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भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

NOTICE INVITING TENDER (NIT)

Volume – 3

TECHNICAL SPECIFICATIONS -

CIVIL WORKS

Name of the work: Construction of precast 2Nos Faculty Housing Tower (G+12), 3Nos Staff Housing Towers (G+12) and 3Nos Hostel Blocks (G+6) RCC Structures at IIT Hyderabad, Kandi, Sangareddy.

Executive Engineer (Civil)
IIT Hyderabad

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SCOPE OF WORK & TECHNICAL SPECIFICATIONS

[1] Construction of Faculty Housing Towers (G+12) – *Tower FT1A (Type – C) G+12 Floors and Construction of Faculty Housing – Tower FT1B (Type – C) G+12 Floors at IITH.*

Construction of 2 Nos of Faculty Housing towers of 12 storied (G+12), 6 Flats per Floor with Plinth area of 17,090.89 Sqm for each tower. (For 2 Faculty towers plinth area shall be: 2x17090.89 = 34,181.78 Sqm) and plinth height minimum of 450 mm. Floor to Floor Height is 3.2 m for all floors except Terrace Floor. For Terrace floor, Floor to Floor height is 3.3 m and for stilt floor, Floor to floor height is 4.2m. Conceptual Drawings for the above Faculty Towers are attached

"Plinth Area" shall have the meaning as given in IS: 3861.

MINIMUM SPECIFICATIONS FOR PRECAST FACULTY TOWERS

Sl. No.	Items of Work	Specifications
1.	**Building structure**	
1.1	Precast Foundation & Super structure	The whole structure shall be of Reinforced Cement Concrete (RCC) structure made of Precast elements comprising of suitable foundation system, Beam & Columns System or solid core walls system and solid core slabs, staircases etc., retaining wall required depth shall be provided at up to Stilt Plinth level to retain the over burden soil. As per Structural design & approved drawings, building shall be earthquake resistant for the zone of location. Pre cast structure with suitable foundation system shall be designed as per the detailed soil investigation report & design or as per the design if Column & Beam system. The precast structure should be designed with solid core walls (150 mm minimum thickness or as per design, whichever is more) and Solid core for slab (125 mm minimum thickness or as per design, whichever is more). The scope includes Construction of Terrace Water Tanks, Staircase Head room, Parapet Walls, Closing of Service Shafts and Pedestals for all service lines and Solar panels for hot water system as per the approved Drawings and as per the directions of Engineer in Charge. For Toilet Block: where ever required, ledge walls of suitable thickness abutting the RCC solid core walls may be constructed using CC Solid blocks to run the concealed plumbing lines & flush tanks.

1.2	Precast Elements	Minimum grade of concrete for all the precast elements shall be M 40. The concrete for the precast elements and its production shall conform to IS 456. The contractor shall get the design mix approved by the Engineer-in-Charge before start of the production activities. The contractor shall submit the timelines for production of the precast elements so that the Engineer-in-charge or his representative inspect and collect samples of concrete for testing. Sampling shall be done as per the frequency specified in the IS Code/ CPWD Specifications. The reinforcement shall be FE 500 D grade conforming to IS 1786. The contractor shall submit the delivery challans and offer Material Inspection on receipt of the same before consuming into the works. **For Detailed requirements Refer "Particular Specifications" on Precast Elements**
1.3	**Anti-termite treatment as per IS:6313**	Providing and injecting chemical emulsion for pre constructional anti termite treatment along the external wall up to depth of 300mm Diluting and injecting chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment a) Along external wall where the apron is not provided using chemical emulsion @ 7.3 litres / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: i) With Chlorpyriphos/ Lindane E.C. 20% with 1% concentration.
1.4	Plinth Filling: a) Sand filling under floor b) PCC Concrete under footings c) Grade Slab at Stilt Level	150mm thick with river sand / crushed stone sand or fine aggregates conforming to IS 383-2016 Minimum 100mm thick mat concrete below footing / raft in M20. Minimum 200 mm thick RCC of grade M25 shall be laid under flooring work in ground floors with reinforcement of 8 mm dia TMT bars of Grade Fe500D @ 200 mm c/c. both ways.
1.5	Filler Walls	All the structural and non-structural wall members shall be precast members only. No brick work shall be allowed. However, in exceptional cases wherever it is feasible CC Solid Block work shall be allowed with the approval of Engineer-in-Charge.
1.6	**Water proofing treatment**	Water Proofing Treatment on Floors, Corridors, Balconies, Lift Pits, Terrace, water storage tanks, top of LMR, Mumty and in Toilets Shall be done as per specifications mentioned at "Particular Specifications"

2.	**Joinery :**	
2.1	Door frames	Providing wood work with kiln seasoned and chemically treated Sal wood frame of size 150mm X 100 mm for Main Doors and Polyster powder coated(minimum 50 microns) Aluminium door frames of sections size not less than 125 x 75 mm and thickness of profiles shall be between 2.5 to 3.00mm with required colour shade for all internal doors and fixed in position with hold fast lugs or with dash fasteners of HILTI or equivalent make of required dia & length and as per the approved shop drawings and directions of Engineer in Charge.
2.2	Door shutters	• **For Main Door:** Providing and fixing factory made 38mm thick solid core flush door shutter confirming to IS 2202 (Part - I); shutter shall be manufactured with exterior quality synthetic adhesive forming marine ply surfaces, internally lipped as per approved manufacturer. Shutter shall be finished on both sides with 4mm thick teak veneer of approved brand and manufacture, and melamine polish in approved shade, colour and design. Further edges of shutter shall be provided with 30 mm x 15mm thick teakwood beadings fixed by using exterior quality synthetic adhesive, headless GI nails, screws. Shutter and beading shall be finished with melamine polish of approved colour and shade. The shutter shall be provided with ironmongeries (of approved make) as listed for each door all complete as per the directions of the Engineer in-charge. Prior to starting of work the agency has to submit detailed full scale shop drawings including details of fixing for approval of the Engineer in-charge.
		• **For Internal Doors including Toilets :** Providing and fixing factory made 32 mm thick laminated flush door shutter made of 30mm thick ISI marked flush door shutters non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters having 1 mm thick decorative type laminates in mat finish, colour, shade, pattern as approved by Engineer-in- charge on both faces of shutter fixed with phenol formaldehyde synthetic resin type adhesive conforming to IS 848 including providing and fixing concealed external lipping with 2nd class teak wood battens 30 mm X 12mm on all edges of shutters and polishing the three exposed faces of lipping with melamine polish in approved shade including fixing shutters with ISI marked stainless steel butt hinges of 100x75x3mm with required number of stainless steel screw etc. Also, all toilet door shutters back side shall be fixed the 2mm thick acrylic sheet for full area of the shutter etc., all above complete as per the relevant drawings and as directed by Engineer-in-charge.

2.3	Ironmongeries	Providing and fixing Ironmongeries of approved make in doors in sets as listed below with necessary matching screws, bolts, nuts & nails etc. **For Main Door:** (Single leaf, structural, opening size - 1200mm x 2550mm) • Stainless steel satin finish ,5 knuckle 2 ball bearing butt hinges of size 100mm x 76mm x 3mm with CP brass screws - 4 Nos. • ii) Dead lock package of approved make with 55mm backset, 20mm square forend prepared for euro profile cylinder(EPC) including strike plate and EPC 60mm Length internal thumb turn & external key operation & Escutcheons in stainless steel satin finish (304 grade). The lock shall be with 3 keys • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish latch 250 x 16 x 5mm long with CP brass screws - 1 No. • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • Peep hole - 1 No. **Set - 1 for Study Area, Guest Bedroom, Typical Bedroom 1 & 2, Master Bedroom etc,** • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish latch 250 x 16 x 5 mm long with CP brass screws - 1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No **Set – 2 for WC, Bath, Toilet** • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. • Sashlock package of approved eqvivalent make with a pair of Lever Handle on Roses & escutcheons including 271a Sash lock with 72mm centre to centre, 55mm Backset 20mm Square forend. EPC 60mm length one side key other side thumb turn operation - 1 set **Set – 3 for Store, Utility, Balcony** Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. a) b) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair

		Set – 4 for Shafts, Ducts a) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. b) Mortice shaft dead bolt with key (Alen Key lock) with BS 57mm and 25mm square forend in SS finish of approved make. The lock shall be with 1 key. **Set – 5 for Electrical room** a) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. b) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair c) Stainless steel satin finish aldrop 300mm long with CP brass screws - 1 No.
2.4	**Metal Modular Ward Robe Units**	All Shall be provided M/s. Godrej make as per specifications and details mentioned at **"Particular Specifications and drawings".**
3	**STEEL WORK, uPVC DOORS & WINDOWS:**	
3.1	MS Grill in windows & Ventilators and MS Gratings Etc,.	Slag Blasting of MS Members shall be carried out at Factory to achieve Sa 2.5 surface along with application of Zinc Chromite Primer. All windows should be fitted with MS grill (minimum weight 10 kg per sqm) and painted with 2 coats of Synthetic Enamel Paint or PU coated as per approved drawings and as per the directions of Engineer in Charge.
3.2	**Railing in staircase/ Balcony railing**	**For Staircase** - 1.2-meter-high railing with SS 304 grade stainless steel of 50 mm dia. of 18-gauge handrail with adequate rods parallel to handrail, balusters, flanges, end caps, newel posts with caps etc. complete as per approved drawing and direction of Engineer – in – charge.
		For Balcony's - Providing, fixing, fabricating railing @ 1200mm high above finish floor level, in profile made out of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) uprights (end and intermediate) at about 950mm c/c and 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel pipe matt finish as hand rail including 12mm thick clear heat strengthened glass for railing, Stainless steel. Rosette cover fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
		Wall side of the Staircase, Over Parapet walls of Corridors and Terrace hand rail, wherever required: Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.

3.3	uPVC Solid Core Door Frames & Shutters	**for Kitchen Utilities, Mumty and Shaft Doors etc, as per approved Drawings:** UPVC solid core frame & openable Door shutter with solid/Glazed/Louvered of approved make as per the approved shop drawings and specifications as mentioned at Particular Specifications and as per the directions of the Engineer in Charge.
3.4	UPVC Doors, Windows & Ventilators with frame	**All Windows, Ventilators and French Doors** Design, Providing and Fixing, uPVC factory made, white colour casement/sliding window and door made of extruded profiles. Profiles of frames and sash will be mitered cut and fusion welded at all corners including drilling of holes for fixing hardware and drainage of water etc., making arrangement for fixing of hardware, EPDM gasket, galvanised steel profile of required thickness as per design to be inserted in required profile, frame shall be fixed to the wall with required sizes of long fasteners of approved make, all complete including specified heat strengthened glazing, hardware, friction grip hinges, fittings etc. as per architectural drawings and Particular Specifications and direction of Engineer-in-charge. For French Doors – 3 or 4 track Sliding Door/Full height window. The (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 85mm with minimum wall thickness as 2.00 mm, with 8mm thick clear heat strengthened glass. 2/4 glass sash and 1/2 mosquito mesh sash Sliding Door (Location: Balconies) (glass fibre mosquito mesh shall be of approved gauge and make). For Windows - 3 track Sliding windows with 2/4 glass + 1/2 mosquito mesh shutters (glass fibre mesh shall be of approved gauge and make) (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 53mm. The wall thickness of the profiles shall be minimum 2.00 mm) For Ventilators - Toilet Duct Ventilator of adjustable frosted glass louvers. The uPVC box sections shall be of minimum size 88x48 mm with minimum wall thickness as 2.00 mm. The size of glass louvers shall be 60mm wide x 5mm thick). Provision for fixed glazing portion shall be with 5 mm frosted glass of required size. Wherever required opening in the ventilator for exhaust fan shall be made Providing specimen and conducting full Scale Mock-up test of UPVC Door/window system (item no. 8.54 above) at an approved independent Laboratory in India as specified in Tender Document etc. all complete as per directions of Engineer-in-Charge. The mock-up test shall be done for approved Door/window of Faculty/Staff Housing Buildings at required floor level. The size of the sample shall be 4.50 m length x 2.40 m high.

		The UPVC windows shall be designed and provided as per the wind pressure at different levels and heights and accordingly the required sections of UPVC and reinforcement shall be provided. The UPVC window shall be tested at Façade India Testing Inc. and passed all required parameters as per relevant ASTM & IS Codes.
3.5	Glazing of windows, Ventilators and openings	Glazing shall be with 6mm / 8mm thick toughenedglass (depending on size of opening). Toughened frosted glass shall be used for ventilators. Opening of windows should be sufficient enoughas per ECBC norms for day light during day time.The properties of glass should meet the ECBC & NBC2016 requirement and including Stainless Steel (SS-304 grades)Friction stays 125 mm UPVC handle for each leaf, all complete, as per direction of Engineer-In-Charge.
3.6	Curtain rod with pelmets	**All Windows and French Doors inside the Flats:** Providing and fixing minimum 19 mm thick, 150 mm wide pelmet of Block Board as per BIS standards with white laminated on both sides, including top cover of 6 mm black board, SS 304 Curtain rods of 25 mm dia of 22-gauge curtain rod with SS brackets, including fixing with 25x3 mm SS Flat 10 cm long fixed to pelmet with hollock wood cleats of size 100 mm x 40 mm x 40 mm on both inner side of pelmet and rawl plugs 75 mm long etc. all complete, as per direction of Engineer-In-Charge.
3.7	Fire rated Doors	**All Fire Escape areas as per the approved drawings and as per the direction of Engineer in charge.** Providing, supplying and fixing internal metal fire rated doors (double/ single leaf) of approved make with Fire Resistant 120 minutes rating as per manufacturers/particular specifications and similar to the prototype tested by CBRI, Roorkee & Certificate issued thereof (as per IS:3614 Part-2, 1992) with overall size as per requirement. Door frames shall be made with 1.6mm thick galvanised steel sheet pressed to double rebate profile of size 143x57mm and filled with foam concrete. Door shutters shall be made with 1.2mm thick galvanised steel sheet pressed formed to provide fully flush double skin panel which shall be not less than 46mm thick with lock seam joints at style edges. The internal construction of panel shall be filled with insulating mineral wool with reinforcement at top, bottom and around stiles. The door shutters shall be provided with provision for vision panel of required size (as per Architectural drawings) with 6 mm thick clear toughened Boro Silicate glass of Schott / Pyran make to give120 minutes fire rating. The item shall also include provision for required iron mongery, shutter and frame which shall be finished with Zinc Phosphate storing primer & Polyurethene paint etc. complete. The shutter shall be fixed to frame with 5 knuckle, 2 bearing butt hinges of size 100x75x3mm of DORMA make or approved equivalent make in SS 304 and in Satin Stainless steel as per EN 1935, CE marked with 4 Nos hinges for each shutter, all complete and as per the drawing and direction of Engineer-In-Charge.

3.8	Aluminum louvers	**For Covering the Shafts in Elevations:** Providing, fabricating and fixing in position louvers system in facade with 100mm x 15mm x 1.2mm Aluminium louvers(C-section), as detailed and approved in shop drawing (based on concept architectural drawings). The louvers shall be fixed to aluminum framing system consisting of aluminium tube (mullions) 63 x 38 x 2 mm and aluminum clip of size 36mm x 31mm x 1mm; The mullions shall be fixed to RCC beam with GI bracket of 50mm x 50mm x 5mm, 50mm long with M10 size anchor fasteners. All aluminium section / louvers to be polyester powder coated (60 microns) all around in approved shade and colour. All items shall be strengthened and lapped as required. Nos. of aluminium mullions shall be as per the drawing. The aluminium clip and louvers shall be fabricated as per profile shown in the drawing. Prior to start of work contractor shall submit detailed full scale shop drawings including plan, elevation and detail of fixing with structure for approval of the Engineer in-charge. Samples of each item on full scale as directed by the Engineer in-charge shall be submitted for approval. Work shall be commenced only on approval of shop drawing by Engineer in Charge.
4.	**Flooring, Dado, Cladding, Jambs, Sill and Counters:**	
4.1	Flooring	• All rooms, Dining, Living, passages: Full body/Double Charged Homogenous Vitrified floor tiles of approved size 600x600 mm / 900x900mm laid with adhesive/Cement Mortar and with spacers, groove filled with tile epoxy/cement grout of approved brand, as per the approved drawings and as per the direction of Engineer in charge. • Common Corridor areas and Lift Lobbies: - 18mm thick Granite flooring as per the approved drawings and as per the direction of Engineer in charge. • Staircase Portion: - 18mm thk Polished Granite stone slab for Threads and Risers with single piece with edge nosing with gripping as per the approved colour, design & pattern as per the approved drawings and as per the direction of Engineer in charge. • Toilets, Utility, Washing Area & Balcony Flooring - Antiskid Vitrified floor tile of minimum size 300x300 mm laid with adhesive/Cement mortar and with spacers, groove filled with tile epoxy grout of approved brand and shall be executed as per the approved drawings and as per the direction of Engineer in charge. • Electrical room, store rooms and other common rooms: Antiskid vitrified tile flooring with rubber mats in front of electrical panels as per the approved drawings and as per the direction of Engineer in charge.

4.2	Skirting / Dado	**Skirting:** All rooms and corridors/ common areas - Specifications for materials of skirting will be same as per flooring with matching joint pattern having 100mm height laid with adhesive as per the approved drawings and as per the direction of Engineer in charge. 1. **Toilets Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to Lintel level of 1st quality conforming to ISO: 13006 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, all complete as per the approved drawings and as per the direction of Engineer in charge.
4.3	Cladding on Lift Well	Cladding shall be done to front face of Lift well with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.4	Parking areas in Stilt Floor	**In Stilt Floor:** Providing and laying 380mm x 380mm or more as per the manufacturer's size Industrial Grade Vitrified tiles confirming to ISO 13006: 2018(Group B1 a), with minimum 25 mm thick bed of cement mortar of 1:3 complete all as per the approved drawings and as per the direction of Engineer in charge.
4.5	Granite Cladding on Elevation of the building at Stilt Floor	**In Elevation** – up to 4 mtrs Height Wet Cladding shall be done on the elevation of the building with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.6	Kitchen :	. **Kitchen Platform:** Pre Polished 18mm thick Jet Black Granite slab of superior Quality laid over RCC slab as per the approved drawing and as per the Direction of Engineer in Charge. . **Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to 750mm height above platform with 1st quality of tiles conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.
4.7	Utility & Washing Area and Wash Basins @Living/Dining Areas	. **Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to slab ceiling/ false ceiling level of 1st quality conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.

4.8	Cement Flooring	**At External Development and Children Play areas etc., as per the approved Drawings.** 1) VDF Flooring: M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator , vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications, approved drawings and as per the directions of Engineer-in-charge.
4.9	Granite for Door Jambs, Windows Sill, Balcony toe wall/ common area parapet	18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
4.10	Wash Basin under counters	**In All Toilets and Common area wash basin :**18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
5.	**ROOFING :**	
5.1	False Ceiling with Thermal Insulation	**At 12th Floor (Top Floor) All Rooms in side Flats:** False ceiling with Plain gypsum board with thermal insulation by using resin bonded glass wool backing. The detailed specification is as mentioned below Providing and fixing False Ceiling with 12.5 mm thick tapered edge gypsum moisture resistant board including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound, jointing tapes, finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge

5.2	**Canopy and Open to Sky areas in the Building**	Providing and fixing 10mm thick multicell polycarbonate sheet conforming to IS or relevant standards; supported on MS pergola (MS pergola shall be measured and paid separately in relevant item); polycarbonate sheets to be UV protected; Panel Width shall be such as to ensure best performance for wind uplift, vibration and visual appearance. Polyster powder coated aluminium Snap-on connector of approved shade to interlock the panels shall have a grip-lock double tooth locking mechanism. The fixing shall be with approved anchor fasteners complete with jointing, sealing with approved silicon sealant and EPDM packing etc. The rate shall include the cost of above specified materials , fixing of the sheet, scaffolding and labour charges for working at all levels, leads and heights.
6.	**FINISHING :**	
6.1	Plastering on walls (Internal & External):	**On CC Block work filler walls:** Cement plaster of minimum 15mm thick shall be provided (with chicken mesh on entire area, plaster mesh of aperture of 15mmx15mm made of 1.3mmx0.35mm GI strips of at junctions of RCC & masonry, fibre mesh at corners) wherever solid CC block constructed like ledge walls in toilets, supporting pedestals (or) Upstands for service lines on terrace etc., **On Precast Surface:** Plastering may not be required as the same being factory made, surface of even, smooth and uniform characterization is noted. However, the same needs to be suitably rectified in case of any deficiency. Necessary drip courses shall be provided in Sunshades, Balcony, Projecting Roof, Beams etc.
6.2	Internal finishing:	All the internal surfaces including ceiling shall be finished with one coat of cement primer, two or more coats of cement based wall putty, two or more coats of premium acrylic emulsion paint with low VOC of Asian Paints on equivalent. However, wherever false ceiling is provided, slabs shall be treated with one coat of cement primer and including applying additional coats wherever required to achieve even shade and colour, complete as per directions of EIC
6.3	External finishing:	External wall surface shall be finished with cement based wall putty in two coats and 2 or more coats of premium acrylic smooth weather proof with silicone additives / texture exterior paints of Apex Ultima Exterior of Asian Paints or equivalent over a coat of cement premier or textured exterior paint in Two or more coats applied over and including priming coat of exterior primer as per the approvals and directions of Engineer-in Charge

6.4	Thermal Insulation of External Walls inside the Flats	Inner face of External walls of the Rooms in flats Except Kitchen and Toilets shall be thermally insulated with resin bonded rock wool covered with wall paneling made of cement fibre board fixed on G.I section as per the below mentioned specifications: Thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m3,50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by criss cossing GI wire etc. complete as per directions of Engineer-in Charge Fixing, in position concealed G.I. section for wall paneling using 8 mm thick cement fibre board (as per IS : 14862) fixed on the 'W' profile (0.55 mm thick) having a knurled web of 51.55 mm and two flanges of 26 mm each with lips of 10.55 mm, placed @ 610 mm C/C in perimeter channel having one flange of 20 mm and another flange of 30 mm with thickness of 0.55 mm and web of length 27 mm. Perimeter channel is fixed on the floor and the ceiling with the nylon sleeves @ 610 mm C/C with fully threaded self-tapping dry wall screws. Board is fixed to the 'W' profile with 25 mm countersunk ribbed head screws @ 200 mm C/C., all complete as per the drawing & directions of engineer-in-charge, the joints of the boards are finished with specially formulated jointing compound and 48mm wide jointing tape to provide seamless finish especially alround window/door opening areas.
7.0	**Internal Sanitary Water Supply Installations :**	
7.1	W.C. with flushing system	**In all Toilets:** Providing and fixing at all floors Vitreous china Wall hung European WC of approved make and colour of HINDWARE make or approved equivalent make, with Concealed flushing cistern with 10 liters capacity, dual flush fittings, seat cover, CI chair bracket, mounting bolts, WC connector, angle cock of Jaguar make Model No. 23059 or approved equivalent make, 15 mm, 450 mm length braided hose connection pipe, with all fittings and fixtures complete, including cutting and making good the walls and floors by using of silicon sealant, wherever required, all complete as approved and directed by Engineer In Charge.
7.2	Hand Shower (Health Faucet)	**In all Toilets:** Providing and fixing ABS Chrome plated Brass Hand Shower (Health Faucet) of Jaguar make Model no. 563 GA or approved equivalent make, CP Angle valve Jaguar make Model no. 5053 or approved equivalent make, as approved by Engineer - In - Charge, including 8 mm dia, 1 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per directions of the Engineer-in-charge.

