aggregate shall be determined by volume separately and accurately in proper gauge boxes measuring 40x35x25 Cm internally.

Consolidation of aggregate in the gauge boxes by ramming or shaking shall not be allowed.

8.13 BATCHING:

In proportioning design mix concrete and nominal mix concrete, the quantity of both cement and aggregate shall be determined by weight. Water shall be either measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean serviceable condition and their accuracy periodically checked.

8.14 In case uniformity in the materials used for concrete making has been established or where weigh batching is not practicable, the proportioning may be done, if so permitted by the Engineer, in writing, by volumetric batching, provided periodic checks are made on weight volume relationship of the materials.

8.15 The grading of coarse and fine aggregate shall be checked as frequently as possible. The frequency for a given job being determined by the Engineer to ensure that specified grading is maintained.

8.16 Where aggregate supplied are not graded, different sizes shall be blended in right proportions, different sizes being stacked in separate stock piles.

8.17 Water cement ratio shall be maintained at its correct value.

9.0 MIXING:

Concrete shall be mixed in a mechanical mixer. The mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency. If there is segregation after unloading from the mixer, the concrete shall be remixed. The mixing time may be taken as 1.5 to 2 minutes.

10. FORM WORK

10.1 MATERIALS

Form work shall be of ply wood/steel. Alternatively contractor may provide from work of ply wood, timber with steel lining or steel plate stiffened by steel angles without any price adjustment. The form work shall be for rough finish. The work shall be rigid and so constructed as to retain the shape and dimensions of the member being cast. It shall have sufficient strength and rigidity to withstand the load of concrete, vibrations, movement of men, materials and plants and any other incidental loads without excessive deflection beyond permissible limits, before concerting is started the props and wedges shall be thoroughly checked 10 sec that these are intact and are not loose. Care shall be taken that props and wedges do not get loose for the minimum period specified for removal of form work.

10.2 PROPING AND CENTERING:

The props shall of bellies or steel sections. The bellies shall be placed at spacing of 1 to 1.2 meters and shall rest squarely on wooden sole plates. Double wedges shall be provided between sole plate and the wooden sole prop, so as to facilitate tightening and easing of shuttering without jerking the concrete.

In case of multi-storeyed structure, the weight of concrete and form work of any upper floor shall be suitably supported on at least two floors below the same.

In case the height of centering exceeds 3.5 meters, the props may be provided in multistage.

10.3 SHUTTERING

Form lining shall be such, it would not discolour the concrete, where steel sheet lining is provided to timer forms, it shall have on mounting, minimum amount of kink and other imperfections, where metal forms are used, all bolts, nuts shall be countersunk and well ground to provide a plain smooth surface.

10.4 SURFACE TREATMENT OF SHUTTERING

Forms shall be thoroughly cleaned of all dust, dirt, wood shaving etc. by washing with water. The surface shall then be coated with soap solution before concerting is done. Soap solution shall be prepared by dissolving yellow soap in water to get consistency of point. Alternatively a coat of raw linseed oil/burned oil may be applied.

10.5 CAMBER

The shuttering for beam shall have a camber as required as per the specifications under permissible limits.

10.6 STRIPPING TIME:

Forms shall not be struck until the concrete has attained a strength at least twice the stress to which concrete may be subjected to at the time of removal of form work in normal circumstances and where ordinary Portland cement is used forms shall generally be removed after expiry of the following periods.

a)	Slabs (Props left under)	3 days
b)	Walls, columns and vertical faces of all structural members	2 days
c)	Beam soffits (props left under)	7 days
d)	Removal of props under slabs	
	i) Spanning upto 4.5 m	7 days
	ii) Spanning over 4.5 m	14 days
e)	Removal of props under beams & arches	

i)	Spanning upto 6 m	14 days
ii)	Spanning over 6 m	21 days

In case of bad weather, these periods may be increased by the Engineer.

10.7 ASSEMBLY OF REINFORCEMENT

Reinforcement shall be bent and fixed and shall be placed and maintained in position shown in drawings during concreting.

10.8 COVER TO REINFORCEMENT

Reinforcement shall be bent and fixed and shall be placed and maintained in position shown in drawings during concreting.

10.9 PLACING:

Concrete shall be deposited as nearly as practicable in its final position to avoid re handling. The concrete shall be placed and compacted before setting commences and should not be subsequently disturbed. The concrete which is deposited or otherwise disturbed is immediately removed from the site. Before placing the concrete in trenches or on sub grade or sub base, the sub grade/sub base shall be cleaned of all injurious or foreign materials, watered and well consolidated if necessary. The final layer of concrete laid to such levels and falls as may be directed.

10.10 COMPACTION

Concrete shall be thoroughly compacted and vibrated around reinforcement, embedded fixtures and into the comers of the form work. Mechanical, vibrators shall be employed for compacting concrete except where rolling and tamping is permitted by the Engineer. Over vibration should be avoided.

10.11 CONSTRUCTION JOINTS

Concerting shall be carried out continuously upto construction joints, the position and arrangement of which shall be indicated or directed.

When work has to be resumed on surface which has hardened such surface shall be roughened. It shall then be swept clean and thoroughly wetted. For vertical joints neat cement slurry at the rate of 2.5 Kg of cement per Sqm shall be applied on the surface before it is dry. For horizontal joints surface shall covered with a layer of motor about 10 to 15 mm, composed of cement and sand in the same ratio as cement and sand in concrete mix. The layer of cement slurry or motor shall be freshly mixed and applied immediately before placing of concrete.

Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and then do concrete not exceeding 150 mm in thickness shall first be placed and shall proceed to the normal way.

10.12 CURING

Exposed surface of concrete shall be kept continuously in a damp or wet condition by covering with a layer of sacking, canvas, Hessian or similar materials or a layer of sand or by pounding for at least seven days from the date of placing of concrete.

10.13 PROTECTION:

No traffic shall be allowed on finished concrete surface for at least 7 days. This period may be increased/decreased by the Engineer.

10.14 INSPECTIONS

Immediately after stripping the form work all concrete shall be carefully inspected for any defective work and defects either removed or made good before concrete has thoroughly hardened.

10.15 SAMPLE AND TESTING OF CONCRETE

Sample from fresh concrete shall be taken as per IS: 1199-1959 and cubes shall be cured and tested at 28 days in accordance with IS 516-1959.

10.16 TEST SPECIMEN

These test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for such purpose as to determine the strength of concrete at 7 days or to check the testing error.

10.17 TEST STRENGTH OF SAMPLES

The test strength of the samples shall be the average of the strength of three specimens. The individual variation shall not be more than 15% of average.

11. SOAKING OF BRICKS

Bricks shall be soaked in stacks by profusely spraying with clean water at regular intervals for a period of not less than 6 hours for complete soaking.

12. LAYING

12.1 All those materials, dirt, lumps of mortar etc. which may be laying over the surface on which brick work is to be freshly started, shall be removed with wire brush and surface wetted slightly. Bricks shall be laid on full bed of mortar, when laying bricks shall be properly and slightly pressed with handle of trowel so that mortar can get into mall the pores of the brick surface to ensure proper adhesion. Addition of water during laying of the course shall not be permitted. In case of walls two brick thick and

over, the joints shall be grouted at every course in addition to bedding and flushing with mortar.

12.2 Top course of all plinth, parapets, steps and top of wall below RCC floor and roof slabs shall be laid with bricks on edge, unless directed otherwise. Care shall be taken that the bricks forming top courses ends of walls are properly keyed into position.

12.3 Bricks shall be laid with frog up. However when top surface is exposed, the bricks shall be laid with frog down, care being taken to fill the frogs with mortar embedding the bricks in position.

12.4 All brick shall be built in English bond, unless otherwise indicated, brick walls shall be built in stretcher bond. Header bond shall be used for walls curved on plan for better alignment. Header bonds shall also be used in foundation fottings, stretcher may be used when thickness of footing is uniform for a number of courses the top course of the footings shall be headers.

12.5 half or cut bricks shall not be used except where necessary to complete the bond.

12.6 Overlap in stretcher bond is usually half brick and is obtained by commencing each alternate course with a half brick. The overlap in header bond which is usually half the width of the brick is obtained by introducing a $3/4^{th}$ the brick in each alternate course at copings.

13. UNIFORMITY

Brick work shall be built in uniform levers corners and other advanced work shall be raked back. No part of wall during its construction shall rise more than one meter above the general construction level to avoid unequal settlement. Parts of walls left at different levels shall be properly raked back. Toothing may be done where future extension is contemplated out shall not be used as an alternative to raking back.

13.1 For half brick partition to be keyed into main walls, indents shall be left in the main walls.

14. THICKNESS OF JOINTS

The thickness of joints shall be 10 mm & 3 mm unless otherwise specified and shall be kept uniform. Where brick work is to match the existing work, the joints shall be of the same thickness as in the existing work.

15. STRIKING JOINTS:

Where no pointing plastering or other finish is indicated the green mortar shall be neatly struck flush. Where pointing plastering or other finish is indicated the joints shall be separately racked out to depth not less than 12mm.

16. PROTECTION AGAINST DAMAGE

Care shall be taken during construction that edges of jambs, sills, heeds etc are not damaged. In inclement weather, newly built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away.

17. CURING

The brick work shall be kept wet at least seven days.

18. HALF BRICK WALLS REINFORCED

Bricks shall be laid stretcher bond in cement and mortar 1:4 or as indicated. Reinforcement may be in the form of MS flat or round bars or deformed bars as indicated. The reinforcement shall be used in every third or fourth course of brick work as indicated. They shall be surely be shared at their ends where partitions bond. The inland steel reinforcement shall be completely embedded in mortar.

19. EXPOSED BRICKS WORK

Wherever exposed brick work has been shown in drawing and / or in schedule of quantities, the contractor shall ensure that the bricks of uniform sizes, shape and quality are selected from the stocks available at site for achieving uniformity in the appearance of exposed brick work. Uniformity/ perfection in the joints shall also be ensured. Contractor's rates for exposed brick work shall deem to include in these elements of costs.

20. DAMP PROOF COURSE (DPC)

It shall consist of a layer of cement concrete of cement mortar of proportions and thickness as indicated. In case of solid walls, pillars etc. the DPC shall run the full width of walls just below it. DPC 40MM thick shall be provided in all openings.

Cement concrete or cement mortar shall be, where indicated, admixed with integral water proofing compound in specified proportion as per manufacturer's instructions. The proportions of water proofing compound shall not exceed 3% by weight of cement. Cement concrete/mortar laying shall be thoroughly compacted to dense impervious mass, be cured for at least 7 days. The upper surface and sides which are not exposed shall be finished fair and even and exposed surface finished fair and smooth and finish with the masonry surface unless otherwise indicated.

21. PLINTH PROTECTION

It shall be provided around the building in specified width of 900mm. The treatment comprises of laying 5 cm thick cement concrete 1:3: (1 cement: 3 coarse sand: 6 graded stone aggregate 20mm nominal size) over 7.5 cm bed of dry brick aggregate 40 mm nominal size grouted with fine sand. Outer edge shall be lined with bricks laid

on edge and joints grouted with cement mortar 1:4 Plinth protection shall be laid with a minimum outward slop of 1 in 48.

22. SUB GRADE:

This shall be made up with 7.5 cm thick (unconsolidated) bed of dry brick aggregate of 40mm nominal size. Brick aggregate shall be spread evenly over the prepared surface to 7.5 cm depth and given a minimum outward slope of 1 in 48. After the brick aggregate has been consolidated to the required slope, the surface shall be grouted evenly with fine sand lightly sprinkled with water and again rammed with heavy iron rammer.

23. CEWMENT CONCRETE TOPPING

After sub grade has been compacted, 5 Cm thick cement concrete 1:3:6 shall be laid in alternate panels of uniform size not exceeding 2.5 Sqm and 2.5 metre and above in length. Alternate panels shall be laid on different days. The top shall be finished with wooden floats.

24. CURING

As soon as cement grout obtains initial set, the surface of the title brick floor shall be cured with wet gunny bags, Hessian cloth or wet sand to prevent quick drying. After 8 to 12 hours, the title brick floor shall be cured by sprinkling of water on the surface for a period of 7 days. After curing has been done the surface shall be swept clean.

Preparing the surface by wire mesh and cleaning to make surface absolutely free from dust, dirt and loose particles then apply one coat of EPOXY based TECHOXY mixing part – I & II and water at ratio 1:1:1 all over surface then apply one coat of polyurethane based TECHCOST all over the TECHOXY applied surface while the coat is tacky condition. Sprinkling of sand thoroughly over the surface for roof treatment against water proofing.

25. TERRAZO FLOORING

26. MATERIALS

26.1 AGGREGATE FOR TERRAZZO TOPPING

The aggregate used in topping shall be marble aggregate unless otherwise specified. Marble powder used in terrazzo topping shall pass through IS sieve Terrazo 30. The marble chips shall be of plain white Makrana, Abu white marble, Abu Panthern marble, white veined Makrana marble. Black Bhainslana (plain blck or black zebra) black zebra from Kishangarh, Abu and narnaul and Makrana Dhobi Doongri zebra marble, Green from Baroda, Abu Falna and Bundi, brown from Bar and Narnaul or as specified. It shall be hard sound, dense and homogenous in texture with crystalline

and course gains. It shall be uniform in colour and free from stains, cracks, decay and weathering. The minimum thickness of top layer for various sizes of chips shall be as under:

Grade No.	Size of chips mm	Thickness of top layer mm
00	1-2>	
0	2-4>	5
1	4-7>	
2	7-10>	8
3	10-15>	
4	15-20>	20
5	20-25>	

26.2 CEMENT

Cement used for the floor finish work shall be ordinary cement; with admixture of pigment to give the desired shade conforming IS 455-1967 or IS 269-1967.

26.3 PIGMENTS

Pigments incorporated in terrazzo shall be of permanent colour and shall conform to the requirement mentioned in Appendix ‘A’ in IS 2114-1962.

26.4 WATER:

Water used for mixing and curing shall be clean and free from injurious quantities of alkalies, acids, oils, salts, sugar, organic materials, vegetable growth or other substances that may be deleterious to bricks, stone, concrete or steel. Portable water is generally considered satisfactory for mixing. The Ph value of water shall be not less than 6. The following concentrations represent the maximum permissible value (of deleterious materials in water).

a) Limits of Acidity: To neutralize 100 MI sample water, using phenolphthalein as an indicator, it should not require more than 5 ml of 0.02 normal NAOH. The details of test shall be as given in IS: 3025 (Part 22).

b) Limit of Alkalinity: To neutralize 100 ml sample of water, using mixed indicator, it should not require more than 25 ml of 0.02 normal H2SO4. The details of tests shall be as given in IS; 3025 (Part 23).

c) Percentage of Solids: maximum permissible limits of solids when tested in accordance with IS: 3025 shall be as under:

Organic	200 mg/litre
Inorganic	3000 mg/litre

Sulphates	400 mg/litre
Chlorides	500 mg/Litre for RCC work and 2000 mg/litre for Concrete not containing embedded steel.
Suspended matter	2000 mg/litre

The physical and chemical properties of ground water shall be tested along with soil investigation.

26.5 DIVIDING STIRPS

4 mm thick glass strips or 5mm thick plain asbestos sheet or 2mm thick PVC strips/aluminium strips/brass strips unless or otherwise specified shall be fixed with their top at proper level to required slope. Strips of stone or marble or of any other material of specified thickness can also be used if specifically required. The fixing and laying shall be as specified in para 11.2.4.2 of CPWD specification.

27. WORKMANSHIP

27.1 GENERAL

Terrazzo finish shall be laid over a layer of base concrete in the case of ground floor. When the terrazzo floor is laid over RCC slabs a cushioning consisting of 75mm thick lime concrete shall be provided below the terrazzo floor. The terrazzo flooring shall consist of an under layer of cement concrete and a top[ping layer of terrazzo which shall be laid monolithically.

27.2 UNDERLAYER

The under layer shall be of cement concrete of mix 1:2:4. The maximum size of aggregate used shall not exceed 10 mm. The thickness of under layer of base concrete and cushion layer is not less than 10 cm respectively and top layer not less than 40 mm.

27.3 PANELS

The floor both while laying the under layer and topping divided into panels not exceeding 2 Sqm in area so as to reduce the risk of cracking due to differential shrinkage or expansion between the terrazzo and the sub floor. The joints shall be so located that the longer dimension of any panels does not exceed 2 m. The panels shall preferably be separated by means of dividing strips. However, where the butt joints are provided, the bays shall be laid alternately allowing for an interval of at least 24 hours between the laying of adjacent bays.

NOTE: The proportion in which pigments are mixed with ordinary Portland cement or white cement to obtain various shades for the binder shall be as specified in table IS 3133-1.

27.4 MIXING OF MATERIALS:

Before starting the work, the contractor shall get the sample of marble chips approved by the Engineer-in-charge. The cement to be used shall be ordinary grey cement, white cement with admixture of colouring matter of approved quality in the ratio specified in the description of the item in the ratio to get the required shade as ordered by the Engineer-in-charge. Colouring materials where specified shall be mixed by thoroughly with the cement and marble powder and then marble chips added and mixed as specified above. The full quantity of dry mixture of mortar required for a room shall be prepared in a lot in order to ensure a uniform colour. This mixture shall be stored in a dry place and well covered and protected from moisture. The dry mortar shall be mixed with water in the usual way as and when required. The mixed mortar shall be homogenous and stiff and contain just sufficient water to make it workable.