7.3	white vitreous china oval counter sunk basin	**In all Toilets and Common Area:** Providing and fixing white vitreous china oval counter sunk basin of HINDWARE make model no. Zen basin Star white 10049 or approved equivalent approved make, size, colour and shade, with CP Central hole basin mixer of Jagaur make model no.23167B GA or equivalent make as approved by Engineer In Charge, with regular spout without popup waste with 15 mm 450 mm braided hoses of Jagaur make model no.805B or equivalent make, C.P. brass angular stop cocks of Jagaur make model no.23059 or equivalent make as approved by Engineer-In-Charge, CP bottle trap and waste coupling both of Jagaur make model no.769 and 705/709 or approved equivalent make, polymer brackets, silicon sealant, with all fittings and fixtures complete, including cutting and making good the walls and floors, wherever required, all leads, lifts, levels and heights and as per directions of Engineer - in - charge.
7.4	stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board	**In Kitchen:** Providing and fixing at all floors stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board of overall sink size 1550 x 545 mm, each bowl size 460 x 460 x 230 mm with waste coupling, of NIRALI Graceful Elegance Big make or approved equivalent make , with one no CP table mounted sink mixer of Jagaur make model no.5319 NB GA or of approved equivalent make, 2 no.s 15mm dia CP angle cocks of Jagaur make model no.5053 or equivalent make as approved by Engineer-In-Charge, 2 No.s 15 mm dia. 450 mm length braided hoses of Jagaur make model no.805B or equivalent make, silicon sealant for filling all the gaps wherever required. uPVC pipe (6kg/sq cm) of required length with necessary fittings, plug for cleaning arrangement shall be connected between waste coupling and outlet point in wall to drain the waste water. All complete and as per directions of Engineer In Charge.
7.5	Stainless Steel Toilet paper Holder	**In All Toilets:** Providing and Fixing Stainless Steel Toilet Paper Holder of Jaguar make model no. ACN -1151N or approved equivalent make, fixed on Wooden / PVC Cleats with CP Screws etc. All complete as per directions of the Engineer-in-charge.
7.6	CP Brass Hand rail (Grab bar)	Providing and Fixing CP Brass Hand rail (Grab bar) Of length 450 mm long. (JAGUAR Make Model No. AHS-1503 or approved equivalent make in Toilets or at located places, fixed with Stainless Steel Screws on wooden cleats etc. All complete as per directions of the Engineer-in-charge.

7.7	Two way CP brass bib cock	**In All Toilets, Kitchen and Utility etc.,** : Providing and Fixing 15 mm dia. two way CP brass bib cock with wall flange and ceramic disc cartridge complete, including cutting and making good the walls wherever required, making all necessary connections etc. All complete as per directions of the Engineer-in-charge. a) CP Brass bib cock of JAGUAR Make, Model No. FLR-5041 N or equivalent make as approved by Engineer - In - Charge.
7.8	CP Shower unit	**In All Toilets**: Providing and fixing at all floors CP Shower unit of approved make comprising of concealed CP four way divertor of JAGUAR Make Model No. FLR-5421 N or approved equivalent make, two nos. concealed CP stop cocks of JAGUAR Make Model No. 5083 or approved equivalent make, overhead shower rose, shower arm of JAGUAR Make Model No. 491 & 483 or approved equivalent make , bath spout of JAGUAR Make Model No 5429 or approved equivalent make, with all fittings and fixtures complete, including making necessary connections, cutting and making good the walls and floors, wherever required. Rate includes divertor, stop cocks, bath spout, shower arm, shower rose all complete. Shower flowrate 8.4 LPM at 5.62 Kg/cm2. Bath spout flow rate 6.4LPM at 5.62 Kg/cm2. All complete and as per the directions of the Engineer - In - Charge.
7.9	Soap dish	**In All Toilets**: Providing and Fixing CP Brass Soap dish of JAGUAR Make Model No. AHS-CHR-1531 recessed type or approved equivalent make, including all necessary materials required for fixing. All complete as per directions of the Engineer-in-charge
7.10	Tumbler Holder	**In All Toilets**: Providing and fixing of C.P. Brass Tumbler Holder of Jaguar make Model no. 1141 N or approved equivalent make with all necessary accessories, screws, nuts and bolts etc. All complete and as per the directions of the Engineer - in - charge.
7.11	Stainless steel (304) square frame grating	**In Toilets, Kitchen, Utility, Corridors and other common areas:** Supply and fixing of approved make 0.6mm thick Stainless steel (304) square frame grating with circular removable jali including fixing in white cement to match floor finish as per directions of Engineer - in - charge.
7.12	Towel Ring Square type	**In All Toilets and wash basin area**: Providing and fixing C.P. brass Towel Ring Square type of Jaguar make model no. 1121 N or approved equivalent make, with necessary CP brass screws, all Complete as per direction of Engineer-in-Charge.

7.13	Internal Water Supply	Providing and Fixing Chlorinated Polyvinyl Chloride (CPVC) Pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer-In-Charge. With Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :
7.14	Angle Cock	Providing and fixing Jaguar make C.P. brass angle valve for basin mixer, geyser points and all other places wherever required. C.P. brass angle valve of approved quality shall be conformed to IS:8931
7.15	Water Meter	Providing and fixing enclosed type water Metre (bulk type) conforming to IS: 2373 and tested by Municipal Board complete with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately)
7.16	Grease Trap	Constructing brick masonry grease trap chamber with FPS bricks of class designation 3.5 in cement mortar 1:4 (1cement:4 coarse sand) R.C.C top slab of 150mm thickness with 1:2:4 mix (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) external plastering to a height of 30 cm on all sides & inside plastering with 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4(1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, two RCC baffle walls of 150 mm thick, medium duty SFRC covers and frame of 60 x 60 cm etc. complete
7.17	Butterfly valves	'Providing and fixing C.I. butterfly valves, water end type class PN 1.6 as per I.S:13095 or BS:5155 with integrally moulded linear of nitrile or EPDM, SS Disc and steam lever operated including necessary nuts, bolts, gaskets, flanges etc. All complete and as per the directions of the Engineer - In - Charge.
7.18	Puddle Flange	Providing and fixing 600 mm long MS hot dip galvanized Puddle Flange fabricated out of 6 mm thick MS plates of suitable size and pipe shall be confirming to IS:1239 heavy class pipes properly fixed in walls / top slab of tanks. The entire fittings shall be hot dipped galvanized after fabrication. Length shall be minimum 600 mm or wall thickness plus 200 mm on either side (whichever is more). Each Puddle shall be flanged on outer side for connection of pipe / fittings all complete as per directions of Engineer-In-Charge.

7.19	Mirror	Providing and fixing 6mm thick bevelled edge Mirror fixed on 12mm thick marine ply, including bevelling of mirror edges, countersunk Stainless steel screws, wood beading and edging etc. all complete as per drawings and as per direction of Engineer in-charge
8.0	**DRAINAGE SYSTEM:**	
8.1	RCC Pipes	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete: Road Crossings: For Road Crossings NP3 Class (Heavy duty) R.C.C. pipes shall be provided with Concrete Encasement.as per the approved drawings and as per the directions of Engineer in Charge
8.2	Manholes	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm Nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm Nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm Nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) : With FPS bricks of class designation 3.5 The Depth of the Manholes shall be as per the actual site requirement w.r.to the invert levels of the pipes, gradients etc. as desired for smooth of flow of drainage.
	Gully Traps	Constructing Gully Traps wherever required as per the approved drawings and shall be confirmed to the CPWD Specifications.

8.3	Soil & waste pipes and fittings	Double Stack system shall be adopted. One pipe only to carry the soil waste from WCs and another pipe only to carry the waste water from Kitchen, bath, Wash basins, Utility& Wash, balcony Areas. Wherever AC provisions shall be made in the flats and those AC drain pipe outlets of all floors/flats shall be connected to External drain lines. Providing and fixing 3-layer PP-R (Poly propylene Random copolymer) pipes confirming to IS:15801 UV stabilized & anti - microbial fusion welded, having thermal stability for hot & cold water supply, including all PP - R plain & brass threaded polypropylene random fittings, including trenching, refilling & testing of joints complete as per direction of Engineer-in-Charge.
8.4	Manhole Covers	Supply and fixing of C.I Manhole frame and cover for water tanks, sumps and all other places wherever required, fixing at all heights, leads and all other materials required for fixing. All complete as per directions of Engineer in Charge.
8.5	**Water supply line :**	
8.5.1	External pipe lines	CPVC Pipes as per IS 15778 and HPDE pipes as per IS 4984 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.2	Internal piping & fittings– Concealed work	CPVC Pipes as per IS 15778 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.3	Painting of Pipes: a) Exposed on buildings	Synthetic enamel paint as per the Directions of Engineer in Charge.
8.5.4	Fittings :	Pillar cocks, angle cocks, 2way bib cocks with health faucet, long body bib cocks, wall mixture, overhead shower, towel rod of 600mm, corner glass shelf along with other miscellaneous fittings like bottle trap, floor trap, waste couplings etc.; as per approved make and model and as per the direction of Engineer – in – Charge. (The above are indicative only. However, the contractor has to provide all fixtures and fittings for functional suitability). Note: The fixtures and fittings shall be of standard equivalent to Jaguar make Florentine series or more only.
8.5.5	Terrace Water Tank	1 lakh litres Capacity RCC water storage tank (Service tank) with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete. In addition to this, RCC water storage tank (firefighting) of suitable capacity as shall be provided exclusively for firefighting and the inlet of service tank shall be connected from this firefighting tank in such a way that the over flow firefighting shall flow to the service tank (this means firefighting storage tank remains always full).

8.5.6	UG Sump	1 lakh litres Capacity RCC UG water tank with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete as per the approved drawings and a per the direction of Engineer in Charge.
8.5.7	Rain water pipes	Providing and fixing UPVC rain water pipes of 6 kg/cm2 conforming to IS: 4985 including all fittings such as with or without access door, bends, junctions, cowls, offsets, etc., and jointing with solvent cement and excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors, excavation, refilling and disposal of surplus earth wherever required and making good the same, complete as directed by the Engineer-in-Charge.
8.5.8	External Service Lines towards Water Supply, Drip Irrigation and Sewerage	Water Supply: - DI pipe lines of suitable diameter from UG sump or HDPE pipe lines of suitable diameter from nearest line to Service tank of each building with control valves complete as per directions of Engineer-in-charge (the system should be conducive to Hydro Pneumatic system to be provided for all buildings). Sewerage: - NP2 pipes of suitable diameter to be laid from each building to the nearest sewerage line / STP complete and NP3 pipes encased in concrete wherever Road Crossings as per directions of Engineer-in-charge. Drip Irrigation / Sprinkler: - CPVC pipe lines of suitable diameter with control valves, sprinkler system complete for horticulture operations specified. (Note:- The External Service Lines towards Water Supply, Drip irrigation/ sprinkler and Sewerage shall be executed as per relevant specifications attached.)
9.0	**Accessibility of Buildings**	All the blocks shall be accessible by differently abled persons with Ramps, SS Railing, Grab bars etc, as required as per GRIHA norms. Ground floor shall have at least one Divyang Toilet for differently abled people.
10.0	**External Development works**	
10.1	Paver Blocks	Providing and laying 80mm thick factory made cement concrete interlocking paver block of M -40 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of fine sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.

10.2	Kerb Stone and Saucer Drains	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement: 3 coarse sand) including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm) including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge Providing and laying in position saucer drain & drain cover made of precast cement concrete units of specified profile and measurements, with key and of other shapes as required in site as per drawing in M 30 grade concrete seated on PCC foundation of M-10 grade including placing and joining with CM mortar of mix 1:4 (1Cement : 4 grade coarse sand) as per the approved Drawings for Saucer drain and other relevant approved drawings and as per the directions of Engineer-in-charge.
10.3	GSB	Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. a)With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30.
10.4	CC Roads	Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge.
10.5	Planter Boxes	CC Solid Block Planter boxes with 18 mm thick Granite coping shall be constructed as per the approved drawings and as per the instructions of Engineer in Charge.
11.0	**Open Paved area around the Building**	60 mm thick factory made cement concrete Interlocking paver block of M30 grade as per Arch drawing and approved development plan over 50 mm thick sand cushion over 150 mm thick Granular sub-base (GSB) and over well compacted earth.
12.0	**Miscellaneous civil and beautification works**	Miscellaneous works like pathways connecting between various blocks, pergolas, Flower beds, open staircases, approach ramps etc. shall be done as per the approved drawings and as per the Direction of Engineer in Charge.
13.0	**Horticulture**	The works shall be done as per specifications mentioned at "Particular Specifications"

14.0	**FRP Grating**	• Platforms in shafts: FRP grating supported on suitable size MS angle supports all round the grating as per the approved drawings and as per the direction of Engineer in charge. And as per specifications and details mentioned at "Particular Specifications".
15	**Children Play area**	The works shall be done as per specifications mentioned at "Particular Specifications"
16	**Façade Cleaning System**	Providing safety harness Anchoring point portable **floor mounting jibs** (one pair of jibs for each building) made up of Structural Aluminium alloy 150mm (I - section) for anchoring at various points and levels around perimeter of the building (RCC terrace slab mounted). A pair of jibs shall be capable of carrying two man cradle weight and a safe working load of 180 kg (2persons weight@70 kg each plus additional load of 40 kg for tools and plants) . The jib shall have a minimum arm length of 1.0 metre and contain a jib hanger for suspending the cradle. The jib shall be equipped with end stoppers to restrict hanger movement. It shall also be equipped with gravity lock at the rear end and stopper at the cantilever end etc., all complete and as directed by the Engineer-in-charge. The contractor shall submit the shop drawings of the Jibs before procurement, for approval of EIC

NOTE: The above list is only indicative and not exhaustive. The contractor has to plan and execute all the missing fittings / fixtures / item to make the premises to the full use. Nothing extra shall be paid on this account.

[2] Construction of Staff Housing Towers (G+12) – *Tower ST2A (Type – D) G+12 Floors and Construction of Staff Housing – Tower ST2B (Type – D) G+12 Floors at IITH.*

Construction of 2 Nos of Staff Housing towers of 12 storied (G+12), 6 Flats per Floor with Plinth area of 10,155.60 Sqm for each tower. (For 2 Staff towers plinth area shall be: 2x10,155.60 = 20,311.20 Sqm) and plinth height minimum of 450 mm. Floor to Floor Height is 3.2 m for all floors except Terrace Floor. For Terrace floor, Floor to Floor height is 3.3 m and for stilt floor, Floor to floor height is 4.2m. Conceptual Drawings for the above Faculty Towers are attached.

"Plinth Area" shall have the meaning as given in IS: 3861.

MINIMUM SPECIFICATIONS FOR PRECAST STAFF TOWERS

Sl. No.	Items of Work	Specifications
1.	**Building structure**	
1.1	Precast Foundation & Super structure	The whole structure shall be of Reinforced Cement Concrete (RCC) structure made of Precast elements comprising of suitable foundation system, Beam & Columns System or solid core walls system and solid core slabs, staircases etc., retaining wall required depth shall be provided at up to Stilt Plinth level to retain the over burden soil. As per Structural design & approved drawings, building shall be earthquake resistant for the zone of location. Pre cast structure with suitable foundation system shall be designed as per the detailed soil investigation report & design or as per the design if Column & Beam system. The precast structure should be designed with solid core walls (150 mm minimum thickness or as per design, whichever is more) and Solid core for slab (125 mm minimum thickness or as per design, whichever is more). The scope includes Construction of Terrace Water Tanks, Staircase Head room, Parapet Walls, Closing of Service Shafts and Pedestals for all service lines and Solar panels for hot water system as per the approved Drawings and as per the directions of Engineer in Charge. For Toilet Block: where ever required, ledge walls of suitable thickness abutting the RCC solid core walls may be constructed using CC Solid blocks to run the concealed plumbing lines & flush tanks. Surplus excavated earth shall not be taken out of the campus and shall be used in campus itself as per direction of the Engineer-in-charge. Construction debris shall be disposed-off out of the campus as per direction of the Engineer-in-charge.

1.2	Precast Elements	Minimum grade of concrete for all the precast elements shall be M 40. The concrete for the precast elements and its production shall conform to IS 456. The contractor shall get the design mix approved by the Engineer-in-Charge before start of the production activities. The contractor shall submit the timelines for production of the precast elements so that the Engineer-in-charge or his representative inspect and collect samples of concrete for testing. Sampling shall be done as per the frequency specified in the IS Code/ CPWD Specifications. The reinforcement shall be FE 500 D grade conforming to IS 1786. The contractor shall submit the delivery challans and offer Material Inspection on receipt of the same before consuming into the works. **For Detailed requirements Refer "Particular Specifications" on Precast Elements**
1.3	**Anti-termite treatment as per IS : 6313**	Providing and injecting chemical emulsion for pre constructional anti termite treatment along the external wall up to depth of 300mm Diluting and injecting chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment a) Along external wall where the apron is not provided using chemical emulsion @ 7.3 litres / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: i) With Chlorpyriphos/ Lindane E.C. 20% with 1% concentration.
1.4	Plinth Filling: d) Sand filling under floor e) PCC Concrete under footings f) Grade Slab at Stilt Level	150mm thick with river sand / crushed stone sand or fine aggregates conforming to IS 383-2016 Minimum 100mm thick mat concrete below footing / raft in M20. Minimum 200 mm thick RCC of grade M25 shall be laid under flooring work in ground floors with reinforcement of 8 mm dia TMT bars of Grade Fe500D @ 200 mm c/c. both ways.
1.5	Filler Walls	All the structural and non-structural wall members shall be precast members only. No brick work shall be allowed. However, in exceptional cases wherever it is feasible CC Solid Block work shall be allowed with the approval of Engineer-in-Charge.

1.6	**Water proofing treatment**	Water Proofing Treatment on Floors, Corridors, Balconies, Terrace, water storage tanks, top of LMR, Mumty and in Toilets Shall be done as per specifications mentioned at "Particular Specifications"
2.	**Joinery :**	
2.1	Door frames	Providing wood work with kiln seasoned and chemically treated Sal wood frame of size 150mm X 100 mm for Main Doors and Polyster powder coated(minimum 50 microns) Aluminium door frames of sections size not less than 125 x 75 mm and thickness of profiles shall be between 2.5 to 3.00mm with required colour shade for all internal doors and fixed in position with hold fast lugs or with dash fasteners of HILTI or equivalent make of required dia & length and as per the approved shop drawings and directions of Engineer in Charge.
2.2	Door shutters	• **For Main Door:** Providing and fixing factory made 38mm thick solid core flush door shutter confirming to IS 2202 (Part - I); shutter shall be manufactured with exterior quality synthetic adhesive forming marine ply surfaces, internally lipped as per approved manufacturer. Shutter shall be finished on both sides with 4mm thick teak veneer of approved brand and manufacture, and melamine polish in approved shade, colour and design. Further edges of shutter shall be provided with 30 mm x 15mm thick teakwood beadings fixed by using exterior quality synthetic adhesive, headless GI nails, screws. Shutter and beading shall be finished with melamine polish of approved colour and shade. The shutter shall be provided with ironmongeries (of approved make) as listed for each door all complete as per the directions of the Engineer in-charge. Prior to starting of work the agency has to submit detailed full scale shop drawings including details of fixing for approval of the Engineer in-charge.
		For Internal Doors including Toilets : Providing and fixing factory made 32 mm thick laminated flush door shutter made of 30mm thick ISI marked flush door shutters non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters having 1 mm thick decorative type laminates in mat finish, colour, shade, pattern as approved by Engineer-in- charge on both faces of shutter fixed with phenol formaldehyde synthetic resin type adhesive conforming to IS 848 including providing and fixing concealed external lipping with 2nd class teak wood battens 30 mm X 12mm on all edges of shutters and polishing the three exposed faces of lipping with melamine polish in approved shade including fixing shutters with ISI marked stainless steel butt hinges of 100x75x3mm with required number of stainless steel screw etc. Also, all toilet door shutters back side shall be fixed the 2mm thick acrylic sheet for full area of the shutter etc., all above complete as per the relevant drawings and as directed by Engineer-in-charge.

2.3	Ironmongeries	Providing and fixing Ironmongeries of approved make in doors in sets as listed below with necessary matching screws, bolts, nuts & nails etc. **For Main Door:** (Single leaf, structural, opening size - 1200mm x 2550mm) • Stainless steel satin finish ,5 knuckle 2 ball bearing butt hinges of size 100mm x 76mm x 3mm with CP brass screws - 4 Nos. • ii) Dead lock package of approved make with 55mm backset, 20mm square forend prepared for euro profile cylinder(EPC) including strike plate and EPC 60mm Length internal thumb turn & external key operation & Escutcheons in stainless steel satin finish (304 grade). The lock shall be with 3 keys • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish latch 250 x 16 x 5mm long with CP brass screws - 1 No. • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • Peep hole - 1 No. **Set - 1 for Study Area, Guest Bedroom, Typical Bedroom 1 & 2, Master Bedroom etc,** • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish latch 250 x 16 x 5 mm long with CP brass screws - 1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No **Set – 2 for WC, Bath, Toilet** • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. • Sashlock package of approved eqvivalent make with a pair of Lever Handle on Roses & escutcheons including 271a Sash lock with 72mm centre to centre, 55mm Backset 20mm Square forend. EPC 60mm length one side key other side thumb turn operation - 1 set **Set – 3 for Store, Utility, Balcony** Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. b) b) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair **Set – 4 for Shafts, Ducts** c) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. d) Mortice shaft dead bolt with key (Alen Key lock) with BS 57mm and 25mm square forend in SS finish of approved make. The lock shall be with 1 key.

		Set – 5 for Electrical room d) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. e) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair f) Stainless steel satin finish aldrop 300mm long with CP brass screws - 1 No.
2.4	**WARDROBES**	All Shall be provided M/s. Godrej make as per specifications and details mentioned at **"Particular Specifications and drawings".**
3	**STEEL WORK, uPVC DOORS & WINDOWS:**	
3.1	MS Grill in windows & Ventilators and MS Gratings Etc,.	Slag Blasting of MS Members shall be carried out at Factory to achieve Sa 2.5 surface along with application of Zinc Chromite Primer.All windows should be fitted with MS grill (minimum weight 10 kg per sqm) and painted with 2 coats of Synthetic Enamel Paint or PU Coated as per approved drawings and as per the Directions of Engineer in Charge.
3.2	**Railing in staircase/ Balcony railing**	**For Staircase** - 1.2-meter-high railing with SS 304 grade stainless steel of 50 mm dia. of 18-gauge handrail with adequate rods parallel to handrail, balusters, flanges, end caps, newel posts with caps etc. complete as per approved drawing and direction of Engineer – in – charge.
		For Balcony's - Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
		Wall side of the Staircase, Over Parapet walls of Corridors and Terrace hand rail, wherever required: Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
3.3	uPVC Solid Core Door Frames & Shutters	**For Kitchen Utilities, Mumty and Shaft Doors etc, as per approved Drawings:** UPVC solid core frame & openable Door shutter with solid/Glazed/Louvered of approved make as per the approved shop drawings and specifications as mentioned at Particular Specifications and as per the directions of the Engineer in Charge.