28. LAYING

28.1 LAYING OF UNDERLAYER

The base shall be divided in panels with the help of dividing strips including the strips required for decorative design, upto the finished surface level of the floor. Screed strips shall be used where dividing strips are not used. The base shall be cleaned of all dust, dirt, laitance and spread with cement slurry at 2.75 Kg/Sqm. under layer shall then be spread and levelled with a screening board. The top surface shall be left rough to provide a good bound to the terrazzo.

28.2 LAYING OF TERRAZZO TOPPING

Terrazzo topping shall be laid while the under layer is still plastic but has hardened enough to prevent cement from rising to the surface, this is normally achieved between 18-24 hours after laying of the under layer. A cement slurry preferably of the same colour as the topping shall be brushed on the surface immediately before laying the topping. The terrazzo mix shall be laid to a uniform thickness (slightly more than that specified in order to get finished thickness after rubbing) on the screed bed and be compacted thoroughly by tamping or rolling and trowlled smooth. Excessive trowlling or rolling in early stage shall be avoided as it results in rising up cement to the surface which will produce a surface liable to cracking and will require more grinding to expose marble chips. The terrazzo surface shall be tamped, trowlled and brought true to required level by a straight edge and steel floats in such a manner that the maximum amount of marble chips come up and are spread uniformly over the surface and no part of the surface is left without the chips.

29. CURING

The surface shall be left dry for air curing for a period of 12 hours. Thereafter water be allowed to stand overnight in pools for a period of minimum four days. The floor shall be prevented from being subjected to extreme temperature.

30. GRINDING AND FINISHING

Grinding and polishing shall be done either by hand or by machine. In case of manual grinding, the process of grinding shall begin after two days while in case of machine grinding; the process shall start after seven days after completion of laying.

First grinding shall be done with carborundum stones of 60 grit size. The surface shall then be washed clean and grouted with a group of cement or/and colouring matter in same mix and proportion as the topping in order to fill any pin holes that appear. It shall then be allowed to dry for 24 hours and wet cured for four days in the same manner as in Para 14.1.2.8 of CPWD specification.

The second grinding shall be done with caborundum stone of 50 grit size. The surface shall then be prepared as after first grinding. The third grinding shall be done with carborunmdum stone of 120 to 150 grit size. The surface shall then be washed again and allow to dry for 12 hours and wet cured for four days as before. The fourth grinding shall be done with carborundum stone 320 to 400 grit size. The surface shall again be washed, cleaned and rubbed hard with felt and slightly moistened oxalic acid powder at five grams per Sqm of floor surface. After the finishing work the surface shall be washed with dilute oxalic acid solution and dried. Floor polishing machine fitted with felt or Hessian bobs shall then be run over it until the floor shines.

In case wax polished surface is required, wax polish shall be applied on the surface with the help of sort linen, over a clean and dry surface. Then the polishing machine fitted with bobs shall be run over it. Clean saw dust shall be spread over the floor surface and polishing machine again operated which will remove excess wax and level glossy surface. Floor shall not be card glossy.

31. THICKNESS:

Thickness of the under layer and topping shall be as specified in the item.

32. MEASUREMENT

Terrazzo shall be measured separately in floors and walls and shall be classified as under.

a) Dark shade pigment with ordinary cement

b) Light shade pigment with white cement

c) Medium shade pigment with approx. 50% white cement and 50% ordinary cement.

d) White cement without any pigment

e) Light shade pigment with ordinary cement

Terrazzo flooring shall be measured as laid in square metres correct to two places of decimals. Length and breadth shall be measured correct upto a cm before laying skirting dado or wall plaster (No deduction shall be made nor extra paid for any opening in floor or area upto 0.1 Sqm). The rate shall cover laying the floor at different levels in the same room or courtyard and nothing extra shall be paid on that account.

Terrazzo flooring laid as floor borders, margins and bands upto 30 cm width and on staircase treads shall be measured separately under the items and paid extra. This extra in case of staircase treads shall include the cost of forming the nosing also. However moulded nosing shall be paid in running metres except where otherwise stated, returned moulded ends and angles to mouldings shall be included in the description. Internal, and external rounded angles shall be paid extra in running metres stating the diameter separately and paid in running metres.

Dividing strips inserted in terrazzo to form bays and patterns shall be described stating the materials, its width and thickness and shall be measured in running metres.

Special surface finishes to treads, risers and the ends of concrete steps and the like shall be measured separately and given in square metres and shall include form work, if required.

32.1 The rate shall include the cost of all materials and labour involved in all the operation described above but shall not include the cost of sub grade concrete. The cushioning layer over RCC slab is included unless specifically mentioned in the item. Dividing strips shall be paid separately. The rate shall also not include wax polishing of the surface.

32.2 BORDERS AND DECORATIVE DESIGNS

Borders and decorative design shall be laid before the main flooring and the procedure would be same as outlined for the main flooring. If in place of dividing strips stencils or form work of wood or metal are used, they shall be removed before the topping begins to harden and in a manner so as not to damage the material and the edges. Any ragged edges left shall be made good before laying the main flooring.

32.3 LAYING TERRAZZO SKIRTING AND DADO

32.4 MATERIALS

As for main flooring in para 14.1.1

32.5 WORKMANSHIP

32.6 UNDERLAYER

The under layer for terrazzo on vertical surface like skirting and dados shall be of stiff cement mortar 1:3 (1 cement: 3 coarse sand finishes rough so as to give a good bond to the topping).

32.7 THICKNESS

Terrazzo topping shall not be less than 6mm thick and the combing thickness of under layer and topping shall be not less than 20mm, other details be same as for flooring with the exception the grinding shall have to be done manually.

32.8 Skirting and Dado shall be measured in square metres correct to the places of decimals, specifying thickness. Dados of height in excess of 30 cms shall be measured separately.

32.9 All the above are only for specification, in case of lumpsum contract no separate measurement considered for payment and work shall be carried out strictly as per drawings duly approved by Assam Rifles.

33. WHITE GLAZED TILES IN DADO

33.1 Glazed earthen ware tiles and fittings shall conform to IS 777-1970 when fractured they shall appear fine grained in texture, dense and homogeneous. The tiles shall be flat true to shape, sound and free from flaws and other manufacturing defects. The top surface of the tiles shall be glazed. The under sides of the tiles shall be completely free from glaze in order that tile may adhere properly to the base. The edges of tiles shall preferably free from glazes if unavoidable, glaze shall be permissible on only one edge of the tile. The glaze shall be uniform in quality and shall be free from blisters crazing, welts, chips, crawling or other imperfections detracting from their appearance.

33.2 LAYING:

12mm thick plaster of cement mortar 1:3 (1 cement 3 coarse sand) or mix as specified shall be applied and allowed to harden. The plaster shall be roughened with the brushes. The back of tiles shall be buttered with a coat of gray cement slurry and edges with white be tamped and corrected to proper plane and lines. The tiles shall be set in required pattern and butt jointed. The joints shall be as fine as possible. Dado shall be truly horizontal and joints truly vertical except where otherwise indicated.

Dado shall rest on the top of flooring, where full size tiles cannot be fixed, these shall be cut (sawn) to the required size and their edges rubbed smooth.

34.1 CURING AND FINISHING

The joints shall be cleaned and flush pointed with white cement. The surface shall then be kept wet for 7 days.

After curing the surface shall be washed and finished clean. The finished work shall not sound hollow when tapped with a wooden mallet.

35. STEEL AND IRON WORK

35.1 STEEL WINDOW AND VENTILATORS

Steel windows and ventilators shall comply to IS 1039-1975, except with regard to sizes, which shall be as indicated and shall be of approved make.

35.2 FABRICATION

Frames: both fixed and opening frames shall be constructed of sections which have been cut to length and metered. The corner of fixed and opening frames shall be welded to form a solid fused welded joint. All frames shall be square and flat. The process of welding adopted may be flash butt welding or any other suitable method which complies with the requirements. Casements shall be fitted to their frames so as to provide continuous contact for the weathering on the inside and outside and shall be secured in close position by fittings which shall have been properly adjusted. Fixing lungs shall have a standard fitting which shall have been properly adjusted. Fixing lungs shall have a standard slot of 8mm width for MS screw of 6mm dia and 12mm long with square nuts.

35.3 SIDE HUNG SHUTTER

For fixing steel hinges, slots shall be cut in fixed frame and hinges inserted inside and welded to the frame. The hinges shall be projecting type and not less than 65mm and not more than 75mm wide. The hinge pin shall be of electro galvanized steel or suitable thickness where indicated, friction hinges shall be provided for side hung windows.