3.4	UPVC Doors, Windows & Ventilators with frame	**All Windows, Ventilators and French Doors** Design, Providing and Fixing, uPVC factory made, white colour casement/sliding window and door made of extruded profiles. Profiles of frames and sash will be mitered cut and fusion welded at all corners including drilling of holes for fixing hardware and drainage of water etc., making arrangement for fixing of hardware, EPDM gasket, galvanised steel profile of required thickness as per design to be inserted in required profile, frame shall be fixed to the wall with required sizes of long fasteners of approved make, all complete including specified heat strengthened glazing, hardware, friction grip hinges, fittings etc. as per architectural drawings and Particular Specifications and direction of Engineer-in-charge. • For French Doors - 3 or 4 track Sliding Door/Full height window. The (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 85mm with minimum wall thickness as 2.00 mm, with 8mm thick clear heat strengthened glass. 2/4 glass sash and 1/2 mosquito mesh sash Sliding Door (Location: Balconies) (glass fibre mosquito mesh shall be of approved gauge and make). • For Windows - 3 track Sliding windows with 2/4 glass + 1/2 mosquito mesh shutters (glass fibre mesh shall be of approved gauge and make) (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 53mm. The wall thickness of the profiles shall be minimum 2.00 mm) • For Ventilators - Toilet Duct Ventilator of adjustable frosted glass louvers. The uPVC box sections shall be of minimum size 88x48 mm with minimum wall thickness as 2.00 mm. The size of glass louvers shall be 60mm wide x 5mm thick). Provision for fixed glazing portion shall be with 5 mm frosted glass of required size. Wherever required opening in the ventilator for exhaust fan shall be made • Providing specimen and conducting full Scale Mock-up test of UPVC Door/window system (item no. 8.54 above) at an approved independent Laboratory in India as specified in Tender Document etc. all complete as per directions of Engineer-in-Charge. The mock-up test shall be done for approved Door/window of Faculty/Staff Housing Buildings at required floor level. The size of the sample shall be 4.50 m length x 2.40 m high.
		• The UPVC windows shall be designed and provided as per the wind pressure at different levels and heights and accordingly the required sections of UPVC and reinforcement shall be provided. The UPVC window shall be tested at Façade India Testing Inc. and passed all required parameters as per relevant ASTM & IS Codes.

3.5	Glazing of windows, Ventilators and openings	Glazing shall be with 6mm / 8mm thick toughenedglass (depending on size of opening). Toughened frosted glass shall be used for ventilators. Opening of windows should be sufficient enoughas per ECBC norms for day light during day time. The properties of glass should meet the ECBC & NBC 2016 requirement and including Stainless Steel (SS-304 grades)Friction stays 125 mm UPVC handle for each leaf, all complete, as per direction of Engineer-In-Charge.
3.6	Curtain rod with pelmets	**All Windows and French Doors inside the Flats:** Providing and fixing minimum 19 mm thick, 150 mm wide pelmet of Block Board as per BIS standards with white laminated on both sides, including top cover of 6 mm black board, SS 304 Curtain rods of 25 mm dia of 22-gauge curtain rod with SS brackets, including fixing with 25x3 mm SS Flat 10 cm long fixed to pelmet with hollock wood cleats of size 100 mm x 40 mm x 40 mm on both inner side of pelmet and rawl plugs 75 mm long etc. all complete, as per direction of Engineer-In-Charge.
3.7	Fire rated Doors	**All Fire Escape areas as per the approved drawings and as per the direction of Engineer in charge.** Providing, supplying and fixing internal metal fire rated doors (double/ single leaf) of approved make with Fire Resistant 120 minutes rating as per manufacturers/particular specifications and similar to the prototype tested by CBRI, Roorkee & Certificate issued thereof (as per IS:3614 Part-2, 1992) with overall size as per requirement. Door frames shall be made with 1.6mm thick galvanised steel sheet pressed to double rebate profile of size 143x57mm and filled with foam concrete. Door shutters shall be made with 1.2mm thick galvanised steel sheet pressed formed to provide fully flush double skin panel which shall be not less than 46mm thick with lock seam joints at style edges. The internal construction of panel shall be filled with insulating mineral wool with reinforcement at top, bottom and around stiles. The door shutters shall be provided with provision for vision panel of required size (as per Architectural drawings) with 6 mm thick clear toughened Boro Silicate glass of Schott / Pyran make to give120 minutes fire rating. The item shall also include provision for required iron mongery, shutter and frame which shall be finished with Zinc Phosphate storing primer & Polyurethene paint etc. complete. The shutter shall be fixed to frame with 5 knuckle, 2 bearing butt hinges of size 100x75x3mm of DORMA make or approved equivalent make in SS 304 and in Satin Stainless steel as per EN 1935, CE marked with 4 Nos hinges for each shutter, all complete and as per the drawing and direction of Engineer-In-Charge.

3.8	Aluminum louvers	**For Covering the Shafts in Elevations:** Providing, fabricating and fixing in position louvers system in facade with 100mm x 15mm x 1.2mm Aluminium louvers(C-section), as detailed and approved in shop drawing (based on concept architectural drawings). The louvers shall be fixed to aluminum framing system consisting of aluminium tube (mullions) 63 x 38 x 2 mm and aluminum clip of size 36mm x 31mm x 1mm; The mullions shall be fixed to RCC beam with GI bracket of 50mm x 50mm x 5mm, 50mm long with M10 size anchor fasteners. All aluminium section / louvers to be polyester powder coated (60 microns) all around in approved shade and colour. All items shall be strengthened and lapped as required. Nos. of aluminium mullions shall be as per the drawing. The aluminium clip and louvers shall be fabricated as per profile shown in the drawing. Prior to start of work contractor shall submit detailed full scale shop drawings including plan, elevation and detail of fixing with structure for approval of the Engineer in-charge. Samples of each item on full scale as directed by the Engineer in-charge shall be submitted for approval. Work shall be commenced only on approval of shop drawing by Engineer in Charge.
4.	**Flooring, Dado, Cladding, Jambs, Sill and Counters:**	
4.1	Flooring	• All rooms, Dining, Living, passages: Full body / Double Charged Homoginious Vitrified floor tiles of approved size 600x600 mm / 900x900mm laid with adhesive/Cement Mortar and with spacers, groove filled with tile epoxy/cement grout of approved brand, as per the approved drawings and as per the direction of Engineer in charge. • Common Corridor areas and Lift Lobbies: - 18mm thick Granite flooring as per the approved drawings and as per the direction of Engineer in charge. • Staircase Portion: - 18mm thk Polished Granite stone slab for Threads and Risers with single piece with edge nosing with gripping as per the approved colour, design & pattern as per the approved drawings and as per the direction of Engineer in charge. • Toilets, Utility, Washing Area & Balcony Flooring - Antiskid Vitrified floor tile of minimum size 300x300 mm laid with adhesive/Cement mortar and with spacers, groove filled with tile epoxy grout of approved brand and shall be executed as per the approved drawings and as per the direction of Engineer in charge. • Electrical room, store rooms and other common rooms: Antiskid vitrified tile flooring with rubber mats in front of electrical panels as per the approved drawings and as per the direction of Engineer in charge.

4.2	Skirting / Dado	**Skirting:** All rooms and corridors/ common areas - Specifications for materials of skirting will be same as per flooring with matching joint pattern having 100mm height laid with adhesive as per the approved drawings and as per the direction of Engineer in charge. 3. **Toilets Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to Lintel level of 1st quality conforming to ISO: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, all complete as per the approved drawings and as per the direction of Engineer in charge.
4.3	Cladding on Lift Well	Cladding shall be done to front face of Lift well with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.4	Parking areas in Stilt Floor	**In Stilt Floor:** Providing and laying 380mm x 380mm or more as per the manufacturer's size Industrial Grade Vitrified tiles confirming to ISO 13006: 2018(Group B1 a), with minimum 25 mm thick bed of cement mortar of 1:3 complete all as per the approved drawings and as per the direction of Engineer in charge.
4.5	Granite Cladding on Elevation of the building at Stilt Floor	**In Elevation** – up to 4 mtrs Height Wet Cladding shall be done on the elevation of the building with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.6	Kitchen :	5. **Kitchen Platform:** Pre Polished 18mm thick Jet Black Granite slab of superior Quality laid over RCC slab as per the approved drawing and as per the Direction of Engineer in Charge. 6. **Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to 750mm height above platform with 1st quality of tiles conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.
4.7	Utility & Washing Area and Wash Basins @Living/Dining Areas	**Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to slab ceiling/ false ceiling level of 1st quality conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.

4.8	Cement Flooring	**At External Development and Children Play areas etc., as per the approved Drawings.** 1) VDF Flooring: M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator , vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications, approved drawings and as per the directions of Engineer-in-charge.
4.9	Granite for Door Jambs, Windows Sill, Balcony toe wall/ common area parapet tops for fixing SS/Glass railings	18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
4.10	Wash Basin under counters	**In All Toilets and Common area wash basin** :18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
5.	**ROOFING :**	
5.1	False Ceiling with Thermal Insulation	**At 12th Floor (Top Floor) All Rooms in side Flats:** False ceiling with Plain gypsum board with thermal insulation by using resin bonded glass wool backing. The detailed specification is as mentioned below Providing and fixing False Ceiling with 12.5 mm thick tapered edge gypsum moisture resistant board including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound, jointing tapes, finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge

5.2	**Canopy and Open to Sky areas in the Building**	Providing and fixing 10mm thick multicell polycarbonate sheet conforming to IS or relevant standards; supported on MS pergola (MS pergola shall be measured and paid separately in relevant item); polycarbonate sheets to be UV protected; Panel Width shall be such as to ensure best performance for wind uplift, vibration and visual appearance. Polyster powder coated aluminium Snap-on connector of approved shade to interlock the panels shall have a grip-lock double tooth locking mechanism. The fixing shall be with approved anchor fasteners complete with jointing, sealing with approved silicon sealant and EPDM packing etc. The rate shall include the cost of above specified materials , fixing of the sheet, scaffolding and labour charges for working at all levels, leads and heights.
6.	**FINISHING :**	
6.1	Plastering on walls (Internal & External):	**On CC Block work filler walls:** Cement plaster of minimum 15mm thick shall be provided (with chicken mesh on entire area, plaster mesh of aperture of 15mmx15mm made of 1.3mmx0.35mm GI strips of at junctions of RCC & masonry, fibre mesh at corners) wherever solid CC block constructed like ledge walls in toilets, supporting pedestals (or) Upstands for service lines on terrace etc., **On Precast Surface:** Plastering may not be required as the same being factory made, surface of even, smooth and uniform characterization is noted. However, the same needs to be suitably rectified in case of any deficiency. Necessary drip courses shall be provided in Sunshades, Balcony, Projecting Roof, Beams etc.
6.2	Internal finishing:	All the internal surfaces including ceiling shall be finished with one coat of cement primer, two or more coats of cement based wall putty, two or more coats of premium acrylic emulsion paint with low VOC of Asian Paints on equivalent. However, wherever false ceiling is provided, slabs shall be treated with one coat of cement primer and including applying additional coats wherever required to achieve even shade and colour, complete as per directions of EIC
6.3	External finishing:	External wall surface shall be finished with cement based wall putty in two coats and 2 or more coats of premium acrylic smooth weather proof with silicone additives / texture exterior paints of Apex Ultima Exterior of Asian Paints or equivalent over a coat of cement premier or textured exterior paint in Two or more coats applied over and including priming coat of exterior primer as per the approvals and directions of Engineer-in Charge

6.4	Thermal Insulation of External Walls inside the Flats	Inner Face of External walls of the Rooms in flats Except Kitchen and Toilets shall be thermally insulated with resin bonded rock wool covered with wall paneling made of cement fibre board fixed on G.I section as per the below mentioned specifications: Thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m3,50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by criss cossing GI wire etc. complete as per directions of Engineer-in Charge Fixing, in position concealed G.I. section for wall paneling using 8 mm thick cement fibre board (as per IS : 14862) fixed on the 'W' profile (0.55 mm thick) having a knurled web of 51.55 mm and two flanges of 26 mm each with lips of 10.55 mm, placed @ 610 mm C/C in perimeter channel having one flange of 20 mm and another flange of 30 mm with thickness of 0.55 mm and web of length 27 mm. Perimeter channel is fixed on the floor and the ceiling with the nylon sleeves @ 610 mm C/C with fully threaded self-tapping dry wall screws. Board is fixed to the 'W' profile with 25 mm countersunk ribbed head screws @ 200 mm C/C., all complete as per the drawing & directions of engineer-in-charge, the joints of the boards are finished with specially formulated jointing compound and 48mm wide jointing tape to provide seamless finish especially alround window/door opening areas.
7.0	**Internal Sanitary Water Supply Installations :**	
7.1	W.C. with flushing system	**In all Toilets:** Providing and fixing at all floors Vitreous china Wall hung European WC of approved make and colour of HINDWARE make or approved equivalent make, with Concealed flushing cistern with 10 liters capacity, dual flush fittings, seat cover, CI chair bracket, mounting bolts, WC connector, angle cock of Jaguar make Model No. 23059 or approved equivalent make, 15 mm, 450 mm length braided hose connection pipe, with all fittings and fixtures complete, including cutting and making good the walls and floors by using of silicon sealant, wherever required, all complete as approved and directed by Engineer In Charge.
7.2	Hand Shower (Health Faucet)	**In all Toilets:** Providing and fixing ABS Chrome plated Brass Hand Shower (Health Faucet) of Jaguar make Model no. 563 GA or approved equivalent make, CP Angle valve Jaguar make Model no. 5053 or approved equivalent make, as approved by Engineer - In - Charge, including 8 mm dia, 1 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per directions of the Engineer-in-charge.

7.3	white vitreous china oval counter sunk basin	**In all Toilets and Common Area:** Providing and fixing white vitreous china oval counter sunk basin of HINDWARE make model no. Zen basin Star white 10049 or approved equivalent approved make, size, colour and shade, with CP Central hole basin mixer of Jagaur make model no.23167B GA or equivalent make as approved by Engineer In Charge, with regular spout without popup waste with 15 mm 450 mm braided hoses of Jagaur make model no.805B or equivalent make, C.P. brass angular stop cocks of Jagaur make model no.23059 or equivalent make as approved by Engineer-In-Charge, CP bottle trap and waste coupling both of Jagaur make model no.769 and 705/709 or approved equivalent make, polymer brackets, silicon sealant, with all fittings and fixtures complete, including cutting and making good the walls and floors, wherever required, all leads, lifts, levels and heights and as per directions of Engineer - in - charge.
7.4	stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board	**In Kitchen:** Providing and fixing at all floors stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board of overall sink size 1550 x 545 mm, each bowl size 460 x 460 x 230 mm with waste coupling, of NIRALI Graceful Elegance Big make or approved equivalent make , with one no CP table mounted sink mixer of Jagaur make model no.5319 NB GA or of approved equivalent make, 2 no.s 15mm dia CP angle cocks of Jagaur make model no.5053 or equivalent make as approved by Engineer-In-Charge, 2 No.s 15 mm dia. 450 mm length braided hoses of Jagaur make model no.805B or equivalent make, silicon sealant for filling all the gaps wherever required. uPVC pipe (6kg/sq cm) of required length with necessary fittings, plug for cleaning arrangement shall be connected between waste coupling and outlet point in wall to drain the waste water. All complete and as per directions of Engineer In Charge.
7.5	Stainless Steel Toilet paper Holder	**In All Toilets**: Providing and Fixing Stainless Steel Toilet Paper Holder of Jaguar make model no. ACN -1151N or approved equivalent make, fixed on Wooden / PVC Cleats with CP Screws etc. All complete as per directions of the Engineer-in-charge.
7.6	CP Brass Hand rail (Grab bar)	Providing and Fixing CP Brass Hand rail (Grab bar) Of length 450 mm long. (JAGUAR Make Model No. AHS-1503 or approved equivalent make in Toilets or at located places, fixed with Stainless Steel Screws on wooden cleats etc. All complete as per directions of the Engineer-in-charge,

7.7	Two way CP brass bib cock	**In All Toilets, Kitchen and Utility etc.,:** Providing and Fixing 15 mm dia. two way CP brass bib cock with wall flange and ceramic disc cartridge complete, including cutting and making good the walls wherever required, making all necessary connections etc. All complete as per directions of the Engineer-in-charge. a) CP Brass bib cock of JAGUAR Make, Model No. FLR-5041 N or equivalent make as approved by Engineer - In - Charge.
7.8	CP Shower unit	**In All Toilets**: Providing and fixing at all floors CP Shower unit of approved make comprising of concealed CP four way divertor of JAGUAR Make Model No. FLR-5421 N or approved equivalent make, two nos. concealed CP stop cocks of JAGUAR Make Model No. 5083 or approved equivalent make, overhead shower rose, shower arm of JAGUAR Make Model No. 491 & 483 or approved equivalent make , bath spout of JAGUAR Make Model No 5429 or approved equivalent make, with all fittings and fixtures complete, including making necessary connections, cutting and making good the walls and floors, wherever required. Rate includes divertor, stop cocks, bath spout, shower arm, shower rose all complete. Shower flowrate 8.4 LPM at 5.62 Kg/cm2. Bath spout flow rate 6.4LPM at 5.62 Kg/cm2. All complete and as per the directions of the Engineer - In - Charge.
7.9	Soap dish	**In All Toilets**: Providing and Fixing CP Brass Soap dish of JAGUAR Make Model No. AHS _ CHR – 1531 Recessed type or approved equivalent make, including all necessary materials required for fixing. All complete as per directions of the Engineer-in-charge
7.10	Tumbler Holder	**In All Toilets**: Providing and fixing of C.P. Brass Tumbler Holder of Jaguar make Model no. 1141 N or approved equivalent make with all necessary accessories, screws, nuts and bolts etc. All complete and as per the directions of the Engineer - in - charge.
7.11	Stainless steel (304) square frame grating	**In Toilets, Kitchen, Utility, Corridors and other common areas:** Supply and fixing of approved make 0.6mm thick Stainless steel (304) square frame grating with circular removable jali including fixing in white cement to match floor finish as per directions of Engineer - in - charge.
7.12	Towel Ring Square type	**In All Toilets and wash basin area**: Providing and fixing C.P. brass Towel Ring Square type of Jaguar make model no. 1121 N or approved equivalent make, with necessary CP brass screws, all Complete as per direction of Engineer-in-Charge.

7.13	Internal Water Supply	Providing and Fixing Chlorinated Polyvinyl Chloride (CPVC) Pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer-In-Charge. With necessary Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :
7.14	Angle Cock	Providing and fixing Jaguar make C.P. brass angle valve for basin mixer, geyser points and all other places wherever required. C.P. brass angle valve of approved quality shall be conformed to IS:8931
7.15	Water Meter	Providing and fixing enclosed type water Metre (bulk type) conforming to IS: 2373 and tested by Municipal Board complete with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately)
7.16	Grease Trap	Constructing brick masonry grease trap chamber with FPS bricks of class designation 3.5 in cement mortar 1:4 (1cement:4 coarse sand) R.C.C top slab of 150mm thickness with 1:2:4 mix (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) external plastering to a height of 30 cm on all sides & inside plastering with 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4(1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, two RCC baffle walls of 150 mm thick, medium duty SFRC covers and frame of 60 x 60 cm etc. complete
7.17	Butterfly valves	'Providing and fixing C.I. butterfly valves, water end type class PN 1.6 as per I.S:13095 or BS:5155 with integrally moulded linear of nitrile or EPDM, SS Disc and steam lever operated including necessary nuts, bolts, gaskets, flanges etc. All complete and as per the directions of the Engineer - In - Charge.
7.18	Puddle Flange	Providing and fixing 600 mm long MS hot dip galvanized Puddle Flange fabricated out of 6 mm thick MS plates of suitable size and pipe shall be confirming to IS:1239 heavy class pipes properly fixed in walls / top slab of tanks. The entire fittings shall be hot dipped galvanized after fabrication. Length shall be minimum 600 mm or wall thickness plus 200 mm on either side (whichever is more). Each Puddle shall be flanged on outer side for connection of pipe / fittings all complete as per directions of Engineer-In-Charge.

7.19	Mirror	Providing and fixing 6mm thick bevelled edge Mirror fixed on 12mm thick marine ply, including bevelling of mirror edges, countersunk Stainless steel screws, wood beading and edging etc. all complete as per drawings and as per direction of Engineer in-charge
8.0	**DRAINAGE SYSTEM:**	
8.1	RCC Pipes	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete: Road Crossings: For Road Crossings NP3 Class (Heavy duty) R.C.C. pipes shall be provided with Concrete Encasement.as per the approved drawings and as per the directions of Engineer in Charge
8.2	Manholes	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm Nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm Nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm Nominal size) finished with a floating coat of neat cement complete as per standard design : c) Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) : d) With FPS bricks of class designation 3.5 The Depth of the Manholes shall be as per the actual site requirement w.r.to the invert levels of the pipes, gradients etc. as desired for smooth of flow of drainage.
8.3	Gully Traps	Constructing Gully Traps wherever required as per the approved drawings and shall be confirmed to the CPWD Specifications.

8.3	Soil & waste pipes and fittings	Double Stack system shall be adopted. One pipe only to carry the soil waste from WCs and another pipe only to carry the waste water from Kitchen, bath, Wash basins, Utility& Wash, balcony Areas. Wherever AC provisions shall be made in the flats and those AC drain pipe outlets of all floors/flats shall be connected to External drain lines. Providing and fixing 3-layer PP-R (Poly propylene Random copolymer) pipes confirming to IS:15801 UV stabilized & anti - microbial fusion welded, having thermal stability for hot & cold water supply, including all PP - R plain & brass threaded polypropylene random fittings, including trenching, refilling & testing of joints complete as per direction of Engineer-in-Charge.
8.4	Manhole Covers	Supply and fixing of C.I Manhole frame and cover for water tanks, sumps and all other places wherever required, fixing at all heights, leads and all other materials required for fixing. All complete as per directions of Engineer in Charge.
8.5	**Water supply line :**	
8.5.1	External pipe lines	CPVC Pipes as per IS 15778 and HPDE pipes as per IS 4984 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.2	Internal piping & fittings– Concealed work	CPVC Pipes as per IS 15778 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.3	Painting of Pipes: a) Exposed on buildings	Synthetic enamel paint as per the Directions of Engineer in Charge.
8.5.4	Fittings :	Pillar cocks, angle cocks, 2way bib cocks with health faucet, long body bib cocks, wall mixture, overhead shower, towel rod of 600mm, corner glass shelf along with other miscellaneous fittings like bottle trap, floor trap, waste couplings etc.; as per approved make and model and as per the direction of Engineer – in – Charge. (The above are indicative only. However, the contractor has to provide all fixtures and fittings for functional suitability). Note: The fixtures and fittings shall be of standard equivalent to Jaguar make Florentine series or more only.
8.5.5	Terrace Water Tank	1 lakh litres Capacity RCC water storage tank (Service tank) with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete. In addition to this, RCC water storage tank (firefighting) of suitable capacity as shall be provided exclusively for firefighting and the inlet of service tank shall be connected from this firefighting tank in such a way that the over flow firefighting shall flow to the service tank (this means firefighting storage tank remains always full).