The handles for side hung shutters shall be of steel and shall be mounted on a steel handle plate. The handle shall have a two point nose which shall engage with a steel skirting plate on fixed frames in a slightly open position as well as in a fast position. The boss of the handle from dropping under its own weight and the assembly shall be so designed that the rotation of the handle may not cause it to unscrew from the pin. The skirting plate shall be so designed and fixed in such a position in relation that

with the latter bearing against its stop, there shall be adequate tight fit between the casement and the outer frame.

In case where non friction type hinges are provided the windows shall be fitted with peg stays which shall be of steel and shall be 300mm long with steel peg and locking bracket riveted or welded to the fixed frames. Side hung casement fitted with friction hinges shall not be provided with stays.

35.4 CENTRE HUNG VENTILATORS

Centre hung ventilators shall be hung on two pairs of brass cup pivots, riveted to the inner and outer frames of the ventilators to permit the ventilators to swing to an angle of approximately 85 deg. The opening portion of the ventilators shall be so balanced that it remains open at any desired angle under normal weather conditions. A brass spring catch shall be fitted in the centre of the top bar of the centre hung ventilator and shall close into a mixed steel or malleable iron catch plates.

35.5 FIXING OF STEEL DOORS, WINDOWS OR VENTILATORS

The fixing details and fixing procedure of steel doors, windows and ventilators shall be as described in IS 1081-1960 code of practice of fixing and glazing of metal doors, windows and ventilators.

35.6 ANGLE IRON DOOR FRAMES

Angle iron frames shall be made from mild steel angle sections of size as indicated. Steel shall be grade Fe 310-0 conforming to IS 1977-1975. The frames shall be fabricated in sections which have been cut and metered. The corners of the frames shall be but welded to form a true right angle. Requisite number of holes shall be made in the frame for fixing of fittings. Nuts shall be welded to the frames. Frames shall be fixed in masonry opening with lugs or any other arrangements indicated.

36. PANELLED, GLAZED OR PANELLED AND GLAZED SHUTTERS FOR DOORS WINDOWS AND CLERESTOREY WINDOWS :

36.1 GENERAL

The work shall be carried out as per detailed drawing. The wooden members shall be plained, smooth and accurate. They shall be cut to the exact shape and sizes without patching or plugging of any kind. Mouldings, rebates rounding's etc., shall be done as shown in the drawing, before the pieces are assembled into the shutter.

36.2 JOINERY WORKS:

The thickness of the styles and rails shall be as specified in the item of works. The minimum thickness of panel shall normally be 15mm where the clear width of panel is not more than 300mm, and 20mm, where the clear width of the panel is more that

300. However where the Engineer-in-charge so considers lesser thickness upto 12mm and 15, respectively may be allowed by him instead of 15mm and 20mm specified above. Solid wood panel for door and window shutters shall be made out of one or more strips of timber planks of not less than 125mm which, it is preferable to use strips of not more than 20mm width to reduce changes of warping, splitting or other defects. The timber strips shall be joined together with continuous tongued and grooved joints, glued together and reinforced with metal dowels. The groovings of the solid panel shall normally run along the longer dimension of the panel unless otherwise directed. The corners and edges of panel shall be finished as shown in the drawing and these shall be feather tongued into styles and rails. Sash bars shall have metered joints with the styles.

Plywood, Particle board, hard wood and asbestos sheet panel for doors, windows and destroy windows shutters shall conform to relevant Indian standard specifications (IS-1003 part I & II of 1966).

Styles and rails shall be properly and accurately mortised and tenoned. Rails which are more than 180mm in width shall have two tenons.

Styles and rails of shutters shall be made out of single piece. Lock and intermediate rails exceeding 200 mm in width may be made out of one or more pieces of timber but the width of each piece shall not be less than 75mm. Where more than one piece of timber is used, they shall be jointed with a continuous tongued and grooved joint glued together and reinforced with metal dowels (rust proof) at regular intervals of 20 cm or pinned with not less than three 40mm rust proof plus pins of the lost head type.

The tenons shall pass clear through styles. The styles and rails shall have a 12mm to receive the panel.

In case of double shutters the rebate at the closing junction of the two shutters shall be of depth not less than 2 cm.

Shutters shall not be patoned or otherwise treated before these are passed by the Engineer-in-charge and fixed in position.

37.0 GLAZING

37.1 SHEET GLASS:

Sheet glasses for glazing conform to IS-2835-1977 specifications for transparent sheet glass of selected quality (A) for glazing and shall be of 4mm thickness otherwise shown on drawings.

37.2 Pin head glass of 4mm thick shall be used in windows coming in toilets.

37.3 Sheet glass shall be flat, transparent and clear as judged by the naked eye. It may however possess a light tint when viewed edge wise. It shall be free from any crack or other defects.

37.4 PUTTY

Linseed oil putty for glazing in wooden and metal surrounds or frames shall conform to IS: 419-1967. Putty shall be homogenous paste and shall be free from dust, grit and other visible impurities. The putty after throve working in hand shall have good plastic quality without sliminess or stickiness.

37.5 SIZE OF GLASS

A clearance of 2.5mm between edge of glass and wood or metal surrounds shall be allowed. Each pane of glass shall be one who square; pieces shall not be allowed. Broken or damaged glass shall be hacked and replaced.

38. PAINTING

The colour painting shall be as approved by the Engineer. The contractor shall sue the 1st and best quality of respective type of paints. The contractor's rate shall also be deemed to include preparation of surfaces and application of primer as prescribed by the manufacturers if required to obtain the best finish of the painted surfaces. The contractor shall obtain the permission of the Engineer well in advance, the make/brand of paint that he will use in the work. He shall also submit sample thereof.

The contractor shall if so desired by the Engineer, produce certificates from the manufacturer or their representative to establish that the brands of paints used by him are of approved make paints shall be brought to the site in the manufacturer's drums with seals intact.

Paints used in priming coat, under coat and finishing coat shall be of the same manufacturers synthetic enamel paint shall be of superior grade and Ist quality of brand suitable for exterior weather conditions.

Surface to be painted shall be passed by the Engineer before each coat is applied. Each coat shall be of slightly varying shade (not applicable to white shade) and shall be accessed by the Engineer before next coat is applied.

38.1 PAINTING OF WOODEN SURFACES

Painting to wooden surfaces shall consist of the following.

38.2 PREPARING NEW SURFACES

All wooden surfaces shall be dry, free from dust, dirt or any other extraneous material and shall be smoothed with abrasive paper used across the grain prior to painting.

38.3 PRIMING

On cleaned prepared surface, a priming coat of paint shall be applied by brushing. Unless otherwise directed, the priming coat shall be applied before the wood works is fixed in position. In case there is already a primer coat but an unsatisfactory one it shall be rubbed to bare wood and surface reprimed.

38.4 FINISHING COAT

38.5 SYNTHETIC ENAMEL PAINT

(i)	British Paints	-	Luxol
(ii)	Jonson paints	-	Borolac
(iii)	Shalimar Paints	-	Superlac
(iv)	Nerolac Pints	-	Nerolac

38.6 PAINTING STEEL AND IRON WORK

38.7 PREPARATION OF NEW SURFACES

The surfaces shall be thoroughly cleaned of dirt, fluxing material, other foreign matter and scrapped thoroughly with hand scraper followed by wire brushing (First with coarse and then with fine wire brushes). The Surface shall then be wiped finally with mineral tarpenting to remove old grease and perspiration left by hand marks.

Surface already pretreated or primed in a factory shall be carefully inspected and damaged areas shall be thoroughly degreased and cleaned of all rust and touched up.

38.8 PRIMER COAT

Immediately after the preparation of the surfaces priming coat shall be applied by brush, working in the paint into the fine dents and ensuring a continuous film without runs and holidays.

38.9 FILLER COAT

After Primer coat is hard dry, the surface shall be rough sanded without scratching or in any way damaging the primer coat and the surface cleaned free from dust. Deep dents and scratches, if any, shall be filled with paste filler using a good putty knifs pressing firmly into the dents and applying in optimum layers, each layer shall be allowed to dry hard and then cut down by we rugger to a smooth finish.

38.10 UNDER COATING

An optimum coat of under coating shall be supplied by brush. The film shall be allowed to hard dry, wet rubbed and cut down to smooth finish ensuring that at no place the under coat is completely removed.

39.0 FRENCH POLISH

39.1 PREPARATION OF SURFACE

All unevenness shall be rubbed down to smoothness with sand paper and the surface shall be well dusted. The pores in the wood shall be filled up with a filler made of a paste of whiting in water or methylated spirit (with a suitable pigment like burnt sienna or umber; if required) otherwise the French polish will get absorbed and a glazy look with be difficult to obtain.