8.5.6	UG Sump	1 lakh litres Capacity RCC UG water tank with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete as per the approved drawings and a per the direction of Engineer in Charge.
8.5.7	Rain water pipes	Providing and fixing UPVC rain water pipes of 6 kg/cm2 conforming to IS: 4985 including all fittings such as with or without access door, bends, junctions, cowls, offsets, etc., and jointing with solvent cement and excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors, excavation, refilling and disposal of surplus earth wherever required and making good the same, complete as directed by the Engineer-in-Charge.
8.5.8	External Service Lines towards Water Supply, Drip Irrigation and Sewerage	Water Supply: - DI pipe lines of suitable diameter from UG sump or HDPE pipe lines of suitable diameter from nearest line to Service tank of each building with control valves complete as per directions of Engineer-in-charge (the system should be conducive to Hydro Pneumatic system to be provided for all buildings). Sewerage: - NP2 pipes of suitable diameter to be laid from each building to the nearest sewerage line / STP complete and NP3 pipes encased in concrete wherever Road Crossings as per directions of Engineer-in-charge. Drip Irrigation / Sprinkler: - CPVC pipe lines of suitable diameter with control valves, sprinkler system complete for horticulture operations specified. (Note:- The External Service Lines towards Water Supply, Drip irrigation/ sprinkler and Sewerage shall be executed as per relevant specifications attached.)
9.0	**Accessibility of Buildings**	All the blocks shall be accessible by differently abled persons with Ramps, SS Railing, Grab bars etc, as required as per GRIHA norms. Ground floor shall have at least one Divyang Toilet for differently abled people.
10.0	**External Development works**	
10.1	Paver Blocks	Providing and laying 80mm thick factory made cement concrete interlocking paver block of M -40 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of fine sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.

10.2	Kerb Stone and Saucer Drains	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement: 3 coarse sand) including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm) including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge Providing and laying in position saucer drain & drain cover made of precast cement concrete units of specified profile and measurements, with key and of other shapes as required in site as per drawing in M 30 grade concrete seated on PCC foundation of M-10 grade including placing and joining with CM mortar of mix 1:4 (1Cement : 4 grade coarse sand) as per the approved Drawings for Saucer drain and other relevant approved drawings and as per the directions of Engineer-in-charge.
10.3	GSB	Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. a)With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30.
10.4	CC Roads	Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge.
10.5	Planter Boxes	CC Solid Block Planter boxes with 18 mm thick Granite coping shall be constructed as per the approved drawings and as per the instructions of Engineer in Charge.
11.0	**Open Paved area around the Building**	60 mm thick factory made cement concrete Interlocking paver block of M30 grade as per Arch drawing and approved development plan over 50 mm thick sand cushion over 150 mm thick Granular sub-base (GSB) and over well compacted earth.
12.0	**Miscellaneous civil and beautification works**	Miscellaneous works like pathways connecting between various blocks, pergolas, Flower beds, open staircases, approach ramps etc. shall be done as per the approved drawings and as per the Direction of Engineer in Charge.
13.0	**Horticulture**	The works shall be done as per specifications mentioned at "Particular Specifications"

14.0	**FRP Grating**	• Platforms in shafts: FRP grating supported on suitable size MS angle supports all round the grating as per the approved drawings and as per the direction of Engineer in charge. And as per specifications and details mentioned at "Particular Specifications".
15	**Children Play area**	The works shall be done as per specifications mentioned at "Particular Specifications"
16	**Façade Cleaning System**	Providing safety harness Anchoring point portable **floor mounting jibs** (one pair of jibs for each building) made up of Structural Aluminium alloy 150mm (I - section) for anchoring at various points and levels around perimeter of the building (RCC terrace slab mounted). A pair of jibs shall be capable of carrying two man cradle weight and a safe working load of 180 kg (2persons weight@70 kg each plus additional load of 40 kg for tools and plants) . The jib shall have a minimum arm length of 1.0 metre and contain a jib hanger for suspending the cradle. The jib shall be equipped with end stoppers to restrict hanger movement. It shall also be equipped with gravity lock at the rear end and stopper at the cantilever end etc., all complete and as directed by the Engineer-in-charge. The contractor shall submit the shop drawings of the Jibs before procurement, for approval of EIC

NOTE: The above list is only indicative and not exhaustive. The contractor has to plan and execute all the missing fittings / fixtures / item to make the premises to the full use. Nothing extra shall be paid on this account.

[3] Construction of Staff Housing Towers (G+12) – *Tower ST1A (Type – E) G+12 Floors at IITH.*

Construction of 1 Nos of Type – E Staff Housing towers of 12 storied (G+12), 6 Flats per Floor with Plinth area of 8886.15 Sqm and plinth height minimum of 450 mm. Floor to Floor Height is 3.2 m for all floors except Terrace Floor. For Terrace floor, Floor to Floor height is 3.3 m and for stilt floor, Floor to floor height is 4.2m. Conceptual Drawings for the above Faculty Towers are attached.

"Plinth Area" shall have the meaning as given in IS: 3861.

MINIMUM SPECIFICATIONS FOR PRECAST STAFF TOWERS

Sl. No.	Items of Work	Specifications
1.	**Building structure**	
1.1	Precast Foundation & Super structure	The whole structure shall be of Reinforced Cement Concrete (RCC) structure made of Precast elements comprising of suitable foundation system, Beam & Columns System or solid core walls system and solid core slabs, staircases etc., retaining wall required depth shall be provided at up to Stilt Plinth level to retain the over burden soil. As per Structural design & approved drawings, building shall be earthquake resistant for the zone of location. Pre cast structure with suitable foundation system shall be designed as per the detailed soil investigation report & design or as per the design if Column & Beam system. The precast structure should be designed with solid core walls (150 mm minimum thickness or as per design, whichever is more) and Solid core for slab (125 mm minimum thickness or as per design, whichever is more). The scope includes Construction of Terrace Water Tanks, Staircase Head room, Parapet Walls, Closing of Service Shafts and Pedestals for all service lines and Solar panels for hot water system as per the approved Drawings and as per the directions of Engineer in Charge. For Toilet Block: where ever required, ledge walls of suitable thickness abutting the RCC solid core walls may be constructed using CC Solid blocks to run the concealed plumbing lines & flush tanks. Surplus excavated earth shall not be taken out of the campus and shall be used in campus itself as per direction of the Engineer-in-charge. Construction debris shall be disposed-off out of the campus as per direction of the Engineer-in-charge.

1.2	Precast Elements	Minimum grade of concrete for all the precast elements shall be M 40. The concrete for the precast elements and its production shall conform to IS 456. The contractor shall get the design mix approved by the Engineer-in-Charge before start of the production activities. The contractor shall submit the timelines for production of the precast elements so that the Engineer-in-charge or his representative inspect and collect samples of concrete for testing. Sampling shall be done as per the frequency specified in the IS Code/ CPWD Specifications. The reinforcement shall be FE 500 D grade conforming to IS 1786. The contractor shall submit the delivery challans and offer Material Inspection on receipt of the same before consuming into the works. **For Detailed requirements Refer "Particular Specifications" on Precast Elements**
1.3	**Anti-termite treatment as per IS : 6313**	Providing and injecting chemical emulsion for pre constructional anti termite treatment along the external wall up to depth of 300mm Diluting and injecting chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment a) Along external wall where the apron is not provided using chemical emulsion @ 7.3 litres / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: i) With Chlorpyriphos/ Lindane E.C. 20% with 1% concentration.
1.4	Plinth Filling: g) Sand filling under floor h) PCC Concrete under footings i) Grade Slab at Stilt Level	150mm thick with river sand / crushed stone sand or fine aggregates conforming to IS 383-2016 Minimum 100mm thick mat concrete below footing / raft in M20. Minimum 200 mm thick RCC of grade M25 shall be laid under flooring work in ground floors with reinforcement of 8 mm dia TMT bars of Grade Fe500D @ 200 mm c/c. both ways.
1.5	Filler Walls	All the structural and non-structural wall members shall be precast members only. No brick work shall be allowed. However, in exceptional cases wherever it is feasible CC Solid Block work shall be allowed with the approval of Engineer-in-Charge.
1.6	**Water proofing treatment**	Water Proofing Treatment on Floors, Corridors, Balconies, Terrace, water storage tanks, top of LMR, Mumty and in Toilets Shall be done as per specifications mentioned at "Particular Specifications"

2.	**Joinery :**	
2.1	Door frames	Providing wood work with kiln seasoned and chemically treated Sal wood frame of size 150mm X 100 mm for Main Doors and Polyester powder coated(minimum 50 microns) Aluminium door frames of sections size not less than 125 x 75 mm and thickness of profiles shall be between 2.5 to 3.00mm with required colour shade for all internal doors and fixed in position with hold fast lugs or with dash fasteners of HILTI or equivalent make of required dia & length and as per the approved shop drawings and directions of Engineer in Charge.
2.2	Door shutters	**For Main Door:** Providing and fixing factory made 38mm thick solid core flush door shutter confirming to IS 2202 (Part - I); shutter shall be manufactured with exterior quality synthetic adhesive forming marine ply surfaces, internally lipped as per approved manufacturer. Shutter shall be finished on both sides with 4mm thick teak veneer of approved brand and manufacture, and melamine polish in approved shade, colour and design. Further edges of shutter shall be provided with 30 mm x 15mm thick teakwood beadings fixed by using exterior quality synthetic adhesive, headless GI nails, screws. Shutter and beading shall be finished with melamine polish of approved colour and shade. The shutter shall be provided with ironmongeries (of approved make) as listed for each door all complete as per the directions of the Engineer in-charge. Prior to starting of work the agency has to submit detailed full scale shop drawings including details of fixing for approval of the Engineer in-charge.
		For Internal Doors including Toilets : Providing and fixing factory made 32 mm thick laminated flush door shutter made of 30mm thick ISI marked flush door shutters non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters having 1 mm thick decorative type laminates in mat finish, colour, shade, pattern as approved by Engineer-in- charge on both faces of shutter fixed with phenol formaldehyde synthetic resin type adhesive conforming to IS 848 including providing and fixing concealed external lipping with 2nd class teak wood battens 30 mm X 12mm on all edges of shutters and polishing the three exposed faces of lipping with melamine polish in approved shade including fixing shutters with ISI marked stainless steel butt hinges of 100x75x3mm with required number of stainless steel screw etc. Also, all toilet door shutters back side shall be fixed the 2mm thick acrylic sheet for full area of the shutter etc., all above complete as per the relevant drawings and as directed by Engineer-in-charge.

	Ironmongeries	Providing and fixing Ironmongeries of approved make in doors in sets as listed below with necessary matching screws, bolts, nuts & nails etc. **For Main Door:** (Single leaf, structural, opening size - 1200mm x 2550mm) • Stainless steel satin finish ,5 knuckle 2 ball bearing butt hinges of size 100mm x 76mm x 3mm with CP brass screws - 4 Nos. • ii) Dead lock package of approved make with 55mm backset, 20mm square forend prepared for euro profile cylinder(EPC) including strike plate and EPC 60mm Length internal thumb turn & external key operation & Escutcheons in stainless steel satin finish (304 grade). The lock shall be with 3 keys • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish latch 250 x 16 x 5mm long with CP brass screws - 1 No. • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • Peep hole - 1 No. **Set - 1 for Study Area, Guest Bedroom, Typical Bedroom 1 & 2, Master Bedroom etc,** • Stainless steel satin finish aldrop 300 x 16mm long with CP brass screws - 1 No. • Stainless steel satin finish latch 250 x 16 x 5 mm long with CP brass screws - 1 No. • Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair • Stainless steel satin finish floor door stopper with rubber buffer -1 No. • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No • 40 mm dia 50 mm long PVC door stopper with CP brass screw - 1 No **Set – 2 for WC, Bath, Toilet** • Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. • Sashlock package of approved eqvivalent make with a pair of Lever Handle on Roses & escutcheons including 271a Sash lock with 72mm centre to centre, 55mm Backset 20mm Square forend. EPC 60mm length one side key other side thumb turn operation - 1 set **Set – 3 for Store, Utility, Balcony** Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. b) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair

		Set – 4 for Shafts, Ducts e) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 1 No. f) Mortice shaft dead bolt with key (Alen Key lock) with BS 57mm and 25mm square forend in SS finish of approved make. The lock shall be with 1 key. **Set – 5 for Electrical room** g) Stainless steel satin finish tower bolt 300x10 mm size with CP brass screws- 2 No. h) Stainless steel satin finish D-type pull handle 200mm long ,19mm dia. With extended spindle- 1 Pair i) Stainless steel satin finish aldrop 300mm long with CP brass screws - 1 No.
2.3	**WARDROBES**	All Shall be provided M/s. Godrej make as per specifications and details mentioned at **"Particular Specifications and drawings".**
3	**STEEL WORK, uPVC DOORS & WINDOWS:**	
3.1	MS Grill in windows & Ventilators and MS Gratings Etc,.	Slag Blasting of MS Members shall be carried out at Factory to achieve Sa 2.5 surface along with application of Zinc Chromite Primer. All windows should be fitted with MS grill (minimum weight 10 kg per sqm) and painted with 2 coats of Synthetic Enamel Paint or PU Coated as per approved drawings and as per the Directions of Engineer in Charge.
3.2	**Railing in staircase/ Balcony railing**	**For Staircase** - 1.2-meter-high railing with SS 304 grade stainless steel of 50 mm dia. of 18-gauge handrail with adequate rods parallel to handrail, balusters, flanges, end caps, newel posts with caps etc. complete as per approved drawing and direction of Engineer – in – charge.
		For Balcony's - Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
		Wall side of the Staircase, Over Parapet walls of Corridors and Terrace hand rail, wherever required: Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
3.3	uPVC Solid Core Door Frames & Shutters	**for Kitchen Utilities, Mumty and Shaft Doors etc, as per approved Drawings:** UPVC solid core frame & openable Door shutter with solid/Glazed/Louvered of approved make as per the approved shop drawings and specifications as mentioned at Particular Specifications and as per the directions of the Engineer in Charge.

3.4	UPVC Doors, Windows & Ventilators with frame	**All Windows, Ventilators and French Doors** Design, Providing and Fixing, uPVC factory made, white colour casement/sliding window and door made of extruded profiles. Profiles of frames and sash will be mitered cut and fusion welded at all corners including drilling of holes for fixing hardware and drainage of water etc., making arrangement for fixing of hardware, EPDM gasket, galvanised steel profile of required thickness as per design to be inserted in required profile, frame shall be fixed to the wall with required sizes of long fasteners of approved make, all complete including specified heat strengthened glazing, hardware, friction grip hinges, fittings etc. as per architectural drawings and Particular Specifications and direction of Engineer-in-charge. For French Doors – 3 or 4 track Sliding Door/Full height window. The (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 85mm with minimum wall thickness as 2.00 mm, with 8mm thick clear heat strengthened glass. 2/4 glass sash and 1/2 mosquito mesh sash Sliding Door (Location: Balconies) (glass fibre mosquito mesh shall be of approved gauge and make). For Windows - 3 track Sliding windows with 2/4 glass + 1/2 mosquito mesh shutters (glass fibre mesh shall be of approved gauge and make) (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 53mm. The wall thickness of the profiles shall be minimum 2.00 mm) For Ventilators - Toilet Duct Ventilator of adjustable frosted glass louvers. The uPVC box sections shall be of minimum size 88x48 mm with minimum wall thickness as 2.00 mm. The size of glass louvers shall be 60mm wide x 5mm thick). Provision for fixed glazing portion shall be with 5 mm frosted glass of required size. Wherever required opening in the ventilator for exhaust fan shall be made Providing specimen and conducting full Scale Mock-up test of UPVC Door/window system (item no. 8.54 above) at an approved independent Laboratory in India as specified in Tender Document etc. all complete as per directions of Engineer-in-Charge. The mock-up test shall be done for approved Door/window of Faculty/Staff Housing Buildings at required floor level. The size of the sample shall be 4.50 m length x 2.40 m high.
		The UPVC windows shall be designed and provided as per the wind pressure at different levels and heights and accordingly the required sections of UPVC and reinforcement shall be provided. The UPVC window shall be tested at Façade India Testing Inc. and passed all required parameters as per relevant ASTM & IS Codes.

3.5	Glazing of windows, Ventilators and openings	Glazing shall be with 6mm / 8mm thick toughenedglass (depending on size of opening). Toughened frosted glass shall be used for ventilators. Opening of windows should be sufficient enoughas per ECBC norms for day light during day time. The properties of glass should meet the ECBC & NBC 2016 requirement and including Stainless Steel (SS-304 grades)Friction stays 125 mm UPVC handle for each leaf, all complete, as per direction of Engineer-In-Charge.
3.6	Curtain rod with pelmets	**All Windows and French Doors inside the Flats:** Providing and fixing minimum 19 mm thick, 150 mm wide pelmet of Block Board as per BIS standards with white laminated on both sides, including top cover of 6 mm black board, SS 304 Curtain rods of 25 mm dia of 22-gauge curtain rod with SS brackets, including fixing with 25x3 mm SS Flat 10 cm long fixed to pelmet with hollock wood cleats of size 100 mm x 40 mm x 40 mm on both inner side of pelmet and rawl plugs 75 mm long etc. all complete, as per direction of Engineer-In-Charge.
3.7	Fire rated Doors	**All Fire Escape areas as per the approved drawings and as per the direction of Engineer in charge.** Providing, supplying and fixing internal metal fire rated doors (double/ single leaf) of approved make with Fire Resistant 120 minutes rating as per manufacturers/particular specifications and similar to the prototype tested by CBRI, Roorkee & Certificate issued thereof (as per IS:3614 Part-2, 1992) with overall size as per requirement. Door frames shall be made with 1.6mm thick galvanised steel sheet pressed to double rebate profile of size 143x57mm and filled with foam concrete. Door shutters shall be made with 1.2mm thick galvanised steel sheet pressed formed to provide fully flush double skin panel which shall be not less than 46mm thick with lock seam joints at style edges. The internal construction of panel shall be filled with insulating mineral wool with reinforcement at top, bottom and around stiles. The door shutters shall be provided with provision for vision panel of required size (as per Architectural drawings) with 6 mm thick clear toughened Boro Silicate glass of Schott / Pyran make to give120 minutes fire rating. The item shall also include provision for required iron mongery, shutter and frame which shall be finished with Zinc Phosphate storing primer & Polyurethene paint etc. complete. The shutter shall be fixed to frame with 5 knuckle, 2 bearing butt hinges of size 100x75x3mm of DORMA make or approved equivalent make in SS 304 and in Satin Stainless steel as per EN 1935, CE marked with 4 Nos hinges for each shutter, all complete and as per the drawing and direction of Engineer-In-Charge.

3.8	Aluminum louvers	**For Covering the Shafts in Elevations:** Providing, fabricating and fixing in position louvers system in facade with 100mm x 15mm x 1.2mm Aluminium louvers(C-section), as detailed and approved in shop drawing (based on concept architectural drawings). The louvers shall be fixed to aluminum framing system consisting of aluminium tube (mullions) 63 x 38 x 2 mm and aluminum clip of size 36mm x 31mm x 1mm; The mullions shall be fixed to RCC beam with GI bracket of 50mm x 50mm x 5mm, 50mm long with M10 size anchor fasteners. All aluminium section / louvers to be polyester powder coated (60 microns) all around in approved shade and colour. All items shall be strengthened and lapped as required. Nos. of aluminium mullions shall be as per the drawing. The aluminium clip and louvers shall be fabricated as per profile shown in the drawing. Prior to start of work contractor shall submit detailed full scale shop drawings including plan, elevation and detail of fixing with structure for approval of the Engineer in-charge. Samples of each item on full scale as directed by the Engineer in-charge shall be submitted for approval. Work shall be commenced only on approval of shop drawing by Engineer in Charge.
4.	**Flooring, Dado, Cladding, Jambs, Sill and Counters:**	
4.1	Flooring	• All rooms, Dining, Living, passages: Full body/Double Charged Homogenous Vitrified floor tiles of approved size 600x600 mm / 900x900mm laid with adhesive/Cement Mortar and with spacers, groove filled with tile epoxy/cement grout of approved brand, as per the approved drawings and as per the direction of Engineer in charge. • Common Corridor areas and Lift Lobbies: - 18mm thick Granite flooring as per the approved drawings and as per the direction of Engineer in charge. • Staircase Portion: - 18mm thk Polished Granite stone slab for Threads and Risers with single piece with edge nosing with gripping as per the approved colour, design & pattern as per the approved drawings and as per the direction of Engineer in charge. • Toilets, Utility, Washing Area & Balcony Flooring - Antiskid Vitrified floor tile of minimum size 300x300 mm laid with adhesive/Cement mortar and with spacers, groove filled with tile epoxy grout of approved brand and shall be executed as per the approved drawings and as per the direction of Engineer in charge. • Electrical room, store rooms and other common rooms: Antiskid vitrified tile flooring with rubber mats in front of electrical panels as per the approved drawings and as per the direction of Engineer in charge.

4.2	Skirting / Dado	**Skirting:** All rooms and corridors/ common areas - Specifications for materials of skirting will be same as per flooring with matching joint pattern having 100mm height laid with adhesive as per the approved drawings and as per the direction of Engineer in charge. **Toilets Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to slab ceiling/ false ceiling level of 1st quality conforming to ISO 13006 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, all complete as per the approved drawings and as per the direction of Engineer in charge.
4.3	Cladding on Lift Well	Cladding shall be done to front face of Lift well with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.4	Parking areas in Stilt Floor	**In Stilt Floor:** Providing and laying 380mm x 380mm or more as per the manufacturer's size Industrial Grade Vitrified tiles confirming to ISO 13006: 2018(Group B1 a), with minimum 25 mm thick bed of cement mortar of 1:3 complete all as per the approved drawings and as per the direction of Engineer in charge.
4.5	Granite Cladding on Elevation of the building at Stilt Floor	**In Elevation** – up to 4 mtrs Height Wet Cladding shall be done on the elevation of the building with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.
4.6	Kitchen :	**Kitchen Platform:** Pre Polished 18mm thick Jet Black Granite slab of superior Quality laid over RCC slab as per the approved drawing and as per the Direction of Engineer in Charge. **Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to 750mm height above platform with 1st quality of tiles conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.
4.7	Utility & Washing Area and Wash Basins @Living/Dining Areas	**Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to slab ceiling/ false ceiling level of 1st quality conforming to IS: 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, as per the approved drawings and as per the direction of Engineer in charge.