39.2 APPLICATION OF POLISH:

A pad of woollen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with polish and rubbed hard on the surface in a series of overlapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil on the face of the pad may be added which shall facilitate this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. In finish off, the pad shall be covered with fresh piece of clean fine cloth, slightly damaged with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall present a uniform texture and high gloss.

40.0 MEASUREMENTS

Area of uneven surfaces shall be converted into equivalent plain areas in accordance with following for the purpose of payment wherever lump sum contract is provided in the agreement, which covered this items shall not be measured and paid separately.

41.0 DISTEMPERING WITH DRY DISTEMPER

Dry Distemper of required colour and shade shall be obtained ready mixed conforming to IS.427=1965. Dry distemper shall be in the form of fine dry homogeneous powder free from odour of pure faction as such and when mixed with water.

No finish shall be executed until a sample of the finish to the required colour and shade has been approved by the Engineer. Each coat shall be approved by the Engineer before subsequent coat is applied.

The colour shall be of even shade over the whole surface, if it is patchy or otherwise badly applied, the work shall be redone by the contractor at his own expenses.

41.1 PREPARATION OF NEW SURRFACE

The surface shall be thoroughly cleaned of dust, dirt, efflorescence, chalking, grease, mortar drops and other foreign matter. The surface shall be sand papered with grade-1 abrasive paper and dust off to achieve even and smooth surface. If surface so obtained

is uneven, it shall be brought to perfectly even surface applying putty and allowing it to dry completely and then it shall be rubbed with the abrasive paper and dusted off.

41.2 PRIMING COAT

For distempering with dry distemper, priming coat of whiting shall be given. Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a thin slurry which shall than be screened through a clean, coarse cloth. Two kg. of gum and 0.4 kg of copper sulphate dissolved separately in hot water shall be added for every cubic metre of slurry which shall then be diluted with water to the consistency of milk so as to make a wash ready for use.

41.3 PREPARATION OF DISTEMPER

The dry distemper shall be added to clean water and stirred slowly using 0.6 litres of water per kg. of distemper or proportion as specified by the manufacturer, warm water shall preferably be used. The mixture shall be allowed to stand for at least 30 minutes before use. The mixture shall be allowed to stand for at least 30 minutes before use. The mixture shall be well stirred before application to maintain an even consistency.

41.4 APPLICATION OF DISTEMPER

The surface of priming coat, where applied shall be lightly prepared taking care not to rub out priming coat and then dusted off. Specific number of coats of distemper shall then be applied with proper distemper brushes in horizontal strokes immediately followed by vertical once which together shall constitute one coat. The subsequent coat shall be applied only after the preceding coat has dried. The finished surface shall be even and uniform without patches, brush marks distemper drops etc.

42.0 LIST OF MANDATORY TEST

The following mandatory tests will have to be carried out during the course of contract by the contractor without claiming extra on account of any reason/ reasons.

S. No.	Clause CPWD Vol. I & II	Test	Field laboratory Test	Test Procedure	Minimum quantity of Material/ Works for carrying out the test	Frequency of testing
1	3.3.3.3 to 3.4.5.4	Chemical Physical Properties of lime	Laboratory	IS.6932 (Part I to X 1973)	SMT of Lime	10 M.T or Part thereof as decided by the Engineer-in-charge
2.	3.1.5.1	a) Silt Content	Field	Appendix D Page 72 of (C.P.W.D. Specification Vol. 1, 77) Typical	20 Cum	Every 20 Cm or part thereof or more frequently as decided by the Engineer-in-charge
3.	3.1.5.1	b) Particle size distribution	Field or Lab Test as decided by the Engineer-in-charge	Appendix G page 71 of CPWD Specification typical	40 Cum	Every 40 Cum of sand required in RCC work only
4.	3.3.1 and 3.3.2	c) Bulking sand	Field	Appendix G page 76 of CPWD Specification typical)	20 Cum	Every 20 Cum of sand required in RCC work only.
5.	4.1.2.1	a) Percent-age of soft or deleterious materials	Field	19.2.386 part II 1963		As required by Engineer-in-charge
6.	4.2.2.5	b) Particle size distribution	Field or Lab	Appendix A page 90 of CPWD Specification typical	45 Cum	For every 4 Cum or part thereof Required only. For rest of the item on decided by the Engineer-in-charge
7.	4.1.2.5	c) 10% fine Value	Lab Test	Appendix C page 92	45 Cum	Initial test subsequent test as & when required by Engineer-in-

						charge
8.	4.3.3	Slump test	Field	Appendix D Page 94 of CPWD Specification Typical		Once a day
9.	5.4.9.1	Cube Strength	Lab	Appendix A Page 113 of CPWD Specification Typical	a) 20 Cum in slab beams & connected columns b) 5 Cum in columns Note: For all other small RCC items and where RCC done in a day is less than 5 Cum. Test will be carried out as required by the Engineer-in-charge	a) Ever 20 Cum of a day's concreting. b) Every 5 Cum.
10	6.1.3 to 6.1.6	Testing of bricks for a)Dimension	Field/Lab	Appendix A page 131 of CPWD Specification on typical Appendix C & D	Best locally available brick but not less than designation 35	For every one lac bricks or part thereof.
		b) Water absorption & efflorescence	Lab	Page 133 & 134 of CPWD specification (typical)	-do-	One test per source of manufacturer
		c) Compressive strength	Lab	Appendix D page 132 of specification (typical)	-do	Two tests for first lot of one lacs bricks & test for every subsequent lot.

11.	Brick Tiles	Testing of brick tiles for a)Compressive strength, water absorption dimension b) Water efflorescence	Lab Lab	Appendix A,B & C page 131, 132 & 133 of CPWD Specification (typical_ Appendix D Page 134 of CPWD specification (typical)	50,000 Nos. brick tiles of designation 100	For every 50,000 or part thereof One test per source of manufacturer
12	8.3 (Table 2)	a)Molisture Absorption b) Mhosscale harness test	Lab	IS:1124-1974	Cost of marble work Rs.10,000	Rs.10,000/- or part thereof if required by the Engineer-in- charge
13.	9.1.6	Moisture content	Field (by moisture meter)Lab test in case of dispute as required by Engineer-in- charge	Appendix A page 196 of CPWD specification (typical)	1 Cum	Every one cum or part thereof.
14	9.8	a)End Immersion test. b)Knif test c)Adhesion	Lab	IS:2002 part-I 1973	26 Shutters	As per Sampling & test specified in clause 9.8.3 (of CPWD specification Vol. II 77)
15	9.2.3	Thickness of anodized coating	Lab	IS:5523-1969	If the cost of fittings excess Rs.5000/-	Rs.5000/- or part thereof if required by the Engineer-in- charge
16.	9.23.12	Testing of Spring	Lab	Clause 9.23.12.2	50 Nos.	100 or part thereof.
17.	10.1.1	Appendix A Page 226 a) Tnsile strength b) Bend Test	Lab	IS: 1599-1974	40 tonnes	Every 20 tonnes or part thereof.
18.	11.16.1 and	a)Water absorption	Lab	IS:777-1970	3000 Nos.	3000 Nos. or part thereof.

	11.17.1	b)Crazing test c) Impact strength test				

SPECIFICATION FOR PLUMBING WORKS

43.0 SPECIFICATION

43.1 GENERAL

All works shall be completely concealed either with in shafts or chess or in floor fills dropped ceilings unless specifically shown in drawings or required otherwise.

All work shall be adequately protected, to the satisfaction of the Engineer so that the whole work is free from damage throughout the period of construction up to the time of handing over.

No work shall be covered without approval of the Engineer.

The Contractor shall be responsible for coordinating this with works of other trades sufficiently ahead of time to avoid unnecessary hold-ups. Hangers, sleeves, recesses, etc. shall be left in time as the work proceeds whether or not these are shown in drawings.

All works shall be done with skilled workman, experienced in the trade.

All materials and equip0ments shall be ISI marked unless no IS Code exists for any particular material to be used for the project. All material shall be got approved from the Engineer-in- charge prior to use at the above project. The contractor shall submit samples and technical literature of proposed material to the Engineer-in- charge and would obtain written approval well in advance. Approval list of material make for general guidance to the contractor, but would be up to Engineer-in- charge to accept or reject the material if found wanting up to requirement. Specific equipment and model approval have to be obtained from the Engineer-in- charge. Any item which is proposed as a substitute, shall be accompanied by all 'technical data' giving sizes, particulars of materials and the manufacturer's name. At the time of submission of proposed substitute, the Contractor shall state the credit if any due to the owner in the event substitutions shall be requested in the writing from the Engineer-in- charge, where no specific make of material is specified.