4.8	Cement Flooring	**At External Development and Children Play areas etc., as per the approved Drawings.** 1) VDF Flooring: M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator , vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications, approved drawings and as per the directions of Engineer-in-charge.
4.9	Granite for Door Jambs, Windows Sill, Balcony toe wall/ common area parapet tops for fixing SS/Glass railings	18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
4.10	Wash Basin under counters	**In All Toilets and Common area wash basin :**18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
5.	**ROOFING :**	
5.1	False Ceiling with Thermal Insulation	**At 12th Floor (Top Floor) All Rooms in side Flats:** False ceiling with Plain gypsum board with thermal insulation by using resin bonded glass wool backing. The detailed specification is as mentioned below Providing and fixing False Ceiling with 12.5 mm thick tapered edge gypsum moisture resistant board including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound, jointing tapes, finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge

5.2	**Canopy and Open to Sky areas in the Building**	Providing and fixing 10mm thick multicell polycarbonate sheet conforming to IS or relevant standards; supported on MS pergola (MS pergola shall be measured and paid separately in relevant item); polycarbonate sheets to be UV protected; Panel Width shall be such as to ensure best performance for wind uplift, vibration and visual appearance. Polyster powder coated aluminium Snap-on connector of approved shade to interlock the panels shall have a grip-lock double tooth locking mechanism. The fixing shall be with approved anchor fasteners complete with jointing, sealing with approved silicon sealant and EPDM packing etc. The rate shall include the cost of above specified materials , fixing of the sheet, scaffolding and labour charges for working at all levels, leads and heights.
6.	**FINISHING :**	
6.1	Plastering on walls (Internal & External):	**On CC Block work filler walls:** Cement plaster of minimum 15mm thick shall be provided (with chicken mesh on entire area, plaster mesh of aperture of 15mmx15mm made of 1.3mmx0.35mm GI strips of at junctions of RCC & masonry, fibre mesh at corners) wherever solid CC block constructed like ledge walls in toilets, supporting pedestals (or) Upstands for service lines on terrace etc., **On Precast Surface:** Plastering may not be required as the same being factory made, surface of even, smooth and uniform characterization is noted. However, the same needs to be suitably rectified in case of any deficiency. Necessary drip courses shall be provided in Sunshades, Balcony, Projecting Roof, Beams etc.
6.2	Internal finishing:	All the internal surfaces including ceiling shall be finished with one coat of cement primer, two or more coats of cement based wall putty, two or more coats of premium acrylic emulsion paint with low VOC of Asian Paints on equivalent. However, wherever false ceiling is provided, slabs shall be treated with one coat of cement primer and including applying additional coats wherever required to achieve even shade and colour, complete as per directions of EIC
6.3	External finishing:	External wall surface shall be finished with cement based wall putty in two coats and 2 or more coats of premium acrylic smooth weather proof with silicone additives / texture exterior paints of Apex Ultima Exterior of Asian Paints or equivalent over a coat of cement premier or textured exterior paint in Two or more coats applied over and including priming coat of exterior primer as per the approvals and directions of Engineer-in Charge

6.4	Thermal Insulation of External Walls inside the Flats	Inner Face of External walls of the Rooms in flats Except Kitchen and Toilets shall be thermally insulated with resin bonded rock wool covered with wall paneling made of cement fibre board fixed on G.I section as per the below mentioned specifications: Thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m3,50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by criss cossing GI wire etc. complete as per directions of Engineer-in Charge Fixing, in position concealed G.I. section for wall paneling using 8 mm thick cement fibre board (as per IS : 14862) fixed on the 'W' profile (0.55 mm thick) having a knurled web of 51.55 mm and two flanges of 26 mm each with lips of 10.55 mm, placed @ 610 mm C/C in perimeter channel having one flange of 20 mm and another flange of 30 mm with thickness of 0.55 mm and web of length 27 mm. Perimeter channel is fixed on the floor and the ceiling with the nylon sleeves @ 610 mm C/C with fully threaded self-tapping dry wall screws. Board is fixed to the 'W' profile with 25 mm countersunk ribbed head screws @ 200 mm C/C., all complete as per the drawing & directions of engineer-in-charge, the joints of the boards are finished with specially formulated jointing compound and 48mm wide jointing tape to provide seamless finish especially alround window/door opening areas.
7.0	**Internal Sanitary Water Supply Installations :**	
7.1	W.C. with flushing system	**In all Toilets:** Providing and fixing at all floors Vitreous china Wall hung European WC of approved make and colour of HINDWARE make or approved equivalent make, with Concealed flushing cistern with 10 liters capacity, dual flush fittings, seat cover, CI chair bracket, mounting bolts, WC connector, angle cock of Jaguar make Model No. 23059 or approved equivalent make, 15 mm, 450 mm length braided hose connection pipe, with all fittings and fixtures complete, including cutting and making good the walls and floors by using of silicon sealant, wherever required, all complete as approved and directed by Engineer In Charge.
7.2	Hand Shower (Health Faucet)	**In all Toilets:** Providing and fixing ABS Chrome plated Brass Hand Shower (Health Faucet) of Jaguar make Model no. 563 GA or approved equivalent make, CP Angle valve Jaguar make Model no. 5053 or approved equivalent make, as approved by Engineer - In - Charge, including 8 mm dia, 1 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per directions of the Engineer-in-charge.

7.3	white vitreous china oval counter sunk basin	**In all Toilets and Common Area:** Providing and fixing white vitreous china oval counter sunk basin of HINDWARE make model no. Zen basin Star white 10049 or approved equivalent approved make, size, colour and shade, with CP Central hole basin mixer of Jagaur make model no.23167B GA or equivalent make as approved by Engineer In Charge, with regular spout without popup waste with 15 mm 450 mm braided hoses of Jagaur make model no.805B or equivalent make, C.P. brass angular stop cocks of Jagaur make model no.23059 or equivalent make as approved by Engineer-In-Charge, CP bottle trap and waste coupling both of Jagaur make model no.769 and 705/709 or approved equivalent make, polymer brackets, silicon sealant, with all fittings and fixtures complete, including cutting and making good the walls and floors, wherever required, all leads, lifts, levels and heights and as per directions of Engineer - in - charge.
7.4	stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board	**In Kitchen:** Providing and fixing at all floors stainless steel (A ISI 304 (18/8)) Double bowl sink with drain board of overall sink size 1550 x 545 mm, each bowl size 460 x 460 x 230 mm with waste coupling, of NIRALI Graceful Elegance Big make or approved equivalent make , with one no CP table mounted sink mixer of Jagaur make model no.5319 NB GA or of approved equivalent make, 2 no.s 15mm dia CP angle cocks of Jagaur make model no.5053 or equivalent make as approved by Engineer-In-Charge, 2 No.s 15 mm dia. 450 mm length braided hoses of Jagaur make model no.805B or equivalent make, silicon sealant for filling all the gaps wherever required. uPVC pipe (4kg/sq cm) of required length with necessary fittings, plug for cleaning arrangement shall be connected between waste coupling and outlet point in wall to drain the waste water. All complete and as per directions of Engineer In Charge.
7.5	Stainless Steel Toilet paper Holder	**In All Toilets**: Providing and Fixing Stainless Steel Toilet Paper Holder of Jaguar make model no. ACN -1151N or approved equivalent make, fixed on Wooden / PVC Cleats with CP Screws etc. All complete as per directions of the Engineer-in-charge.
7.6	CP Brass Hand rail (Grab bar)	Providing and Fixing CP Brass Hand rail (Grab bar) Of length 450 mm long. (JAGUAR Make Model No. AHS-1503 or approved equivalent make in Toilets or at located places, fixed with Stainless Steel Screws on wooden cleats etc. All complete as per directions of the Engineer-in-charge,

7.7	Two way CP brass bib cock	**In All Toilets, Kitchen and Utility etc.,** : Providing and Fixing 15 mm dia. two way CP brass bib cock with wall flange and ceramic disc cartridge complete, including cutting and making good the walls wherever required, making all necessary connections etc. All complete as per directions of the Engineer-in-charge. a) CP Brass bib cock of JAGUAR Make, Model No. FLR-5041 N or equivalent make as approved by Engineer - In - Charge.
7.8	CP Shower unit	**In All Toilets**: Providing and fixing at all floors CP Shower unit of approved make comprising of concealed CP four way divertor of JAGUAR Make Model No. FLR-5421 N or approved equivalent make, two nos. concealed CP stop cocks of JAGUAR Make Model No. 5083 or approved equivalent make, overhead shower rose, shower arm of JAGUAR Make Model No. 491 & 483 or approved equivalent make , bath spout of JAGUAR Make Model No 5429 or approved equivalent make, with all fittings and fixtures complete, including making necessary connections, cutting and making good the walls and floors, wherever required. Rate includes divertor, stop cocks, bath spout, shower arm, shower rose all complete. Shower flowrate 8.4 LPM at 5.62 Kg/cm2. Bath spout flow rate 6.4LPM at 5.62 Kg/cm2. All complete and as per the directions of the Engineer - In - Charge.
7.9	Soap dish	**In All Toilets**: Providing and Fixing CP Brass Soap dish of JAGUAR Make Model No. AHS – CHR – 1531 Recessed type or approved equivalent make, including all necessary materials required for fixing. All complete as per directions of the Engineer-in-charge
7.10	Tumbler Holder	**In All Toilets**: Providing and fixing of C.P. Brass Tumbler Holder of Jaguar make Model no. 1141 N or approved equivalent make with all necessary accessories, screws, nuts and bolts etc. All complete and as per the directions of the Engineer - in - charge.
7.11	Stainless steel (304) square frame grating	**In Toilets, Kitchen, Utility, Corridors and other common areas:** Supply and fixing of approved make 0.6mm thick Stainless steel (304) square frame grating with circular removable jali including fixing in white cement to match floor finish as per directions of Engineer - in - charge.
7.12	Towel Ring Square type	**In All Toilets and wash basin area**: Providing and fixing C.P. brass Towel Ring Square type of Jaguar make model no. 1121 N or approved equivalent make, with necessary CP brass screws, all Complete as per direction of Engineer-in-Charge.

7.13	Internal Water Supply	Providing and Fixing Chlorinated Polyvinyl Chloride (CPVC) Pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer-In-Charge. With Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :
7.14	Angle Cock	Providing and fixing Jaguar make C.P. brass angle valve for basin mixer, geyser points and all other places wherever required. C.P. brass angle valve of approved quality shall be conformed to IS:8931
7.15	Water Meter	Providing and fixing enclosed type water Metre (bulk type) conforming to IS: 2373 and tested by Municipal Board complete with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately)
7.16	Grease Trap	Constructing brick masonry grease trap chamber with FPS bricks of class designation 3.5 in cement mortar 1:4 (1cement:4 coarse sand) R.C.C top slab of 150mm thickness with 1:2:4 mix (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) external plastering to a height of 30 cm on all sides & inside plastering with 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4(1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, two RCC baffle walls of 150 mm thick, medium duty SFRC covers and frame of 60 x 60 cm etc. complete
7.17	Butterfly valves	'Providing and fixing C.I. butterfly valves, water end type class PN 1.6 as per I.S:13095 or BS:5155 with integrally moulded linear of nitrile or EPDM, SS Disc and steam lever operated including necessary nuts, bolts, gaskets, flanges etc. All complete and as per the directions of the Engineer - In - Charge.
7.18	Puddle Flange	Providing and fixing 600 mm long MS hot dip galvanized Puddle Flange fabricated out of 6 mm thick MS plates of suitable size and pipe shall be confirming to IS:1239 heavy class pipes properly fixed in walls / top slab of tanks. The entire fittings shall be hot dipped galvanized after fabrication. Length shall be minimum 600 mm or wall thickness plus 200 mm on either side (whichever is more). Each Puddle shall be flanged on outer side for connection of pipe / fittings all complete as per directions of Engineer-In-Charge.

7.19	Mirror	Providing and fixing 6mm thick bevelled edge Mirror fixed on 12mm thick marine ply, including bevelling of mirror edges, countersunk Stainless steel screws, wood beading and edging etc. all complete as per drawings and as per direction of Engineer in-charge
8.0	**DRAINAGE SYSTEM:**	
8.1	RCC Pipes	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete: Road Crossings: For Road Crossings NP3 Class (Heavy duty) R.C.C. pipes shall be provided with Concrete Encasement.as per the approved drawings and as per the directions of Engineer in Charge
8.2	Manholes	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm Nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm Nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm Nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) : With FPS bricks of class designation 3.5 The Depth of the Manholes shall be as per the actual site requirement w.r.to the invert levels of the pipes, gradients etc. as desired for smooth of flow of drainage.
8.2.1	Gully Traps	Constructing Gully Traps wherever required as per the approved drawings and shall be confirmed to the CPWD Specifications.

8.3	Soil & waste pipes and fittings	Double Stack system shall be adopted. One pipe only to carry the soil waste from WCs and another pipe only to carry the waste water from Kitchen, bath, Wash basins, Utility& Wash, balcony Areas. Wherever AC provisions shall be made in the flats and those AC drain pipe outlets of all floors/flats shall be connected to External drain lines. Providing and fixing 3-layer PP-R (Poly propylene Random copolymer) pipes confirming to IS:15801 UV stabilized & anti - microbial fusion welded, having thermal stability for hot & cold water supply, including all PP - R plain & brass threaded polypropylene random fittings, including trenching, refilling & testing of joints complete as per direction of Engineer-in-Charge.
8.4	Manhole Covers	Supply and fixing of C.I Manhole frame and cover for water tanks, sumps and all other places wherever required, fixing at all heights, leads and all other materials required for fixing. All complete as per directions of Engineer in Charge.
8.5	**Water supply line :**	
8.5.1	External pipe lines	CPVC Pipes as per IS 15778 and HPDE pipes as per IS 4984 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.2	Internal piping & fittings– Concealed work	CPVC Pipes as per IS 15778 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.3	Painting of Pipes: a) Exposed on buildings	Synthetic enamel paint as per the Directions of Engineer in Charge.
8.5.4	Fittings :	Pillar cocks, angle cocks, 2way bib cocks with health faucet, long body bib cocks, wall mixture, overhead shower, towel rod of 600mm, corner glass shelf along with other miscellaneous fittings like bottle trap, floor trap, waste couplings etc.; as per approved make and model and as per the direction of Engineer – in – Charge. (The above are indicative only. However, the contractor has to provide all fixtures and fittings for functional suitability). Note: The fixtures and fittings shall be of standard equivalent to Jaguar make Florentine series or more only.

8.5.5	Terrace Water Tank	1 lakh litres Capacity RCC water storage tank (Service tank) with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete. In addition to this, RCC water storage tank (firefighting) of suitable capacity as shall be provided exclusively for firefighting and the inlet of service tank shall be connected from this firefighting tank in such a way that the over flow firefighting shall flow to the service tank (this means firefighting storage tank remains always full).
8.5.6	UG Sump	1 lakh litres Capacity RCC UG water tank with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete as per the approved drawings and a per the direction of Engineer in Charge.
8.5.7	Rain water pipes	Providing and fixing UPVC rain water pipes of 6 kg/cm2 conforming to IS: 4985 including all fittings such as with or without access door, bends, junctions, cowls, offsets, etc., and jointing with solvent cement and excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors, excavation, refilling and disposal of surplus earth wherever required and making good the same, complete as directed by the Engineer-in-Charge.
8.5.8	External Service Lines towards Water Supply, Drip Irrigation and Sewerage	Water Supply: - DI pipe lines of suitable diameter from UG sump or HDPE pipe lines of suitable diameter from nearest line to Service tank of each building with control valves complete as per directions of Engineer-in-charge (the system should be conducive to Hydro Pneumatic system to be provided for all buildings). Sewerage: - NP2 pipes of suitable diameter to be laid from each building to the nearest sewerage line / STP complete and NP3 pipes encased in concrete wherever Road Crossings as per directions of Engineer-in-charge. Drip Irrigation / Sprinkler: - CPVC pipe lines of suitable diameter with control valves, sprinkler system complete for horticulture operations specified. (Note:- The External Service Lines towards Water Supply, Drip irrigation/ sprinkler and Sewerage shall be executed as per relevant specifications attached.)
9.0	**Accessibility of Buildings**	All the blocks shall be accessible by differently abled persons with Ramps, SS Railing, Grab bars etc, as required as per GRIHA norms. Ground floor shall have at least one Divyang Toilet for differently abled people.
10.0	**External Development works**	

10.1	Paver Blocks	Providing and laying 80mm thick factory made cement concrete interlocking paver block of M -40 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of fine sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.
10.2	Kerb Stone and Saucer Drains	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement: 3 coarse sand) including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm) including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge Providing and laying in position saucer drain & drain cover made of precast cement concrete units of specified profile and measurements, with key and of other shapes as required in site as per drawing in M 30 grade concrete seated on PCC foundation of M-10 grade including placing and joining with CM mortar of mix 1:4 (1Cement : 4 grade coarse sand) as per the approved Drawings for Saucer drain and other relevant approved drawings and as per the directions of Engineer-in-charge.
10.3	GSB	Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. a)With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30.
10.4	CC Roads	Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge.
10.5	Planter Boxes	CC Solid Block Planter boxes with 18 mm thick Granite coping shall be constructed as per the approved drawings and as per the instructions of Engineer in Charge.
11.0	**Open Paved area around the Building**	60 mm thick factory made cement concrete Interlocking paver block of M30 grade as per Arch drawing and approved development plan over 50 mm thick sand cushion over 150 mm thick Granular sub-base (GSB) and over well compacted earth.
12.0	**Miscellaneous civil and beautification works**	Miscellaneous works like pathways connecting between various blocks, pergolas, Flower beds, open staircases, approach ramps etc. shall be done as per the approved drawings and as per the Direction of Engineer in Charge.

13.0	**Horticulture**	The works shall be done as per specifications mentioned at "Particular Specifications"
14.0	**FRP Grating**	• Platforms in shafts: FRP grating supported on suitable size MS angle supports all round the grating as per the approved drawings and as per the direction of Engineer in charge. And as per specifications and details mentioned at "Particular Specifications".
16	**Façade Cleaning System**	Providing safety harness Anchoring point portable **floor mounting jibs** (one pair of jibs for each building) made up of Structural Aluminium alloy 150mm (I - section) for anchoring at various points and levels around perimeter of the building (RCC terrace slab mounted). A pair of jibs shall be capable of carrying two man cradle weight and a safe working load of 180 kg (2persons weight@70 kg each plus additional load of 40 kg for tools and plants) . The jib shall have a minimum arm length of 1.0 metre and contain a jib hanger for suspending the cradle. The jib shall be equipped with end stoppers to restrict hanger movement. It shall also be equipped with gravity lock at the rear end and stopper at the cantilever end etc., all complete and as directed by the Engineer-in-charge. The contractor shall submit the shop drawings of the Jibs before procurement, for approval of EIC

NOTE: The above list is only indicative and not exhaustive. The contractor has to plan and execute all the missing fittings / fixtures / item to make the premises to the full use. Nothing extra shall be paid on this account.

[4] 3 Nos x 336 Boarders Precast Hostel (Two Units of 84 rooms each, two seater accommodation)

Construction of 3 Numbers of Buildings of each comprising of 336 Boarders Hostels of 6 storied (G+6) with Plinth area of 5032 Sqm for each hostel. (For 3 hostels plinth area shall be: 3x5032 = 15,096 Sqm) and plinth height minimum of 450 mm. Floor to Floor Height is 3.2 m for all floors except Terrace Floor. For Terrace floor, Floor to Floor height is 3.3 m. Conceptual Drawings for the above Hostels are attached.

"Plinth Area" shall have the meaning as given in IS: 3861.

MINIMUM SPECIFICATIONS FOR PRECAST HOSTELS

Sl. No.	Items of Work	Specifications
1.	**Building structure**	
1.1	Precast Foundation & Super structure	The whole structure shall be of Reinforced Cement Concrete (RCC) structure made of Precast elements comprising of suitable foundation system, Beam & Columns System or solid core walls system and solid core slabs, staircases etc., retaining wall required depth shall be provided at up to Stilt Plinth level to retain the over burden soil. As per Structural design & approved drawings, building shall be earthquake resistant for the zone of location. Pre cast structure with suitable foundation system shall be designed as per the detailed soil investigation report & design or as per the design if Column & Beam system. The precast structure should be designed with solid core walls (150 mm minimum thickness or as per design, whichever is more) and Solid core for slab (125 mm minimum thickness or as per design, whichever is more). The scope includes Construction of Terrace Water Tanks, Staircase Head room, Parapet Walls, Closing of Service Shafts and Pedestals for all service lines and Solar panels for hot water system as per the approved Drawings and as per the directions of Engineer in Charge. For Toilet Block: where ever required, ledge walls of suitable thickness abutting the RCC solid core walls may be constructed using CC Solid blocks to run the concealed plumbing lines & flush tanks. Surplus excavated earth shall not be taken out of the campus and shall be used in campus itself as per direction of the Engineer-in-charge. Construction debris shall be disposed-off out of the campus as per direction of the Engineer-in-charge.

1.2	Precast Elements	Minimum grade of concrete for all the precast elements shall be M 40. The concrete for the precast elements and its production shall conform to IS 456. The contractor shall get the design mix approved by the Engineer-in-Charge before start of the production activities. The contractor shall submit the timelines for production of the precast elements so that the Engineer-in-charge or his representative inspect and collect samples of concrete for testing. Sampling shall be done as per the frequency specified in the IS Code/ CPWD Specifications. The reinforcement shall be FE 500 D grade conforming to IS 1786. The contractor shall submit the delivery challans and offer Material Inspection on receipt of the same before consuming into the works. **For Detailed requirements Refer "Particular Specifications" on Precast Elements**
1.3	**Anti-termite treatment as per IS : 6313**	Providing and injecting chemical emulsion for pre constructional anti termite treatment along the external wall up to depth of 300mm Diluting and injecting chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment a) Along external wall where the apron is not provided using chemical emulsion @ 7.3 litres / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall & rodding etc. complete: i) With Chlorpyriphos/ Lindane E.C. 20% with 1% concentration.
1.4	Plinth Filling: c) Sand filling under floor d) PCC Concrete under footings e) Grade Slab at Stilt Level	150mm thick with river sand / crushed stone sand or fine aggregates conforming to IS 383-2016 Minimum 100mm thick mat concrete below footing / raft in M20. Minimum 200 mm thick RCC of grade M25 shall be laid under flooring work in ground floors with reinforcement of 8 mm dia TMT bars of Grade Fe500D @ 200 mm c/c. both ways.
1.5	Filler Walls	All the structural and non-structural wall members shall be precast members only. No brick work shall be allowed. However, in exceptional cases wherever it is feasible CC Solid Block work shall be allowed with the approval of Engineer-in-Charge.
1.6	Water proofing treatment	Water Proofing Treatment on Floors, Corridors, Balconies, Terrace, water storage tanks, top of LMR, Mumty and in Toilets Shall be done as per specifications mentioned at "Particular Specifications"

2.	**Joinery :**	
2.1	Door frames	• Main Door: - Factory made 1.6 mm thick pressed steel door frame as per CPWD specifications, powder coated to the required shade. The frame shall be filled as per specifications foam concrete or with any filler material as approved by the Engineer-in-charge.
2.2	Door shutters	• Door of hostel rooms: - 35 mm thick flush door shutters with 1.0 mm thick laminate of required shade on front face and 0.80 mm thick laminate on the rear face. Shutter shall be fixed to the frame with 125 mm stainless steel butt hinges of approved make. The door shall contain all required fittings such as stainless steel sliding door bolt, tower bolts, hanging floor door stopper etc., all of approved make and model. • Shutters for Wardrobes: 25 mm thick flush door shutters. Other details as mentioned above. • Bath and WC door shutters shall be 30mm thick Fibre reinforced Plastic (FRP) flush door shutters in wood finish. • Plain Glass (Frosted) louvers and SS Wire mesh of grade 304 (powder coated) with aperture 1.4 X 1.4 mm shall be provided in the top ventilator portion of door frames.
	Door / Cupboard/ Wardrobe/ Showcase fittings:	Separate cup board for each student of suitable size made of Cement Fiber Board shelves of Minimum 25mm thk suitable number of shelves for Wardrobe as per the approved design and as per the directions of Engineer in Charge. All fittings of SS 304 of approved brand. **Ironmongeries:** Hostel room and Toilet main door: - Sliding door bolt – 250 mm X 16 mm (Single Shutter), 300 x 16 mm (Double Shutter); tower bolt – 250mm, door handles – 200mm WC/Bath: - Door Latch-150 mm, Tower bolt – 250mm, Tower bolt – 150mm, Door handles – 150mm. All other rooms: - As per approved drawings and directions of Engineer – in – Charge. Misc. fittings like door stopper, door buffer, magic eye etc. NOTE: This list indicated above is only indicative, but not exhaustive. The contractor has to ensure to provide fittings of all types and quantity to make the shutters function

3	**STEEL WORK, uPVC DOORS & WINDOWS:**	
3.1	MS Grill in windows & Ventilators and MS Gratings Etc,.	Slag Blasting of MS Members shall be carried out at Factory to achieve Sa 2.5 surface along with application of Zinc Chromite Primer. All windows should be fitted with MS grill (minimum weight 10 kg per sqm) and painted with 2 coats of Synthetic Enamel Paint or PU Coted as per approved drawings and as per the Directions of Engineer in Charge.
3.2	**Railing in staircase/ Balcony railing/ Corridor Railing**	**For Staircase** - 1.2-meter-high railing with SS 304 grade stainless steel of 50 mm dia. of 18-gauge handrail with adequate rods parallel to handrail, balusters, flanges, end caps, newel posts with caps etc. complete as per approved drawing and direction of Engineer – in – charge.
		For Balcony/Corridors - 1.2-meter-high railing with SS 304 grade stainless steel of 50 mm dia. of 18-gauge handrail with adequate rods parallel to handrail, balusters, flanges, end caps, newel posts with caps etc. complete as per approved drawing and direction of Engineer – in – charge.
		Wall side of the Staircase, Over Parapet walls of Corridors and Terrace hand rail, wherever required: Providing, fixing, fabricating Hand rail made of 50mm (O.D) dia and 2.5 mm wall thickness Stainless steel (grade 304) pipe matt finish as hand rail fixed with Stainless steel pins, dowels, clamps, rubber, screws, gaskets etc. including required jointing and sealing with suitable arrangement as per approval of Engineer-in-charge all complete as per detail drawing.
3.3	uPVC Solid Core Door Frames & Shutters	**for Mumty and Shaft Doors etc, as per approved Drawings:** UPVC solid core frame & openable Door shutter with solid/Glazed/Louvered of approved make as per the approved shop drawings and specifications as mentioned at Particular Specifications and as per the directions of the Engineer in Charge.