43.2 PIPING

a) Pipes for suction and delivery line shall be galvanized steel tubes to IS:1239 (medium class). Fittings and flanges shall be malleable. Pipes shall be ITC or BST make & C.I. fittings 'R' brand.

b) Full way and check valve above 65 mm dia shall be C.I. double flanged confirming to IS:780 manufactured by Kirloskar Kilburn, IVC or Leaders.

c) Full way and checked valves 65 mm dia below shall be gun metal tested to 20 Kg/cm' pressure (Leader or GG Make) certified and confirming up IS : 778.

43.3 JOINTS

All G.I. Pipes and fittings shall be provided with screw joints unless otherwise instructed.

44 TESTING

44.1 All G.I. pipes shall be tested by hydrostatically for a period of 30 minutes to a pressure of 6kg/cm^2 without drop of a pressure.

44.2 All sanitary ware and fittings shall confirm to I.S. standards and of approved manufacturer. The contractor shall submit samples of all fittings and fixtures proposed to be used or equivalent to approved manufacture to the Engineer for his approval. The approved samples shall remain with the Engineer till the completion of the work.

44.3 All workmanship shall confirm to Indian standard Codes of Practice, latest of CPWD specifications. The fixing and finishing shall be neat, true to level and plumb. Manufacturer's instructions shall be followed closely regarding installation and commissioning. All fixtures shall be protected throughout the progress of the work from damage. Special care shall be taken to prevent damage and scratching of fittings. Tool marks on exposed fixtures shall not be accepted. Protective paper on fixture shall be removed without water only at the final completion of work.

45 WATER SUPPLY WORKS, DRAINAGE AND SANITARY INSTALLATION

All works related with supply, installation and commissioning of sanitary installations, water supply system and drainage system shall be carried out as per Central Public Works Department (CPWD) Specifications No. 77(Vol.Two) Chapter 18, 19 & 20 respectively. Wherever these specifications are found wanting, the decision of the Engineer shall be final and binding.

46 OVERHEAD TANKS

The overhead tank shall be one piece moulded high density polyethylene (HDPE)/Prestress steel tank with all inlets, outlets over flow and scour pipe with painted M.S. Frame support or concrete pedestal including all pipe work and inter connection as required and directed by the Engineer. The tanks shall be manufactured by Sintex t Container or approved equivalent. (Pressed steel).

47 WATER HEATERS:

Water heaters shall be automatic pressure type water heater (with pressure release valve) with heavy gauge copper container duly tinned, thermostats, Indicator lamp

and glass wool insulation. The water heater shall be fitted with pressure release valve, non-return valve and outlet stop valves as required.

48.0 OTHERS:

1) Providing / fixing full way wheel valve of various sizes as per drag & direction of site-in-charge.
2) P/F towel rail & soap dish of stainless steel approved quality as per drag.
3) P/L of sewerage line from the outlet of the building to the inlet of septic tank with SW pipe of 100/150 mm size with necessary manhole chambers etc as per CPWD specification. The SW pipe should be jointed with cement mortar and necessary fittings as per specification & direction of Engineer-in- charge.
4) P/L of water supply line as per site Condition from PVC water tank to main supply line with GI pipe of 32mm dia from main line to bottom of the building and with 25mm dia from bottom of building to PVC tank at top with necessary wheel valve. Inspection chambers, reducer / sockets as per the drawing and CPWD specification.

49.0 PLANT AND EQUIPMENT (External Water Supply)

a. Water supply pumps shall be single stage Horizontal centrifugal pumps, centre line discharge volute delivery casting unit closed balanced bronze impeller, stainless steel shaft, grease or oil lubricated heavy duty ball bearing suitable for direct drive to a TEFC electric motor. Each pump shall be capable of operating within performance pressure characteristics range sufficiently below and above the required working pressure.
b. Pump and motor shall be mounted on a common M.S. structural or base Plate.
c. Each pump shall be provided with a totally enclosed fan cooled induction motor of H.P. and R.P.M. specified with schedule of quantities.
d. Each pumping set shall be provided with a Gun Metal “Bourden” type pressure gauge with gun metal isolator cock and connecting piping.
e. Provide vibration climinating pads appropriate for each pump.

50.0 LEVEL CONTROLLER

Contractor shall provide and install low voltage transistorized level controllers, as specified below each level controller shall be provided with required number of Alarm for low water level in underground tank.

51 DOMESTIC WATER SUPPLY PUMP

To cut off duty pumps on low water level in underground water tank and to start pump at low water level and stop pump at high water level in overhead tanks.

52.0 PRE-COMMISSIONING

a. All piping accessories and pumping sets have to be completely installed and tested.

b. The electrical connection has been made and direction of motor rotation checked.

c. Water supply available in adequate quantities in the underground tank.

53.0 COMMISSIONING

Commissioning of the system shall commence only after

a. On completion of all related work given above, start pumping set and check if it start and stop at present level of liquid level controller.

b. Sump pump shall be tested by filling the same with water for automatic operation.

SPECIFICATION FOR ELECTRICAL WORKS

The Electrical installation work shall be carried out in accordance with Indian Standard code of practice for Electrical Wiring Installation IS 732-1963 and IS: 2274-1963. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the local electric supply authority and fire insurance regulations in so far as these become applicable to the installation electrical work in general shall carried out as per following (PWT) specifications. General Specification of Electrical works (Part-I – Internal) 2005General Specifications of Electrical works (Part-II – External) – 1974

Whenever this specifications calls for a higher standard of materials and or workmanship than those required by any of the above mentioned regulation and specification, then the specification here under shall take precedence over the said regulation and standards.

1.0 DISTRIBUTION BOARD

Distribution board shall be of the 500 V metal type with lockable hinged doors suitable for flush installation as required. All distribution boards shall be of three phase of single phase type with isolator or shown on the drawings. Distribution boards shall contain plug in or pin type miniature circuit breaker mounted on busbars. Miniature circuit breakers shall be quick made, quick break type with trip free mechanism they shall have thermal & magnetic short circuit protection MCBs shall confirm with IS 8828-1988.Neutral bus bars shall be provided with the same number of terminals as there are single ways on the board, in addition to the terminals for incoming mains. As earth bar or similar size to the neutral bard shall also be provided, phase barrier shall be fitted and all live parts shall be screened for the front. Ample clearance shall be provided between all live metal and the earth case and adequate space for all incoming and outgoing cables. All distribution board panels' enclosures light gray. A circuit identification card within clear plastic as with metal frame shall be provided within each distribution board.

Miniature circuit breakers for lighting circuits shall be of "L" series whereas the circuits feeding Equipment machinery shall of G series (Motor Circuit) types.

1.1 L.T. SWITCHGEAR

L.T.PANELS

CONSTRUCTION FEATURES

Motor control center (MCC)/power control center (PCC) the MCC/PCC shall comprise of all the switchgear as detailed in bills of quantities and drawings. All the switch gears including the bus-bar chamber on the same board shall be of the same manufacturer for facility of interchange ability bus-bar chamber shall be made of sheet steel of thickness not less than 2mm with detachable covers on all sides. The joints should be continuous welded the detachable cover shall be secured to the box with sufficient number of cadmium plated iron screw to ensure dust tightness.

Bus bar chamber of size upto 90 cm shall have detachable end cover so that the same can be extended.

Bus-bar shall be made of wrought aluminium alloy or electrolytic copper grade 91 as the case may be of sufficient cross section so that a current density 100 amps/sq.cm in case of aluminium and 150 amps/sq.cm in case of copper is not exceeded at nominal rating. The cross section of neutral bus bar will be the same as that of the phase bus bar of capacity upto 200 amps. The bus bars should be suitably insulated with the heat shrinkable PVC sleeving and colour coded. Connections to bus bars shall be made by the bolting arrangements by the aluminium alloy or the forged brass nuts and bolts. Ensuring that the current density of the bus bars at the point of connection does not exceed permissible limit and there is no heat due to bimetallic contact.

Minimum clearance between bus bar throughout the panel shall be 32mm between phase and 25mm between phases to earth. Danger plate of approved shape and size be provided on each switch board without any extra charge.

The bus bars shall be supported on DMC/SMC and shall be rated for a fault level of 50 Kasecond. The temperature rise at full load shall not exceed 45 deg. above ambient.

MCC panel shall be floor mounted, compartmentalized in the cubicle pattern fabricated out of 14 SWG sheet. The base shall be of ISMC 75 of 5mm thick. Removable gland plates shall be of 3mm thick sheet and galvanized. The size of the gland plate shall be sufficient to ensure that all cable size designed are accommodated. In addition 25% spare space shall be left blank to receive future cables. The contractor shall submit the drawings for the gland plates also showing all the glands in position and 25% spare space. The gland plate shall have a gasket sheet

on all four sides so that the panel remains vermin proof. The panel shall be in 54 enclosures. There shall be spare space of 25% in the panel for future expansion. The height of panel shall be limited to 2200 mm including the base channel.

The depth of front access panel shall be minimum 400 mm and that of rear access panel minimum 1500 mm.

1.2 SELECTIONS OF COMPONENTS IN MCC

Contractor shall use only one make of component only for ease in maintenance and interchange ability. The rating of other components i.e. conductors, fuse, circuit breaker over load relay. Single phasing preventer etc. shall be as recommended in these specifications.

1.3 SELECTION OF CABLES/WIRES:

The size of cables and wires for individual connection to outgoing MCCB/SFU/Isolator shall be suitably rated above 10 amps. Solid links shall be used.

All power wiring shall be carried out with 650/1100 volt grade PVC insulated aluminium conductor cable/wire size for starting current and continuous rating of motors after applying derating factor.

1.4 CABLE COMPARTMENTS

Cable compartment of minimum size 400 x 400mm shall be provided in the boards for termination of all incoming and outgoing cable entering from bottom or top adequate supports shall be provided in cable compartment to support cables. All incoming and outgoing switch terminal shall be brought out to the spring loaded terminal blocks in cable compartments and identified accordingly.

The minimum size of terminals for power wiring shall be 10 Sqm.

No cable, however small, shall be terminated on the switch/Isolator/MCCB/ Conductor/Relay under any circumstances.

1.5 METERS AND INDICATIONS

All meters shall be housed in a separate compartment and accessible from front only lockable doors shall be provided or the metering compartment all switches conductor push buttons. Push button stations indicating lamps shall be distinctly marked with a small description of the service.

1.6 PAINTING

Entire sheet metal works shall undergo seven tank process including passivating. Sprayed with a high corrosive resistant primer and baked in oven. The finishing treatment shall be of two coats of synthetic enamel paint of approved colour.

Decreasing	:	Connection of chemical	:	5%-7%-40 deg.c
Derusting	:	Connection of chemical	:	25%
Phosphtising	:	Connection of chemical	:	3.5% 40-50 deg.c
Passivation	:	Connection of chemical	:	2.05%-0/1%-60-70Deg.C

Two coats of zinc chromatic primer should be applied after the above processing before surface is to be given a coat of surface and baked in oven.

1.7 TESTING

All switch board shall be tested at manufactures works. The test certificates shall be got approved before dispatch of switch boards to site.

1.8 INSTRUMENT COMPARTMENT

All instruments shall be flush mounted 144mm suitably sealed. Instrument chamber should have sufficient space. Indicating lamps should have minimum 50mm gap0 between them. They shall be accessible for testing and maintenance without any danger of accident and contact with live parts of circuit's breaker and bus bar.

1.9 CONTROL CABLES AND TERMINALS

All control wiring shall be with minimum area of 1.5 sq.mm copper conductor. These shall be ferruled coded and identified at both ends as per IS specification. A horizontal wire way shall be provided along the length of panel for taking the control wiring from one section to another. Control wiring when terminated, shall be terminated on the terminal block and identified for the duties to be performed. Each terminal shall be separately identified. Minimum 10% spare terminals shall be provided on every terminal block.

All power wiring shall be carried out with 650/1100 volt grade PVC insulated aluminium conductor cable/wires sizes for starting current and continuous rating of motors after applying derating factor.

1.10 MOULDED CASE CIRCUIT BREAKERS

1.11 APPLICATION STANDARDS

Unless otherwise stipulated in the specification, the moulded case circuit breakers shall comply with latest version of IS: 2516 (Part I & II).

1.12 CONSTRUCTION

Construction shall comprise a switching mechanism, contract system, an arc extinguishing device and a tripping unit contained in compact moulded case end covers. The operating mechanism shall be quick made and quick break and trip free and shall have rotary handle. It shall be independent of speed of manual operation. A separate issuable neutral link shall be provided to all three phase MCCB without

exception, alternatively four pole MCCB should be provided for motor protection suitable MCCB should be mounted vertically in the panels.

1.14 ARC EXTINGUISHING DEVICE

A series of grid plates will be mounted in parallel between supports of insulting material. The profile of de-ion steel plates shall extend directly over the contacts and draw the arc away from the moving contacts up into the divider chamber. The art will thus be confined, divided and extinguished.

1.15 TRIPPING SYSTEM

The tripping system of moulded case circuit breaker shall be of thermal magnetic or full magnetic type for overload and short circuit protection the tripping device shall be calibrated for applications at ambient temperature 40 deg. C. For ambient temperature higher/lower, temperature compensation will be applicable.

1.16 POSITIVE INDICATION

The handle position should give positive indication of whether the MCCB is on (top) off (down) or tripped (in between).

1.17 RATED SHORT CIRCUIT BREAKING CURRENT

The maximum rated short circuit breaking current of the MCCB shall be as per fault current requirement. However, MCCB’s shall not require any back up protection fuses.

NEAT MANNER

2. MEASURING INSTRUMENTS

2.1 GENERAL

Direct reading electrical instruments shall be in conformity with IEC-51, BS:89 or IS:1248. The accuracy of direct reading shall be 1.0 for volt meters and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5 the meters shall be suitable for continuous operation between 10 deg. C and 50 deg. C. All meters shall be of flush mounting type with square pattern the meter shall be enclosed in a dust light housing, the meters shall be provided with white dials and black scale markings. The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside.

2.2 AMMETERS

Ammeters shall be of moving iron type. The moving part assembly shall be with jewel bearing. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibration and shocks. The ammeters shall be manufactured and calibrated as per the latest edition of IS: 1248 or BS 89. Ammeters shall be instrument

transformer operated and shall be suitable for 5 amp secondary and up to 30 amps. The ammeter shall be direct operated without current transformer on one phase only. Beyond 30 amps the ammeter shall be operated with selector switch.

2.3. VOLTMETERS

Voltmeter shall be of moving iron type. The range for 400 volts 3 phase voltmeters shall be 0 to 500 volts. The voltmeter shall be provided with protection fuse of suitable capacity.

2.4 WATTMETER, POWER FACTOR METER

WATTMETER

Wattmeters shall be of 3 phase electrodynamics type. Suitable for use with current and potential transformers associated with the particular panel. Wattmeter shall provide with a maximum demand indicator.

2.5 TESTS

The MCCB shall be tested as per IS: 2516 (Part-I & II) and the relevant test certificates shall be provided.

3.0 INSTRUMENTS

GENERAL

The specifications hereinafter laid down shall cover all the meters and instruments.

4.0 INSTRUMENT TRANSFORMERS

4.1 CURRENT TRANSFORMERS

Current transformers shall be in conformity with IS: 2705 (Part I, II, III & IV) in all respects. All current transformers used for medium voltage applications shall be rated for 1 KV. However the rated secondary current shall be 5A unless otherwise specified the acceptable minimum class of various applications shall be as given below:

Measuring : Class 0.5 to 1

Protection : Class 10 p

Current transformers shall be capable of withstanding without damage, the magnetic and thermal stresses due to short circuit fault of 35 MVA on medium voltage system. Terminals of the current transformers shall be marked permanently for easy identification of poles. Current transformers shall be provided with earthing terminals for earthing. Chassis, frame work and fixed part of the metal casing (if any), each CT shall be provided with rating plate indicating the following:

i) Name and make

ii) Serial number

iii) Transformation ratio

iv) Rated burden

v) Rated voltage

vi) Accuracy class

Current transformers shall be mounted such that they are easily accessible for inspection, maintenance and replacement. The wiring for CTS shall be copper conductor PVC insulated wires with proper termination lugs and wiring shall be bunched with cable straps and fixed to the panel structure in A.

5.0 ONLOAD CHANGE OVER SWITCH

The switch shall consist of two switches coupled by a common foolproof interlock mechanism. Each switch can be individually switched off; only one can be switched on at a time.

FEATURES

1. Four pole, front operated on load switching
2. Quick make and quick break mechanism
3. Two breaks per pole
4. Flat extended terminal for ease of bus/cable connection
5. Clear on / off indication
6. Common copper terminal with individual epoxy supports

The switch should conform to IS 13947-1993. Its electrical characteristics shall be rated duly uninterrupted rated making and breaking capacity as per AC 23 A for rating upto 630 AMPS and AC 22 A for 800 AMPS. Fused short circuit rating shall be 50 KA 9rms) and 120 KA (peak) at 415 volts and 0.12 pf.

6.0 INTERNAL WORKS

i) Internal wiring

ii) System of wiring

The system of wiring shall consists of single core PVC insulated copper conductor wires in PVC conduits concealed as called for :

7.0 GENERAL

Prior to laying and fixing of conduits the contractor shall carefully examine the drawings indicating the location of, various lighting arrangements. The agency should satisfy about the sufficiency of number and size of conductors, location of switch boxes and other relevant details.