3.4	UPVC Doors, Windows & Ventilators with frame	**All Windows, Ventilators** Design, Providing and Fixing, uPVC factory made, white colour casement/sliding window and door made of extruded profiles. Profiles of frames and sash will be mitered cut and fusion welded at all corners including drilling of holes for fixing hardware and drainage of water etc., making arrangement for fixing of hardware, EPDM gasket, galvanised steel profile of required thickness as per design to be inserted in required profile, frame shall be fixed to the wall with required sizes of long fasteners of approved make, all complete including specified heat strengthened glazing, hardware, friction grip hinges, fittings etc. as per architectural drawings and Particular Specifications and direction of Engineer-in-charge. For Windows - 3 track Sliding windows with 2/4 glass + 1/2 mosquito mesh shutters (glass fibre mesh shall be of approved gauge and make) (Outer frame -3 Track minimum 102 mm wide and minimum sash size 38 x 53mm. The wall thickness of the profiles shall be minimum 2.00 mm) For Ventilators - Toilet Duct Ventilator of adjustable frosted glass louvers. The uPVC box sections shall be of minimum size 88x48 mm with minimum wall thickness as 2.00 mm. The size of glass louvers shall be 60mm wide x 5mm thick). Provision for fixed glazing portion shall be with 5 mm frosted glass of required size. Wherever required opening in the ventilator for exhaust fan shall be made Providing specimen and conducting full Scale Mock-up test of UPVC Door/window system (item no. 8.54 above) at an approved independent Laboratory in India as specified in Tender Document etc. all complete as per directions of Engineer-in-Charge. The mock-up test shall be done for approved Door/window of Faculty/Staff Housing Buildings at required floor level. The size of the sample shall be 4.50 m length x 2.40 m high.
		The UPVC windows shall be designed and provided as per the wind pressure at different levels and heights and accordingly the required sections of UPVC and reinforcement shall be provided. The UPVC window shall be tested at Façade India Testing Inc. and passed all required parameters as per relevant ASTM & IS Codes.
3.5	Glazing of windows, Ventilators and openings	Glazing shall be with 6mm / 8mm thick toughenedglass (depending on size of opening). Toughened frosted glass shall be used for ventilators. Opening of windows should be sufficient enoughas per ECBC norms for day light during day time. The properties of glass should meet the ECBC & NBC 2016 requirement and including Stainless Steel (SS-304 grades)Friction stays 125 mm UPVC handle for each leaf, all complete, as per direction of Engineer-In-Charge.

3.6	Curtain rod	Powder coated SS 304 Curtain rods of 25 mm dia of 22 gauge with finials as approved by the Engineer in charge including required supports all complete.
3.7	Fire rated Doors	**All Fire Escape areas as per the approved drawings and as per the direction of Engineer in charge.** Providing, supplying and fixing internal metal fire rated doors (double/ single leaf) of approved make with Fire Resistant 120 minutes rating as per manufacturers/particular specifications and similar to the prototype tested by CBRI, Roorkee & Certificate issued thereof (as per IS:3614 Part-2, 1992) with overall size as per requirement. Door frames shall be made with 1.6mm thick galvanised steel sheet pressed to double rebate profile of size 143x57mm and filled with foam concrete. Door shutters shall be made with 1.2mm thick galvanised steel sheet pressed formed to provide fully flush double skin panel which shall be not less than 46mm thick with lock seam joints at style edges. The internal construction of panel shall be filled with insulating mineral wool with reinforcement at top, bottom and around stiles. The door shutters shall be provided with provision for vision panel of required size (as per Architectural drawings) with 6 mm thick clear toughened Boro Silicate glass of Schott / Pyran make to give120 minutes fire rating. The item shall also include provision for required iron mongery, shutter and frame which shall be finished with Zinc Phosphate storing primer & Polyurethene paint etc. complete. The shutter shall be fixed to frame with 5 knuckle, 2 bearing butt hinges of size 100x75x3mm of DORMA make or approved equivalent make in SS 304 and in Satin Stainless steel as per EN 1935, CE marked with 4 Nos hinges for each shutter, all complete and as per the drawing and direction of Engineer-In-Charge.
3.8	Aluminum louvers	**For Covering the Shafts in Elevations:** Providing, fabricating and fixing in position louvers system in facade with 100mm x 15mm x 1.2mm Aluminium louvers(C-section), as detailed and approved in shop drawing (based on concept architectural drawings). The louvers shall be fixed to aluminum framing system consisting of aluminium tube (mullions) 63 x 38 x 2 mm and aluminum clip of size 36mm x 31mm x 1mm; The mullions shall be fixed to RCC beam with GI bracket of 50mm x 50mm x 5mm, 50mm long with M10 size anchor fasteners. All aluminium section / louvers to be polyester powder coated (60 microns) all around in approved shade and colour. All items shall be strengthened and lapped as required. Nos. of aluminium mullions shall be as per the drawing. The aluminium clip and louvers shall be fabricated as per profile shown in the drawing. Prior to start of work contractor shall submit detailed full scale shop drawings including plan, elevation and detail of fixing with structure for approval of the Engineer in-charge. Samples of each item on full scale as directed by the Engineer in-charge shall be submitted for approval. Work shall be commenced only on approval of shop drawing by Engineer in Charge.

4.	**Flooring, Dado, Cladding, Jambs, Sill and Counters:**	
4.1	Flooring	• All rooms: Full Body / Double Charged Homogenous Vitrified floor tiles of approved size 600x600 mm / 900x900mm laid with adhesive/Cement Mortar and with spacers, groove filled with tile epoxy/cement grout of approved brand, as per the approved drawings and as per the direction of Engineer in charge. • Common Corridor areas and Lift Lobbies: - 18mm thick Granite flooring as per the approved drawings and as per the direction of Engineer in charge. • Staircase Portion: - 18mm thk Polished Granite stone slab for Threads and Risers with single piece with edge nosing with gripping as per the approved colour, design & pattern as per the approved drawings and as per the direction of Engineer in charge. • Toilets, Balcony Flooring - Antiskid Vitrified floor tile of minimum size 300x300 mm laid with adhesive/Cement mortar and with spacers, groove filled with tile epoxy grout of approved brand and shall be executed as per the approved drawings and as per the direction of Engineer in charge. • Electrical room, store rooms and other common rooms: Antiskid vitrified tile flooring with rubber mats in front of electrical panels as per the approved drawings and as per the direction of Engineer in charge.
4.2	Skirting / Dado	**Skirting:** All rooms and corridors/ common areas - Specifications for materials of skirting will be same as per flooring with matching joint pattern having 100mm height laid with adhesive as per the approved drawings and as per the direction of Engineer in charge. . **Toilets Dadoing:** Providing and laying Vitrified tiles 300x450 mm up to Slab / False Ceiling Level of 1st quality conforming to ISO 15622 of approved make in all colours & design patterns, for dado fixing with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness, including grouting of joints etc, all complete as per the approved drawings and as per the direction of Engineer in charge.
4.3	Cladding on Lift Well	Cladding shall be done to front face of Lift well with 18 mm thick Granite slabs in approved shade, colour and pattern as per the approved drawings and as per the direction of Engineer in charge.

4.4	Cement Flooring	**At External Development as per the approved Drawings.** 1) VDF Flooring: M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications, approved drawings and as per the directions of Engineer-in-charge.
4.5	Granite for Door Jambs, Windows Sill, Balcony toe wall/ common area parapet	18 mm thick Pre moulded and Pre polished granite slab of colour & shade as per the approved drawings and as per the direction of Engineer in charge.
5.	**ROOFING :**	Toilets - Calcium silicate board of size 600x600mm (finished with PVC lamination / painted) with suitable frame work complete as per manufacturer's specifications.
5.1	False Ceiling with Thermal Insulation	**At 6th Floor (Top Floor) All Rooms of Hostel:** False ceiling with Plain gypsum board with thermal insulation by using resin bonded glass wool backing. The detailed specification is as mentioned below Providing and fixing False Ceiling with 12.5 mm thick tapered edge gypsum moisture resistant board including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound, jointing tapes, finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge

5.2	**Canopy and Open to Sky areas in the Building**	Providing and fixing 10mm thick multicell polycarbonate sheet conforming to IS or relevant standards; supported on MS pergola (MS pergola shall be measured and paid separately in relevant item); polycarbonate sheets to be UV protected; Panel Width shall be such as to ensure best performance for wind uplift, vibration and visual appearance. Polyster powder coated aluminium Snap-on connector of approved shade to interlock the panels shall have a grip-lock double tooth locking mechanism. The fixing shall be with approved anchor fasteners complete with jointing, sealing with approved silicon sealant and EPDM packing etc. The rate shall include the cost of above specified materials , fixing of the sheet, scaffolding and labour charges for working at all levels, leads and heights.
6.	**FINISHING :**	
6.1	Plastering on walls (Internal & External):	**On CC Block work filler walls:** Cement plaster of minimum 15mm thick shall be provided (with chicken mesh on entire area, plaster mesh of aperture of 15mmx15mm made of 1.3mmx0.35mm GI strips of at junctions of RCC & masonry, fibre mesh at corners) wherever solid CC block constructed like ledge walls in toilets, supporting pedestals (or) Upstands for service lines on terrace etc., **On Precast Surface:** Plastering may not be required as the same being factory made, surface of even, smooth and uniform characterization is noted. However, the same needs to be suitably rectified in case of any deficiency. Necessary drip courses shall be provided in Sunshades, Balcony, Projecting Roof, Beams etc.
6.2	Internal finishing:	All the internal surfaces including ceiling shall be finished with one coat of cement primer, two or more coats of cement based wall putty, two or more coats of premium acrylic emulsion paint with low VOC of Asian Paints on equivalent. However, wherever false ceiling is provided, slabs shall be treated with one coat of cement primer and including applying additional coats wherever required to achieve even shade and colour, complete as per directions of EIC
6.3	External finishing:	External wall surface shall be finished with cement based wall putty in two coats and 2 or more coats of premium acrylic smooth weather proof with silicone additives / texture exterior paints of Apex Ultima Exterior of Asian Paints or equivalent over a coat of cement premier or textured exterior paint in Two or more coats applied over and including priming coat of exterior primer as per the approvals and directions of Engineer-in Charge

6.4	Thermal Insulation of External Walls inside the Flats	Inner face of External walls of the Rooms shall be thermally insulated with resin bonded rock wool covered with wall paneling made of cement fiber board fixed on G.I section as per the below mentioned specifications: Thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m3,50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawel plug & washers and held and in position by criss cossing GI wire etc. complete as per directions of Engineer-in Charge Fixing, in position concealed G.I. section for wall paneling using 8 mm thick cement fibre board (as per IS : 14862) fixed on the 'W' profile (0.55 mm thick) having a knurled web of 51.55 mm and two flanges of 26 mm each with lips of 10.55 mm, placed @ 610 mm C/C in perimeter channel having one flange of 20 mm and another flange of 30 mm with thickness of 0.55 mm and web of length 27 mm. Perimeter channel is fixed on the floor and the ceiling with the nylon sleeves @ 610 mm C/C with fully threaded self-tapping dry wall screws. Board is fixed to the 'W' profile with 25 mm countersunk ribbed head screws @ 200 mm C/C., all complete as per the drawing & directions of engineer-in-charge, the joints of the boards are finished with specially formulated jointing compound and 48mm wide jointing tape to provide seamless finish especially alround window/door opening areas.
7.0	**Internal Sanitary Water Supply Installations :**	
7.1	W.C. with flushing system	**In all Toilets:** Providing and fixing at all floors Vitreous china Wall hung European WC of approved make and colour of HINDWARE make or approved equivalent make, with Concealed flushing cistern with 10 liters capacity, dual flush fittings, seat cover, CI chair bracket, mounting bolts, WC connector, angle cock of Jaguar make Model No. 23059 or approved equivalent make, 15 mm, 450 mm length braided hose connection pipe, with all fittings and fixtures complete, including cutting and making good the walls and floors by using of silicon sealant, wherever required, all complete as approved and directed by Engineer In Charge.
7.2	Hand Shower (Health Faucet)	**In all Toilets:** Providing and fixing ABS Chrome plated Brass Hand Shower (Health Faucet) of Jaguar make Model no. 563 GA or approved equivalent make, CP Angle valve Jaguar make Model no. 5053 or approved equivalent make, as approved by Engineer - In - Charge, including 8 mm dia, 1 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per directions of the Engineer-in-charge.

7.3	Urinals	Half stall urinals (bucket type) of approved make with push cock of approved make and design along with 16mm thick black granite partition of approved shape and pattern.
7.5	Stainless Steel Toilet paper Holder	**In All Toilets**: Providing and Fixing Stainless Steel Toilet Paper Holder of Jaguar make model no. ACN -1151N or approved equivalent make, fixed on Wooden / PVC Cleats with CP Screws etc. All complete as per directions of the Engineer-in-charge.
7.6	Internal Water Supply	Providing and Fixing Chlorinated Polyvinyl Chloride (CPVC) Pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer-In-Charge. With Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :
7.7	Angle Cock	Providing and fixing Jaguar make C.P. brass angle valve for basin mixer, geyser points and all other places wherever required. C.P. brass angle valve of approved quality conforming to IS:8931
7.8	Water Meter	Providing and fixing enclosed type water Metre (bulk type) conforming to IS: 2373 and tested by Municipal Board complete with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately)
7.9	Grease Trap	Constructing brick masonry grease trap chamber with FPS bricks of class designation 3.5 in cement mortar 1:4 (1cement:4 coarse sand) R.C.C top slab of 150mm thickness with 1:2:4 mix (1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) external plastering to a height of 30 cm on all sides & inside plastering with 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4(1 cement:2 coarse sand:4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement, two RCC baffle walls of 150 mm thick, medium duty SFRC covers and frame of 60 x 60 cm etc. complete
7.10	Butterfly valves	'Providing and fixing C.I. butterfly valves, water end type class PN 1.6 as per I.S:13095 or BS:5155 with integrally moulded linear of nitrile or EPDM, SS Disc and steam lever operated including necessary nuts, bolts, gaskets, flanges etc. All complete and as per the directions of the Engineer - In - Charge.

7.11	Puddle Flange	Providing and fixing 600 mm long MS hot dip galvanized Puddle Flange fabricated out of 6 mm thick MS plates of suitable size and pipe shall be confirming to IS:1239 heavy class pipes properly fixed in walls / top slab of tanks. The entire fittings shall be hot dipped galvanized after fabrication. Length shall be minimum 600 mm or wall thickness plus 200 mm on either side (whichever is more). Each Puddle shall be flanged on outer side for connection of pipe / fittings all complete as per directions of Engineer-In-Charge.
7.12	Mirror	Providing and fixing 6mm thick bevelled edge Mirror fixed on 12mm thick marine ply, including bevelling of mirror edges, countersunk Stainless steel screws, wood beading and edging etc. all complete as per drawings and as per direction of Engineer in-charge
8.0	**DRAINAGE SYSTEM:**	
8.1	RCC Pipes	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement: 2 fine sand) including testing of joints etc. complete: Road Crossings: For Road Crossings NP3 Class (Heavy duty) R.C.C. pipes shall be provided with Concrete Encasement.as per the approved drawings and as per the directions of Engineer in Charge
8.2	Manholes	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm Nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand : 8 graded stone aggregate 40mm Nominal size), inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm Nominal size) finished with a floating coat of neat cement complete as per standard design : Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) : With FPS bricks of class designation 3.5 The Depth of the Manholes shall be as per the actual site requirement w.r.to the invert levels of the pipes, gradients etc. as desired for smooth of flow of drainage.
8.2.1	Gully Traps	Constructing Gully Traps wherever required as per the approved drawings and shall be confirmed to the CPWD Specifications.

8.3	Soil & waste pipes and fittings	Double Stack system shall be adopted. One pipe only to carry the soil waste from WCs and another pipe only to carry the waste water from Kitchen, bath, Wash basins, Utility& Wash, balcony Areas. Wherever AC provisions shall be made in the flats and those AC drain pipe outlets of all floors/flats shall be connected to SWR PVC vertical stack as desired. Providing and fixing at all floors Type B - SWR PVC pipes including all fittings such as plain and door bends, tees, elbows, equal and unequal junctions, heel rest sanitary bends, collars etc. confirming to IS13592, IS 14735, including jointing with solvent and providing necessary supports, clamps/MS brackets at specified intervals. The joints of pipe and fittings shall be of drip seal jointing in exposed areas like in shafts etc. and pasted type (solvent) for all other locations all complete and as per directions of Engineer - in – charge
8.4	Manhole Covers	Supply and fixing of C.I Manhole frame and cover for water tanks, sumps and all other places wherever required, fixing at all heights, leads and all other materials required for fixing. All complete as per directions of Engineer in Charge.
8.5	**Water supply line :**	
8.5.1	External pipe lines	CPVC Pipes as per IS 15778 and HPDE pipes as per IS 4984 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.2	Internal piping & fittings– Concealed work	CPVC Pipes as per IS 15778 shall be laid as per approved plumbing drawings and as per the Directions of Engineer in Charge.
8.5.3	Painting of Pipes: a) Exposed on buildings	Synthetic enamel paint as per the Directions of Engineer in Charge.
8.5.4	Fittings :	Pillar cocks, angle cocks, 2way bib cocks with health faucet, long body bib cocks, wall mixture, overhead shower, towel rod of 600mm, corner glass shelf along with other miscellaneous fittings like bottle trap, floor trap, waste couplings etc.; as per approved make and model and as per the direction of Engineer – in – Charge. (The above are indicative only. However, the contractor has to provide all fixtures and fittings for functional suitability). Note: The fixtures and fittings shall be of standard equivalent to Jaguar make Florentine series or more only.

8.5.5	Terrace Water Tank	1 lakh litres Capacity RCC water storage tank (Service tank) with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete. In addition to this, RCC water storage tank (firefighting) of suitable capacity as shall be provided exclusively for firefighting and the inlet of service tank shall be connected from this firefighting tank in such a way that the over flow firefighting shall flow to the service tank (this means firefighting storage tank remains always full).
8.5.6	UG Sump	1 lakh litres Capacity RCC UG water tank with suitable water proofing treatment with float valve, scour valve, CI cover with locking arrangement etc., complete as per the approved drawings and a per the direction of Engineer in Charge.
8.5.7	Rain water pipes	Providing and fixing UPVC rain water pipes of 6 kg/cm2 conforming to IS: 4985 including all fittings such as with or without access door, bends, junctions, cowls, offsets, etc., and jointing with solvent cement and excavation, refilling and disposal of surplus earth, including cutting holes in walls and floors, excavation, refilling and disposal of surplus earth wherever required and making good the same, complete as directed by the Engineer-in-Charge.
8.5.8	External Service Lines towards Water Supply, Drip Irrigation and Sewerage	Water Supply: - DI pipe lines of suitable diameter from UG sump or HDPE pipe lines of suitable diameter from nearest line to Service tank of each building with control valves complete as per directions of Engineer-in-charge (the system should be conducive to Hydro Pneumatic system to be provided for all buildings). Sewerage: - NP2 pipes of suitable diameter to be laid from each building to the nearest sewerage line / STP complete and NP3 pipes encased in concrete wherever Road Crossings as per directions of Engineer-in-charge. Drip Irrigation / Sprinkler: - CPVC pipe lines of suitable diameter with control valves, sprinkler system complete for horticulture operations specified. (Note:- The External Service Lines towards Water Supply, Drip irrigation/ sprinkler and Sewerage shall be executed as per relevant specifications attached.)
9.0	**Accessibility of Buildings**	All the blocks shall be accessible by differently abled persons with Ramps, SS Railing, Grab bars etc, as required as per GRIHA norms. Ground floor shall have at least one Divyang Toilet for differently abled people.