8.0 MATERIAL

All materials shall be of ISI marked carrying licence number allotted by BIS and CPWD approved. The owner shall be at liberty to get any material tested at

government's laboratories at contractor's cost without being questioned by the contractor.

9.0 SWITCH OUTLET & JUNCTION BOXES

All outlets for switch and other receptacles shall be equipped with rust proof outlet boxes of MS as called for having external and internal surface true to finish. Where called for outlet boxes for receiving switches and fan regulators shall be fabricated to approve sizes and covered with white urea powder pressed cover plate. All boxes shall have adequate number of knock out holes of required diameters and an earthing terminal screw. The junction boxes and switch/sockets outlet boxes shall be provided with white urea powder pressed cover plate secured to the box with brass countersunk screws. Outlets exposed to the weather shall be fully weather tight, complete with rubber gasket covers, glass where used shall be heat resistant.

10.0 TELEPHONE SYSTEM

Conduits, junction boxes draw boxes, outlet boxes and covers for telephone system shall be at least 150mm away from the electrical conduits.

11.0 CONDUCTOR

All PVC insulated copper conductor wires shall be ISI marked.

12.0 SWITCHES

All 5/15 Amp switches shall be Piano type of 250 V AC grade. The switch controlling the light or fan shall be located at 1200 mm above finished floor level unless otherwise indicated.

All 5 AMP and 15 AMP 3 pin socket outlets where on the drawing shall be switched and 3 pin type the sockets shall be erected approximately 150 mm above floor level unless otherwise directed.

The switch controlling the point outlets and socket shall be on the dphase wire of the circuit. The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

13.0 LIGHT FIXTURES:

The light fixtures and fans shall be assembled and installed in position complete and ready for service in accordance with the detailed drawings, manufacturer's instructions and to the satisfaction of the consultant/Engineer-in-charge.

All ceiling fans shall be provided with suspension arrangements in the concrete slab/roof members. It is the duty of the contractor to make these provisions at the appropriate stage of construction. Exhaust fans shall be fixed at location shown on the drawings. They shall be wired to a plug socket at a convenient location near the fan.

All switch and outlet boxes, fan and light fittings shall be bonded to earth through connector blocks.

Distribution boards for light and power distribution boards shall be suitable for 415 volts, 3 phase AC system or 230 volt single phase system as required. Distribution boards shall confirm to IS: 2675.

The distribution boards for light and power shall be enclosed dead front, double door type. The enclosure shall be made of best quality sheet steel 16 SWG. The sheet steel shall be treated in seven, tank process. The board shall be stove enamelled to gray colour. The inside surface shall be of white colour.

Suitable copper bus bar of adequate size of high conductivity shall be mounted on non hygroscopic insulating supports.

All the live parts shall be shrouded to avoid accidental contact. End of bus bars shall be shrouded.

The distribution board shall have separately terminal blocks for incoming and outgoing cable/wires. Each shall termite on separate terminal, separate terminal block shall be provided for neutral (rating equal to phase rating) and earth. The terminal block for earth shall be of the same size that of neutral.

The distribution boards have a complete directory of circuits with circuit numbers and areas marked on it while terminating the cables/wires in the distribution board. The same circuit numbers should be inserted on the form of ferrules in the wires.

The distribution boards shall be surface or recess as required at site at the locations marked on the drawings. The board shall be fixed with suitable angles, iron clamps and bolts cables. Conduits shall be properly terminated using glands/grips/check nuts etc.

Distribution board shall be tested at factory as per IS 2675. The distribution boards shall be tested for insulation resistance after erection.

14.0 MINATURE CIRCUIT BREAKER (MCB)

MCBs shall be quick make and break type and shall confirm to relevant Indian Standards. The housing shall be heat resistant and having high impact strength. MCBs shall be flush mounted with trip free manual operating lever on and off indication, the contacts shall be provided to quench the arc immediately. MCBs shall be provided with magnetic thermal release for overload and short circuit protections. Both the protections shall have a common trip bar.

15. EARTHING

15.1 GENERAL

All non current carrying metal parts of the electrical installation shall be earthed s per IS 3043. All metal conduits, trunking cable, sheathes switchgear, distribution boards meters, light fixture, fans and all other metal parts forming parts of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall meet the requirement of IER 1956.

16.0 SPECIAL CONDITION

All electrical work shall be carried out in compliance with specifications given here under in this section and in compliance with Indian Electricity Act/CPWD and rules in force; the work shall also conform to any special requirement of local state electricity board or local electricity Supply Company.

The work shall be executed as per CPWD specification.

17.0 Unless otherwise stated in the conditions of the contact samples of all materials fittings and fixtures to be supplied by the contractor shall be submitted to Engineer-in-charge for his approval. The contractor shall not commence the work until the samples are approved in writing by Engineer-in-charge. The contractor shall ensure that all the materials incorporated in the work are identical in all respects with the approved samples. All samples not destroyed in testing shall be returned to the contractor after completion of the contract. No payment shall be made for samples destroyed in testing.

18.0 All materials, fittings and fixtures used in electrical works shall confirm to the Indian Standard Specifications whatever exit. In case of materials for which Indian standard specification do not exist, the materials shall be approved by Engineer-in-charge. All materials shall be new, soundly and strongly made robust in construction and well finished.

19.0 All electrical work shall be tested by the contractor in accordance with the prescribed test in the presence of the Engineer-in-charge the results of such test shall be recorded and signed by the contractor and his electrical supervisor and the Engineer-in-charge. The contractor shall ensure that the test results are satisfactory and are in conformity with the standard test results, accepted for such works. If there is any variation in test results, the decision of Engineer-in-charge regarding acceptance of the works shall be final and binding. The reports shall be submitted (in triplicate) in the form as approved by the Engineer-in-charge. Any installation/work which fails in the test shall be replaced by the contractor at his own cost.

20.0 SITE

The contractor shall visit the site of the work and shall satisfy himself also the conditions under which the work is to be performed, he shall also, check and ascertain the location of any existing structures or equipment or any other situation which may affect the work no claim made in ignorance or misunderstanding of site conditions on account of grounds of insufficient description shall be allowed at a later date.

21.0 MATERIAL & WORKMANSHIP

All material sued in the electrical installations shall be of the best quality obtainable and of approved manufacturer and shall confirm to the latest Indian standards specifications.

The owner shall have full powers to get the material or workmanship etc. inspected and tested by the independent agency at the contractor's expense in order to ascertain their soundness and adequacy.

22.0 DRAWINGS AND SPECIFICATIONS

Drawings indicated the extent and general layout of equipments etc. Any changes found essential to coordinate installation of this work with others shall be made without any extra claims.

The quantities given in the schedule of quantities price schedule are as exact as could be secured and their complete accuracy is not guaranteed. The contractor shall be responsible to check and ascertain the exact location of all the all equipment as well as the routes and length of all cables etc.

Prior to the installation of all switchgear/panels and laying of cables the contractor shall discuss with the Engineer-in-charge, the layout and route he proposes to take and obtain the owners concurrence to the same. He shall submit adequate sets of drawings for switchgear and get it approved from owner before commencing execution of the job.

23.0 CABLES

23.1 Contractor shall provide all power and control cables from the motor control center to various motors level controllers and other control devices.

23.2 Cable shall confirm to IS 1554 and carry ISI mark.

23.3 Wiring cables shall confirm to IS 694

23.4 All power and wiring cables shall be aluminium conductor PVC insulated armoured and PVC sheathed of 1100 volts grade.

23.5 All control cables shall be copper PVC insulated armoured and PVC sheathed 100 Volts grade.

23.6 All cables shall be standard conductors. The cables shall be in drums as far as possible and bear manufacturers name.

23.7 All cable joints shall be made in an approved manner as per standard practice.

23.8 Wherever underground cables are to be laid, cable indicator at specified interval as per IS/State Electricity Deptt. Shall be provided.

24.0 CABLE TRAYS

(a) Contractor shall provide MS slotted cable trays, at locations as shown on the drawings and of sizes as given in the schedule of quantities.

Mass product of a reputed manufacturer may be used provided it confirm to the requirements of these specifications.

The drawings are diagrammatic only. These shall be followed as closely as actual construction will permit. If any deviation from drawings are found essential, the contractor shall at no extra cost prepare drawings showing the revised proposals and submit the same to the Engineer for approval, only when approved, the work shall proceed.

Before the work is handed over, the contractor shall clean all fixtures removing all plastic stickers, rust stain and other foreign matter of discolouration of fixtures, leaving every part in acceptable condition and ready for use to the satisfaction to the Engineer.