10.0	**External Development works**	
10.1	Paver Blocks	Providing and laying 80mm thick factory made cement concrete interlocking paver block of M -40 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of fine sand, filling the joints with fine sand etc. all complete as per the direction of Engineer-in-charge.
10.2	Kerb Stone and Saucer Drains	Providing and laying at or near ground level factory made kerb stone of M 25 grade cement concrete in position to the required line, level and curvature jointed with cement mortar 1:3 (1 cement: 3 coarse sand) including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm) including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge Providing and laying in position saucer drain & drain cover made of precast cement concrete units of specified profile and measurements, with key and of other shapes as required in site as per drawing in M 30 grade concrete seated on PCC foundation of M-10 grade including placing and joining with CM mortar of mix 1:4 (1Cement : 4 grade coarse sand) as per the approved Drawings for Saucer drain and other relevant approved drawings and as per the directions of Engineer-in-charge.
10.3	GSB	Construction of granular sub-base by providing close graded Material conforming to specifications, mixing in a mechanical mix plant at OMC, carriage of mixed material by tippers to work site, for all leads & lifts, spreading in uniform layers of specified thickness with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per specifications and directions of Engineer-in-Charge. a)With material conforming to Grade-I (size range 75 mm to 0.075 mm) having CBR Value-30.
10.4	CC Roads	Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge.
10.5	Planter Boxes	CC Solid Block Planter boxes with 18 mm thick Granite coping shall be constructed as per the approved drawings and as per the instructions of Engineer in Charge.
11.0	**Open Paved area around the Building**	60 mm thick factory made cement concrete Interlocking paver block of M30 grade as per Arch drawing and approved development plan over 50 mm thick sand cushion over 150 mm thick Granular sub-base (GSB) and over well compacted earth.

12.0	**Miscellaneous civil and beautification works**	Miscellaneous works like pathways connecting between various blocks, pergolas, Flower beds, open staircases, approach ramps etc. shall be done as per the approved drawings and as per the Direction of Engineer in Charge.
13.0	**Horticulture**	The works shall be done as per specifications mentioned at "Particular Specifications"
14.0	**FRP Grating**	• Platforms in shafts: FRP grating supported on suitable size MS angle supports all round the grating as per the approved drawings and as per the direction of Engineer in charge. And as per specifications and details mentioned at "Particular Specifications".
16	**Façade Cleaning System**	Providing safety harness Anchoring point portable **floor mounting jibs** (one pair of jibs for each building) made up of Structural Aluminium alloy 150mm (I - section) for anchoring at various points and levels around perimeter of the building (RCC terrace slab mounted). A pair of jibs shall be capable of carrying two man cradle weight and a safe working load of 180 kg (2persons weight@70 kg each plus additional load of 40 kg for tools and plants) . The jib shall have a minimum arm length of 1.0 metre and contain a jib hanger for suspending the cradle. The jib shall be equipped with end stoppers to restrict hanger movement. It shall also be equipped with gravity lock at the rear end and stopper at the cantilever end etc., all complete and as directed by the Engineer-in-charge. The contractor shall submit the shop drawings of the Jibs before procurement, for approval of EIC

NOTE: The above list is only indicative and not exhaustive. The contractor has to plan and execute all the missing fittings / fixtures / item to make the premises to the full use. Nothing extra shall be paid on this account.

COMMON SPECIFICATIONS TO ALL BUILDINGS

GENERAL CONDITIONS

General specifications for construction:

1. Several documents forming the Bid are to be taken as mutually complementary to each another.

2. Except for the items, for which particular specifications are given or where it is specifically mentioned otherwise in the description of the items, the work shall generally be carried out in accordance with the following:

Civil work:

1. CPWD Specifications 2019 Volume- I

2. CPWD Specifications 2019 Volume- II

3. MORTH specifications (5th Edition) published by IRC with upto date amendments.

All above specifications shall be applicable with corrections slips up to the last date of submission/ uploading of Bid.

All above specifications hereinafter shall be referred as CPWD specifications. Wherever CPWD Specifications are silent, the latest BIS Codes/Specifications, National Building Code 2016, MoRTH specification or any other specification shall be followed.

If there is any difference or discrepancy between the description of items as given in the schedule of quantities, particular specifications for individual items of work (including special conditions) and BIS Codes etc., the following order of preference shall be followed:

a) Description under Scope of work.

b) Architectural Drawings and Schedule of finishes.

c) Schedule of Quantities.

d) Technical Specifications.

e) CPWD Specifications, Civil, Electrical & Mechanical and Horticulture with up to date corrections as on last date of submission of Bid.

f) Indian Standard Specifications of B.I.S.

g) National Building Code 2016

h) Manufacturers specifications.

i) Sound Engineering practices.

j) Decision of Engineer-in-charge.

A reference made to any Indian Standard Specifications in these documents, shall imply to the latest version of that standard, including such revisions/ amendments as issued by the Bureau of Indian Standards upto last date of submission of Bids. The Contractor shall provide and make it available at his own cost all such publications of relevant Indian Standards applicable to the work at site, with correction slips upto last date of submission of Bids.

GENERAL:

1. The Bidder shall acquaint himself with the proposed site of work, its approach roads, working space available etc. before quoting his rates and no claim on this account shall be entertained by the department.

2. The Contractor(s) shall get himself acquainted with nature and extent of the work and satisfy himself about the availability of materials from kiln or approved quarries for collection and conveyance of materials required for construction.

3. Contractor shall take all precautionary measures to avoid any damage to adjoining property. All necessary arrangement shall be made at his own cost.

4. The Contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the occupiers of adjacent properties and to the public in general and to prevent any damage to such properties and any pollution of smoke, streams and water-ways. He shall make good at his cost and to the satisfaction of the Engineer-in-charge, any damage to roads, paths, cross drainage works or public or private property whatsoever caused thereon by the Contractor. All waste or superfluous materials shall be disposed of by the Contractor without any reservation entirely to the satisfaction of the Engineer-in-charge. Nothing extra shall be paid on this account.

5. Utmost care shall be taken to keep the noise levels to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of building/adjacent properties.

SETTING OUT:

1. The Contractor shall establish, maintain and assume responsibility for grades, lines, levels and bench marks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions to the Engineer-in-charge before commencing work. Commencement of work shall be regarded as the Contractors acceptance of such grades, lines, levels and dimensions and no claim shall be entertained at a later date for any errors found.

2. If at any time, any error in this respect shall appear during the progress of the work, the Contractor shall, at his own expense rectify such errors, if so required to the satisfaction of the Engineer-in-charge.

a) Though the site levels may be indicated in the drawings, the Contractor shall ascertain himself and confirm the site levels with respect to GTS (Global Trigonometrical Survey) Bench mark from the concerned authorities.

b) The approval by the Engineer-in-charge of the setting out by the

Contractor shall not relieve the Contractor of any of his responsibilities.

c) The Contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignment, the level and correctness of every part of the work and shall rectify effectively any errors or imperfections therein. Such rectifications shall be carried out by the Contractor at his own cost to the instructions and satisfaction of the Engineer-in-charge-in- Charge.

d) The rates quoted by the Contractor are deemed to be inclusive of site clearance, setting out work, profile, establishment of reference bench mark, spot levels, construction of all safety and protection devices, barriers, earth embankments, preparatory works, all testing of materials, working during monsoon, working at all depths, height and locations etc. unless specified in the schedule of quantities.

Temporary Water, Electricity & Telephone Connections:

1. The Contractor shall make his own arrangements for water and for Electricity by obtaining electric connections and by providing diesel generators of adequate capacity if required and make necessary payments directly to the State Govt. departments concerned. Contractor shall get the water tested from laboratory approved by the Engineer-in charge at regular interval as per the CPWD Specifications 2019. All expenses towards collection of samples, packing, transportation, testing charges etc. shall be borne by the Contractor.

2. The Contractor shall arrange electricity at his own cost for testing of the various electrical installations as directed by Engineer-in-charge and for the consumption by the Contractor for executing the work. Also all the water required for testing various electrical installations, fire pumps, wet riser / firefighting equipments, fire sprinklers etc. and also testing water supply, sanitary and drainage lines, water proofing of underground sump, Terrace tanks, water proofing treatment etc. shall be arranged by the Contractor at his own cost. Nothing extra shall be payable on this account.

3. Arrangement of temporary telephone, Internet, water and electricity connections required by Contractor, shall be made by him at his own cost and also necessary permissions shall be obtained by him directly from concerned authorities, under intimation to the Department. Also, all initial cost and running charges, and security deposit, if any, in this regard shall be borne by him. The Contractor shall abide by all the rules/ bye laws applicable in this regard and he shall be solely responsible for any penalty on account of violation of any of the rules / byelaws in this regard. Nothing extra shall be payable on this account.

4. The Contractor shall be responsible for maintenance and watch and ward of the complete installation and water / electricity meter and shall also be responsible for any pilferage, theft, damage, penalty etc. in this regard. The Contractor shall indemnify the Department against any claim arising out of pilferage, theft, damage, penalty etc. whatsoever on this account. Security deposit for the work shall be released only after No Dues Certificates are obtained from the local Authorities from whom temporary electric/ water / telephone connection have been obtained by the Contractor. Nothing extra shall be payable on this account.

5. The Department shall in no way be responsible for either any delay in getting electric and/or water and/or telephone., Internet connections for carrying out the work or not getting connections at all. No claim of delay or any other kind, whatsoever, on this account shall be entertained from the Contractor. Also contingency arrangement of stand-by water & electrical supply shall be made by the Contractor for smooth progress of the work so that work does not suffer on account of power failure or disconnection or not getting connection at all. No claim of any kind whatsoever shall be entertained on this account from the Contractor. Nothing extra shall be payable on this account.

EXECUTION:

1. The work shall be carried out in accordance with the Detailed Architectural drawings and structural drawings, to be prepared and submitted by architectural/structural consultants engaged by the Contractor and approved by the Engineer-in-charge. Before commencement of any item of work the Contractor shall correlate all the relevant architectural and structural drawings, nomenclature of items and specifications etc. issued for the work and satisfy himself that the information available there from is complete and unambiguous. The figures and written dimension of the drawings shall be superseding the measurement by scale. The discrepancy, if any, shall be brought to the notice of the Engineer-in- charge before execution of the work. The Contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information and no claim whatsoever shall be entertained on this account.

2. The Contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other Contractor(s) or by the Engineer-in-charge and shall as far as possible arrange his work and shall place and dispose off the materials being used or removed, so as not to interfere with the operations of other Contractor & simultaneously working or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.

3. The cost of work shall be inclusive of pumping out or bailing out water encountered in foundation, if required, for which no extra payment will be made. This will include water encountered from any source, such as rains, floods, and sub-soil water table being high due to any other cause whatsoever.

4. The foundation trenches shall be kept free from water while works below ground level are in progress.

5. The work shall be executed and measured as per metric dimensions given in the Schedule of quantities, drawings etc. (F.P.S. units

wherever indicated are for guidance only).

6. Samples including brand /quality of materials and fittings to be used in the work shall be got approved from the Engineer-in-charge, well in advance of actual execution and shall be preserved till the completion of the work. Nothing Extra shall be paid on this account.

7. Unless otherwise specified in the schedule of quantities, the rates quoted by the Contractor for all items of the work shall be inclusive of cost of all labour, material, leads & lifts, tools & plants, mandatory taxes direct and indirect costs and other inputs involved in the execution of the item. Nothing extra shall be paid on this account.

8. Royalty or Seigniorage fee for all the boulders, stone aggregate, brick aggregate, shingle, coarse or fine sand, earth, gravel, bajri etc. collected by him for the execution of the work, and payment need to be done directly to the Revenue Authority or authorized agent of the State Government concerned or Central Government. Further, the Contractor needs to submit proof of submission of full royalty to the State Government or local authority. Nothing extra shall be payable on this account.

9. Any cement slurry/bonding material added over base surface for continuation of concreting for better bond is deemed to have been built in the items and nothing extra shall be payable and no extra cement considered in consumption on this account.

10. Unless otherwise specified in the contract, No payment shall be made for any damage caused by rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The Contractor shall be fully responsible for any damage to the Govt. property and work for which the payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The Contractor shall be fully responsible for safety and security of his material, T&P, Machinery brought to the site by him.

11. The Contractor shall be required to protect the flooring work with suitable material till handing over of the building. Nothing extra shall be payable on this account.

12. The Contractor shall provide for adequate number of garbage bins around the construction site and the workers facilities and will be responsible for the proper utilization of these bins for any solid waste generated during the construction. The Contractor shall ensure that the site and the workers facilities are kept litter free. Separate bins should be provided for plastic, glass, metal, biological and paper waste and labelled in both Hindi and English with suitable symbols.

13. The Contractor shall be responsible for the watch and ward / guard of the buildings safety, fittings and fixtures provided by him against pilferage and breakage during the period of installations and thereafter till the building is physically handed over to the department. No extra payment shall be made on this account.

14. Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar service encountered in the course of the execution of work shall be protected against the damage by the Contractor at his own expense. In case the same are to be removed and diverted, the same shall be payable to the Contractor unless specified in the item or specifications concerned to that item. The Contractor shall work out the cost and submit to Engineer-in-charge for approval. The Contractor shall not store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services.

15. The Contractor(s) shall obtain all requisite permission/ licenses from the Municipality, police and other authorities that may be required as per law for temporary constructions, enclosures etc. Contractor(s) shall pay necessary charges on account of these operations in executing the contract for which nothing shall be paid. He shall make good any damage to the property whether public or private and shall maintain lights either for illumination or for cautioning the public at night. The Contractor(s) shall erect the barricading as per norms mentioned in the Bid document or higher height enclosing the area as per direction of Engineer-in-charge, and nothing extra will be payable on this account.

16. The Contractor(s) shall take instructions from the Engineer-in-charge regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed. The stacking shall take place as per stacking plan. However, if any change is required, the same shall be done with the approval of Engineer-in-charge.

17. Contractor(s) shall provide Permanent Bench Marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings.

18. The Contractor shall have to use properly designed barricading system of MS Framework with pre-coated Galvanised sheets to barricade the entire plot premises and the cost of same deemed to be inclusive in the overall contract cost. The height of such barricading system should confirm to the latest CPCB/SPCB and NGT Guidelines.

Such barricading shall only be removed from the premises after completion of the work.

19. No foreign exchange shall be made available by the Department for importing (purchase) of equipment, plants, machinery, materials of any kind or any other items required to be carried out during execution of the work. No delay and no claim of any kind shall be entertained from the Contractor, on account of variation in the foreign exchange rate.

20. Water tanks, taps, sanitary, water supply and drainages pipes, fittings and accessories should conform to the specifications provided in Bidding documents, if CPWD Specifications are not available, NBC – 2016, IS codes shall be followed. The Contractor(s) should engage approved, licensed plumbers for the work and get the materials (fixtures/fittings) tested, by the municipal Body/Corporation authorities wherever required at his own cost. The Contractor(s) shall submit for the approval of the Engineer-in-charge- in-Charge the name of the plumbing Agency proposed to be engaged by him.

21. The Contractor shall get the water tested with regard to its suitability for construction and conforming to the relevant BIS Code at 3 months frequency or on change of source of water whichever is earlier. The Contractor shall obtain written approval from the Engineer-in-charge before he proceeds by using the same for execution of work. The water testing charges shall be borne by the Contractor.

22. All materials obtained from Govt. Stores or otherwise shall be got checked by the Engineer-in-charge or his any authorized supervisory staff on receipt of the same at site before use.

23. All material shall only be brought at site as per programme finalized with the Engineer-in-charge-in- Charge. Any redelivery of the material not required for immediate consumption shall not be accepted and thus not be paid for.

24. All materials and fittings brought by the Contractor to the site for use shall conform to the samples approved by the Engineer-in-charge which shall be preserved till the completion of the work. If a particular brand of material is specified in the item of work in Schedule of Quantity, the same shall be used after getting the same approved from Engineer-in-charge. Wherever brand/quality of material is not specified in the item of work, the Contractor shall submit the samples as per approved list of brand names given in the Bid document/particular specifications for approval of technical sanctioning authority. For all other items, materials and fittings of

BIS Marked shall be used with the approval of Engineer-in-charge. Wherever BIS Marked material / fittings are not available, the Contractor shall submit samples of materials / fittings manufactured by firms of repute conforming to relevant specifications or BIS codes and use the same only after getting the approval. To avoid delay, Contractor should submit samples as stated above well in advance so as to give timely orders for procurement. If any material, even though approved by Engineer-in-charge is found defective or not conforming to specifications, shall be replaced / removed by the Contractor at his own risk & cost.

25. The day to day receipt and issue accounts of different grade/brand of cement shall be maintained separately in the standard Performa by the Contractor which shall be periodically checked by the Engineer-in- charge or his authorized representative.

26. Cement bags shall be stored in two separate godowns, one for tested cement and the other for fresh cement (under testing) to be constructed by the Contractor at his own cost as per sketches given in C.P.W.D Specifications – 2019 Vol. I to II with upto date correction slips having weatherproof roofs and walls. The size of the cement godown is indicated in the sketch for guidance. The actual size of godown shall be as per site requirements and nothing extra shall be paid for the same. The decisions of the Engineer-in-charge regarding the capacity needed will be final. The authorized representative of the Contractor at the site of work is responsible for the issue of cement from godown according to the daily requirement with the knowledge of Engineer-in-charge or his authorized representative. The account of daily receipt and issue of cement shall be maintained in a register in the prescribed performa and signed daily by the Contractor or his authorized agent in token of its correctness.

27. For construction works which are likely to generate malba / rubbish, the Contractor shall dispose of malba / rubbish & other unserviceable materials and wastes at his own cost to the notified specified Municipal dumping ground only and under no circumstances these shall be stacked / dumped even temporarily, outside the construction premises

28. The Contractor shall arrange all the materials and manpower in advance for execution of work within stipulated period and as per Milestones specified in the Bid document.

29. The Contractor shall give performance test of the entire installation(s) as per the specifications & codes in the presence of the Engineer-in-charge or his authorized representative before the work is finally accepted and nothing extra what-so-ever shall be payable to

the Contractor for the test.

Scaffolding & Staging:

1 Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed, by the Contractor. The scaffolding shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc with adjustable and suitable working platforms to access the areas with ease for working and inspection. Single scaffolding system is strictly prohibited and shall invite necessary action. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. It shall be ensured that no damage is caused to any structure due to the scaffolding. Nothing extra shall be payable on this account.

2. Any particular structural system may involve requirement of scaffolding and staging for its execution. Since the choice of selection of structural system is left to the Contractor, the rates quoted by him are deemed to be included for the requirement of scaffolding and staging for that particular structural system. Hence nothing extra is payable for using scaffolding or staging or any other supporting system for a given structural system choosen by the Contractor.

3 The Contractor should submit the shop drawings of staging and shuttering for approval of Engineer-in-charge before actually commencing the execution of work under the item. Nothing extra shall be payable on this account.

Co-ordination with other agencies:

1 The Contractor shall executive his work so as not to interfere with or hinder the progress of the work being performed by other Contractors or by the Engineer-in-charge. As far as possible, he shall arrange his work and place, so as not to interfere with the operations of other Contractors or shall arrange his work with that of the others, in an acceptable and coordinated manner and shall perform it in proper sequence.

Procurement of materials:

1. All material shall only be brought at site as per program finalized with the Engineer-in-charge. Any pre-delivery of the material not required for immediate consumption shall not be accepted and thus not paid for.

2 The Contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work.

PERTICULAR SPECIFICATIONS FOR CIVIL WORKS

1.0 EARTH WORK: -

1.1 The work shall be done in accordance with CPWD Specifications - 2019 - Vol.I & Vol. II and National Building Code 2016 with upto date correction slips.

1.2 Excavation shall be undertaken to the width of the Basement / Retaining wall footing including necessary margins for construction operation as per drawing or directed otherwise. Where the nature of soil or the depth of the trench and season of the year, do not permit vertical sides, the contractor at his own expense shall put up the necessary shoring, strutting and planking or cut slopes with or without steps, to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer – in – charge.

1.3 Wherever the Black-cotton soil encountered in foundation of proposed structures and Road works shall be removed the soil in total for the designated designed depths and excavate further more depth of minimum 800mm and said block cotton soil shall be removed and refilled bottom layer of 500mm depth with good moorum soil and then further 300mm depth layer with crushed stone dust (CSS) and as per the directions of Engineer in Charge.

1.4 Exactions in Hard rock shall be carried out with suitable methods except blasting and as per the directions of Engineer in Charge.

1.5 The contractor shall make at his own cost all necessary arrangements for maintaining water level, in the area where works are under execution low enough so as not to cause any harm to the works or problems in carrying out with the execution. The water coming from any source, such as rains, accumulated rain water, floods, leakages from sewer and water mains, subsoil water table being high or due to any other cause whatsoever. The contractor shall make necessary provision of pumping, dredging, and bailing out water coming from all above sources and excavation and other works shall be kept free of water by providing suitable system approved by the Engineer-in-charge.

1.6 All the major excavation shall be carried out by mechanical excavator.

2.0 PRECAST CONCRETE PANELS AND ELEMENTS: -

1.0 Description of system

System of Construction adopted shall be Precast Large Concrete Panel system (PLCP) or modular system or a combination of both. Precast Large Construction Panel (PLCP) system shall consists of precast elements such as walls, beams, slabs, columns, staircase, landing and customized elements that are standardized and designed for stability, durability and structural integrity of the Building. All precast elements shall be of Solid Core. Scope includes design, strategic yard planning, production, lifting,

handling and transportation of precast elements, erection, grouting of joints, stitch concreting of slabs, application of sealants of external joints, waterproofing and testing all external joints and floor areas etc.

1.1 Type of precast elements

Solid Core Precast reinforced concrete elements

2.0 Design Considerations and Requirements

2.1 Structural Design Approach

The design of Precast high rise buildings shall resist seismic and wind induced lateral loads along with gravity loads.
The overall behaviour of a precast structure is dependent on the behaviour of the connections which must provide:

- Resistance to all design forces
- Ductility in case of excessive deformation
- Resistance to volume changes and related forces
- Adequate durability
- Required fire resistance
- Feasible production considerations
- Feasible construction considerations

2.2 Floor panels

The thickness of the floor panel shall be such that the serviceability requirements are satisfied. The minimum thickness of concrete slab shall be 125 mm or as per approved Design whichever is more. Panels shall be designed in accordance with the recommendations given in IS 456:2000 governing reinforcement and detailing.

2.3 Walls

Structural load bearing walls and Columns shall be designed as per codal provisions of IS 456:2000 and IS 13920: 2016 as applicable. Internal non load bearing walls shall be designed as plain concrete walls with nominal reinforcement for handling and erection stresses. The minimum thickness of solid core wall shall be 150mm or as per approved design, whichever is more.

2.4 Connections

The Precast Large concrete panal system shall be designed using the emulative detailing concept such that once the structure is completed it will behave similar to an equivalent RCC System and shall provide necessary strength and ductility. Wet connections shall be used to achieve the emulative behavior and shall be substantiated by approved test results

2.5 Design Philosophy

The precast structure shall be analysed as a monolithic one and the joints

in them designed to take the forces of an equivalent discrete system. Resistance to horizontal loading shall be provided by having appropriate moment and shear resisting joints. The individual components shall be designed, taking into consideration the appropriate end conditions and loads at various stages of construction. The components of the structure shall be designed for loads in accordance with IS 875 (Parts 1-5):1987 and IS 1893 (Part 1):2016. In addition, members shall be designed for handling, erection and impact loads that might be expected during handling and erection.

2.6 Structural system

The structural system of superstructure consists of precast construction of RCC wall, columns, slabs and beams. Floor slab shall be considered to act as a rigid diaphragm to transfer the lateral forces to walls/column. Ground Floor shall be designed keeping in view that the space is designated for parking, the structural system and elements shall be designed in such a way to optimize the utilization of space for parking.

2.7 Fire rating

Period of fire resistance of RCC buildings is based on NBC requirements. To meet the fire rating requirement, provision specified in IS 456:2000 shall be followed.

2.8 Design loads

2.8.1 Dead loads – the dead load shall comprise of self-weight of all the frames and shell elements modelled in the structure as well as self-weight of slabs.

2.8.2 Imposed loads – The imposed loads that are envisaged to act permanently (whichever applicable) are as follows:

2.8.2.1 **Waterproofing:** Shall depend on the thickness, slope and kind of material to be used for waterproofing.

2.8.2.2 **False ceiling/Internal partitions:** False ceiling load shall be calculated based on type of material and thickness using unit weights specified in IS 875(Part 1):1987. Partition loads shall be as per actuals.

2.8.2.3 **All structural elements:** Layout and size of elements shall be followed as per structural requirements.

2.8.4 Wind load

The loads due to wind shall be as per the provisions specified in IS 875 (Part 3) and IS 875-2015 Part 5.

2.8.4 Earthquake loads

As per seismic zone map of IS 1893 (Part 1) – 2016.

2.8.5 Special Loads

In addition, loads that might be expected during manufacturing of precast element and during transportation to the construction site shall also be considered in the design.

2.8.6 Load combinations

The various loads shall be combined as specified in IS 875 (Part 5):1987; whichever combination produces the most unfavorable effect in the building foundation or structural member concerned shall be adopted

2.9 Progressive Collapse

The building shall be designed to prevent progressive collapse as per the codal provisions of IS 15916:2011.

2.10 Analysis Methods

The analysis of the structure shall be carried out using ETABS software package. Appropriate loads and its combinations as per provisions specified in IS 875:1987 and IS 1893:2002, for most Unfavourable effects shall be chosen for design.

For Structural analysis of prefabricated elements including loads, analysis of shear walls, floors, walls, joints and accidental forces, reference may be made to IS 11447:1985.

2.11 Design Methodology

All structural elements shall be designed according to the Limit state method as specified inIS 456:2000.
For design of ties, key elements and joints etc. reference may be made to IS 15916:2011.

2.12 SUBMITTALS

- **Design Mix**: The Contractor shall submit for approval of the Engineer-in-charge the design mixes to be adopted in the work. Minimum grade of concrete shall be M 40 for all precast elements

a) Shop (Erection) Drawings:

i. Detail fabrication and installation of structural precast concrete units including connections at member ends and to each adjoining member.
ii. Indicate locations, plan views, elevations, dimensions, shapes, and cross sections of each unit, openings, support conditions and types of reinforcement, including special reinforcement.
iii. Indicate aesthetic intent including joints, rustications or reveals, and extent and location of each surface finish.
iv. Coordinate and indicate openings and inserts required by other trades.

v. Indicate location of each structural precast concrete member by same identification mark placed on unit.
vi. Indicate locations and details of joint treatment.
vii. Provide handling procedures, erection sequences, and for special conditions provide temporary bracing and shoring plan.

b) Comprehensive engineering design for all MEP services.

c) Material Test Reports

As per attached Mandatory tests by CPWD Specifications 2019

Material Test Certificates by manufacturers:

i. Cement.
ii. Non shrink Grout.
iii. Reinforcement Couplers
iv. Loop Boxes
v. Structural Sealants
vi. Reinforcing and Structural Steel.
vii. Admixtures.
viii. Bearing pads.
ix. Insulation.
x. Waterproofing Chemicals

d) Testing Agency:

Shall be an independent NABL accredited testing agency as approved by Engineer-in-charge.

3. Production of Precast Elements

3. 1 Factory Set up

The Precast elements shall be casted in a controlled factory condition. The factory shall be developed at or near the site which shall provide sufficient production capacity, storage and ease of transportation to meet the timelines of the project. The factory shall be provided with a captive batching plant of suitable capacity to cater the production needs and project timelines.

The factory shall have complete testing facility and shall follow the prescribed QA/QC procedures.

3.2 Moulds

Moulds for precast elements shall be of steel. For design of the moulds for various elements, special importance shall be given to easy de-moulding and assembly of the various parts. At the same time rigidity, strength and water tightness of the mould shall also be taken into consideration

3.3 Casting Concrete

The procedure for casting concrete shall be as follows:

i. Precast concrete elements shall be produced on horizontal/vertical, flat steel surfaced tilting tables.

ii. Prior to casting, electrical conduits and other required inserts / embedment shall be fixed in position and the mould treated with mould release agent.

iii Steel reinforcement shall be kept in position using adequate spacers to ensure correct position and concrete cover.

iv. After that side shutter sides shall be fixed. The concrete shall be transported from batching plant to the precast yard through transit mixer.

v. Thereafter, concrete shall be carried to mould by gantry crane with concrete bucket.

vi. During casting, table vibrators (as & when required) shall be used to achieve the best compaction. Top surface shall be finished with hand operated trowel which gives smooth finish.

vii. Care should be taken on embedded items while concreting.

After casting, all exposed surfaces shall be covered with a tarpaulin (as and when required) to avoid vaporization. Casted elements shall be de-moulded once the strength meets the design requirements and the units are then shifted to the stockyard. Curing shall be carried out for 7 days.

3.4 Curing

The curing of the prefabricated elements shall be done by the normal methods of curing by sprinkling water and keeping the elements moist. This can also be done in the case ofsmaller elements by immersing them in specially made water tanks. Curing shall be carried out for a period of 7 days.

3.5 Demoulding and Segment Marking:

a) The segment shall be demolded when the concrete attains required minimum concrete strength of 15 N/mm^2 or as per design requirement whichever is more

b) The side forms will be opened and the segment will be lifted from the mould by using crane with lifting arrangement that will be bolted or hooked to the precast segments.

c) The segments shall be inspected for surface defects, recorded and shall be rectified as per approved repair procedure.

d) All segments marking shall be done immediately after demolding using a labeling machine, to be marked with its mould number, followed by segment running number, date of casting.

e) All markings shall be made on the bottom centre of segment, which can be observed easily at the area.

f) The rejected segment (Segments which are rejected due to strength (Refer Cl. 16 and Cl. 17 of IS 456: 2000) or any other defects like major honeycombing or defect beyond repairs) shall be marked in red colour paint at the edges and shall be disposed.

3.6 Stacking of elements

3.6.1 Different types of slabs shall not be placed in one stack. Number of the elements per lot should not exceed man height.

3.6.2 The wooden runner shall be placed perpendicular to lifting points and the elements placed over runner.

3.6.3 In case of vertical stacking, the gap between the elements shall be 150 mm to 200mm.

3.7 Transportation of Elements

The process of transportation of precast elements from yard to site shall be as follows:

3.7.1 Loading of slab over trailer

1. It must be ensured that the identification mark on the slab should be the same as perdispatch list.
2. Any damage occurred during loading should be informed to the concerned authority.
3. The lifting clamps/clutches shall be fixed to the lifting beam at proper position.
   The lifting beam shall be placed over the precast elements and ensured that theclutches are locked properly before lifting.
5. Instruction regarding loading height, positioning of precast elements over the trailershall be followed as per capacity of trailer.
6. The wooden batten shall be placed in between the slabs at 500 mm from each end.
7. The slab shall not be overhanging from trailer.
8. The slab shall be tied firmly to the trailer by means of belt/rope as moving the loadwithout proper tie will cause damage.
9. Wall Panels shall be placed vertically and transported through "A"frame fixed vehicle.
10. While transporting elements vertically, the vehicle should be loaded equally on bothsides.

3.8 Unloading of slab from trailer and placing in site yard

1. Every slab shall be inspected for dimensions/identification mark and damages etc. priorto unloading at site.

2. The stacking area shall be levelled and hard enough for stacking the elements.
3. There shall be proper access for trailer movement.

3.9 Erection

The process of erection and installation of panels during the construction cycle by usingtower cranes shall be as follows:

1. Before starting erection a survey of the area to receive precast elements shall be doneto monitor any difference in dimensions or levels exceeding the tolerances. In case of unacceptable tolerances, necessary action shall be taken for rectification with the approval of Engineer In charge
2. Installation shall be done by tower crane with sufficient capacity. Panels shall be shifted from the stack rack/truck from yard to the nearest point of construction site and shall be kept above the truck during the construction or inside the storage racks as per the site situation.
3. The necessary access for the truck to reach the nearest point of the tower shall be prepared before starting erection of the panels.
4. Once the truck reaches the tower, chain and lifting clutch with required capacity andguide rope shall be attached to the precast panels to allow the workers to control the load to its final place.
5. As the elements are lifted to its final position above the cast-insitu slab/precast panel, vertical and horizontal alignment of the panel shall be adjusted. The gap between the element and adjusted elements shall be maintained as per the drawings within the allowable tolerances. Shims and spacers shall be used for levelling and adjustment.
6. Temporary propping jacks shall be provided for restraining the walls laterally until grouting.
7. After completion of fixing, alignment of the panels shall be checked again.
8. Minor damages, if any to the precast panels shall be repaired by approved materials as per directions of Engineer In Charge
9. After completion of installation and alignment, elements shall be handed over for inspection.
10. The joints between the precast wall panels shall be filled with high precision, Non Shrink, Pourable cementitious grout –SIKA 214 or Equivalent.
11. Precast slab shall be erected above the wall panels without any scaffolding system. The electrical conduit/fitting shall be done.After electrical works are completed, screed concrete shall be laid over the precast slab.
12. Installation of the next floor shall start only after completion of screed concrete of the previous floor.

3.10 Screed Concrete for Flooring

The procedure for screed concrete shall be as follows:

3.10.1 The surface for screed concrete shall be clean, free from dust, loose materials, lumps and foreign material. The screed shall be provided over the entire slab. Inthis case the entire slab shall act as a continuous structural diaphragm providing optimum load transfer mechanism for lateral loads. The screed shall be treated as apart of the compression

zone for gravity loads on the slab. The design shall consider composite action between the slab & screed and compressive strength of screed in slab. Further, the interface shear between the slab & screed shall be checked for verifying adequate shear transfer capacity at the interface. Water proofing treatment shall be provided on precast slabs as mentioned in the section below

3.10.2 Electrical conduits or any other embedment shall be laid as per approved drawing before screed concrete flooring

3.10.3 The reference level from main survey pillars shall be transferred and marked on side channels

3.10.4 While marking level, sloping direction in flooring shall be taken care as per approved drawing

3.10.5 Before laying the concrete, cement slurry shall be spread on the slab surface for better bonding and filling of gaps between wall and slab soffit junction.

3.10.6 The concrete should be placed from one end and shall be compacted immediately after placing and levelled uniformly.

3.10.7 The vibrator shall be applied smoothly and concrete shall be compacted well.

3.10.8 The concrete shall be allowed to set so as to be in dry condition.

3.10.9 The troweling shall start after concrete is set and reach dry condition.

3.10.10 Curing shall be done by using bunds over the screed surface /wet hessian cloth.

3.11 Joints: -

3.11.1 Preparation and Grouting

1. The joints between the precast wall panels shall be filled with high precision, Non Shrink, Pourable cementitious grout –SIKA Grout 214 IN or Equivalent time tested products of approved brands and as per the Directions of Engineer in Charge.
2. Pan Mixtures shall be used at site for mixing of Preparation of Grout Material
3. While preparing the Grout, water powder ratio shall be maintained as per manufacturer's specification
4. Cube samples shall be collected from each day's production and tested for compressive strength
5. All surfaces shall be cleaned from spillage of Grout material

3.11.2 Appearance:

The appearance of precast components join shall merge with architectural aesthetic appearance and shall not be physically prominent compared to other parts of structural components.

3.11.3 Water Tightness of all Precast Joints:

The contractor shall submit the details of the waterproofing system to be applied at the precast wall panel joints and get it approved by the Engineer in Charge. All treated joints shall be checked for water tightness by water jetting on to the joints for specified period of time as per directions of Engineer in Charge.

3.12 For Waterproofing Treatment of Entire Floor area inside the flats and Corridors following procedure shall be followed

I All surfaces should be dry and free from contamination such as oil, grease, loose particles, decayed matter, laitance, and all traces of mould release oils and curing compounds

II Area to receive the treatment shall be ponded with water for 24 hours to observe any leakages

III Identified areas where leakages were observed shall be grouted with cement slurry admixed with Cebex 100 of Fosroc make or equivalent

IV After completion of Final set of cement slurry, Area shall be again ponded with water to observe any seepages

V Above procedure shall be repeated till the mother slab is leakage and seepage proof

VI Brushbond of Fosroc Make or equivalent shall be applied in two coats. Minimum thickness of waterproofing membrane shall be 2mm.

VII After application of waterproofing membrane necessary protection shall be provided to waterproofing membrane by spreading cement slurry and area shall be restricted for movement of workmen

VIII Flooring work shall be immediately commenced after completion of waterproofing treatment to avoid any damages to the waterproofing membrane

Guarantee Bond

- Five years guarantee bond in prescribed proforma attached at Annexure-I herewith shall be submitted by the contractor which shall also be signed by both the specialized agency and the contractor to meet their liability/ liabilities under the guarantee bond. However, the sole responsibility about efficiency of water proofing treatment shall rest with the main contractor.

- 10% (Ten percent) of the cost of water proofing item of work shall be retained as security deposit and the amount so withheld from the bills would be released after five years from the date of completion of the entire work under the agreement, if the performance of the work done is found satisfactory. If any defect is noticed during the guarantee period, it shall be

rectified by the contractor within seven days of receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of contractor.

- However, the security deposit amount may be released in full against Fixed deposit in favor of IIT Hyderabad of equivalent amount as intimated by Engineer-in-Charge, if so decided by the Engineer-in- Charge.
- The security deposit against this item of work shall be in addition to the security deposit mentioned elsewhere in contract form.

3.13 TESTS FOR PRECAST COMPONENTS / STRUCTURES

Sampling Procedure

Lot: All the precast units of the same size, manufactured from the same material under similar conditions of production shall be grouped together to constitute a lot.

The number of units to be selected from each lot for dimensional requirements shall depend upon the size of the lot and shall be in accordance with col 2 and col 3 of Table 1 of IS 15916 : 2010. The units shall be selected from the lot at random. In order to ensure the randomness of selection, reference may be made to IS 4905.

Number of Tests and Criteria for Conformity:
All the units selected at random in accordance with col 2 and col 3 of Table 1 of IS 15916 : 2010 shall be subjected to the dimensional requirements. A unit failing to satisfy any of the dimensional requirements shall be termed as defective. The lot shall be considered as conforming to the dimensions requirements, if no defective is found in the sample, and shall be rejected, if the number of defectives is greater than or equal to the first rejection number. If the number of defectives is less than the first rejection number the second sample of the same size as taken in the first stage shall be selected from the lot at random and subjected to the dimensional requirements. The number of defectives in the first sample and the second sample shall be combined and if the combined number of defectives is less than the second rejection number, the lot shall be considered as conforming to the dimensional requirements, otherwise not.
The lot which has been found as satisfactory with respect to the dimensional requirements shall then be tested for load test. For this purpose one unit shall be selected for every 300 units or part thereof. The lot shall be considered as conforming to the strength requirement, if all the units meet the requirement; otherwise not.

Testing on Individual Components

The component should be loaded for 1 h at its full span with a total load (including its own self weight) of 1.25 times the sum of the dead and imposed loads used in design. At the end of this time it should not show any sign of weakness, faulty construction or excessive deflection. Its recovery 1 h after the removal of the test load, should not be less than 75 percent of the maximum deflection recorded during the test. If prestressed, it should not show any visible cracks up to working load and should have a recovery of not less than 85 percent in 1 h.

Load Testing of Structure or Part of Structure

Loading test on a completed structure should be made, if required by the specification or if there is a reasonable doubt as to the adequacy of the strength of the structure

In such tests the structure should be subjected to full dead load of the structure plus an imposed load equal to 1.25 times the specified imposed load used in design, for a period of 24 h and then the imposed load shall be removed. During the tests, vertical struts equal in strength to take the whole load should be placed in position leaving a gap under the member.

NOTE — Dead load includes self-weight of the structural members plus weight of finishes and walls or partitions, if any, as considered in the design.

1.1 If within 24 h of the removal of the load, a reinforced concrete structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 h under load, test loading should be repeated after a lapse of 72 h. If the recovery is less than 80 percent in second test, the structure shall be deemed to be unacceptable.

1.2 If within 24 h of the removal of the load, prestressed concrete structure does not show a recovery of at least 85 percent of the maximum deflection shown during the 24 h under load, the test loading should be repeated. The structure should be considered to have failed, if the recovery after the second test is not at least 85 percent of the maximum deflection shown during the second test.

If the maximum deflection, in mm, shown during 24 h under load is less than 40 l 2/D, where l is the effective span, in m; and D, the overall depth of the section, in mm, it is not necessary for the recovery to be measured and the recovery provisions of 1.1 and 1.2 shall not apply

3.12 Tolerances for Precast Elements

Casting tolerances of precast elements shall be inaccordance with Clause 6.2 of IS 15916 is as mentioned below:

Sl No. (1)	*Product Tolerances* (2)	*Product (see Key No.)* (3)
i)	*Length:*	
	a) ± 5 mm	1, 7
	b) ± 5 mm or ±0.1 percent whichever is greater	2, 3, 8
	c) ±0.1 percent subject to maximum of $^{+5}_{-10}$ mm	4
	d) ±2 mm for length below and up to 500 mm ±5 mm for length over 500 mm	5
	e) ±10 mm	6, 9,10
ii)	*Thickness/cross-sectional dimensions:*	
	a) ±3 mm	1
	b) ±3 mm or 0.1 percent, whichever is greater	2, 8

Sl No. (1)	*Product Tolerances* (2)	*Product (see Key No.)* (3)
	c) ±2 mm up to 300 mm wide ±3 mm for greater than 300 mm wide	4, 5
	d) ±2 mm	3, 7
	e) ±4 mm	6, 9, 10
iii)	*Straightness/bow:*	
	a) ±5 mm or 1/750 of length, whichever is greater	2, 4, 8
	b) ±3 mm	1, 5
	c) ±2 mm	7
iv)	*Squareness:*	
	When considering the squareness of the corner, the longer of two adjacent sides being checked shall be taken as the base line	
	a) The shorter side shall not vary in length from the perpendicular by more than 5 mm	2, 5, 8
	b) The shorter side shall not vary in length from the perpendicular by more than 3 mm	1, 7
	c) The shorter side shall not be out of square line for more than $^{+2}_{-5}$ mm	4
v)	*Twist:*	
	Any corner shall not be more than the tolerance given below from the plane containing the other three corners:	
	a) Up to 600 mm in width and up to 6 m in length 5 mm Over 600 mm in width and for any length 10 mm length	2, 8
	b) ± 1/1 500 of dimension or ± 5 mm, whichever is less	4
	c) ± 3 mm	1
	d) ± 1 mm	7
vi)	*Flatness:*	
	The maximum deviation from 1.5 m straight edge placed in any position on a nominal plane surface shall not exceed:	
	a) ± 5 mm	2, 8
	b) ± 3 mm	4
	c) ± 2 mm	1, 7
	d) ± 4 mm or maximum of 0.1 percent length	5

Key No. for product reference:

1 Channel unit
2 Ribbed slab unit/hollow slab
3 Waffle unit
4 Large panel prefabrication
5 Cellular concrete floor/roof slabs
6 Prefabricated brick panel
7 Precast planks
8 Ribbed/plain wall panel
9 Column
10 Step unit

3.13 QUALITY CONTROL AT SITE AND PRECAST CASTING YARD (FACTORY)

i. Engineer-in-charge will employ an accredited independent testing agency to evaluate quality of structural precast concrete. Contractor shall bear all expenses towards testing including samples.

ii. Contractor shall allow testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with the testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

iii. Strength of precast concrete members will be considered deficient if units fail to comply with concrete strength requirements given in IS 456.

iv. Testing: If there is apprehension that strength of precast concrete members may be deficient or may not comply with Code requirements, Contractor shall employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength. Patching: If core test results are satisfactory and precast concrete members comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

v. Acceptability: Structural precast concrete members that do not comply with acceptability requirements, including concrete strength, and manufacturing tolerances, are unacceptable. Chipped, spalled or cracked members may be repaired/ replaced as directed. Replace unacceptable units with precast concrete

vi. members that comply with requirements.

Quality of Materials and Workmanship

(i) The Contractor shall ensure that the Materials and workmanship are in accordance with the requirements specified in this Agreement, Specifications and Standards and Sound Engineering practice. The work shall be of the specified quality and standard both in respect of ingredients as well as the intended functions it ts supposed to perform for service life.

(ii) The Contract warrants that all Materials shall be new, unused, not reconditioned unless otherwise allowed as per contract or by Engineer-in-Charge, and in conformity with Specification and Standards. Applicable Laws and Sound Engineering Practice and that the Contractor shall not use any materials which are generally recognized as being deleterious under Sound Engineering Practice.

Quality Assurance System: The Contractor shall devise a quality assurance mechanism to ensure compliance with the provisions of this Agreement (the "Quality Assurance Plan" or "QAP').

(i) The Contractor shall, submit to the Engineer-in-Charge. its Quality Assurance Plan **15 (fifteen)** days in advance of start of the execution stage specified in the Bid document. The Engineer-in-Charge shall convey its comments to the Contractor within a period of 7 (seven) days of receipt of the QAP stating the modifications, if any, required and the Contractor shall incorporate those in the QAP conforming with the provisions of this clause. The QAP shall include the following:

(a) Contractor's Organization & structure. duties and responsibilities of individual key personnel, quality policy of contractor, procedure forcontrol of non-conformities and corrective action, inspections and documentation.

(b) Internal quality audit system.

(c) Machinery, Shuttering, other Tool & plants, etc. required to bedeployed at site.

(d) Method statement of important activities. These can be submitted as per the sequencing of the activities of the work.

(e) Quality control mechanism including sampling and testing of Materials, test frequencies, standards, acceptance criteria, testing facilities, reporting, recording and interpretation of test results, approvals, proforma for testing and calibration in accordance with the Specifications and Standards and Sound Engineering Practice, and Material Lot size, number of required tests and frequency of testing for different construction materials. All the relevant and applicable codes, specifications and standards. as well as the acceptance criteria for various items of work, workmanship, materials and process employed needs to be mentioned.

(f) Check-list for various items and materials.

(g) Formats for site documentation, monthly reports on implementation of QAP.

(ii) **Sampling of materials:** All samples of materials including Cement Concrete Cubes shall be taken by the QA Engineers deployed by the Contractor and shall be witnessed by the Engineer-in-Charge or his authorized representatives as specified in Bid document. All the necessary assistance facilities and safety shall be provided by the Contractor. Cost of sample of materials and testing charges shall be borne by the Contractorand he/she is responsible for safe custody of samples to be tested at site.

(iii) **Testing of Materials:** The Contractor shall establish temporary field laboratory of adequate size with all necessary facilities. Field laboratoryshall be equipped with the testing equipment for conducting routine field tests as per this contract. It will also have copies of standards, BIS codes, IRC codes. relevant publications. All the tests in field lab setup at construction site shall be carried out by the QA Staff deployed by the contractor and shall be witnessed by the Engineer-in-Charge or his authorized subordinates. The Contractor shall provide all necessary facility to them for witnessing the tests in the field laboratory. In general, Contractor shall carry out 90% of field tests in site laboratory and 10% tests shall be got carried out from outside laboratory as indicated below. Contractor shall endeavor to obtain test reports for tests conducted from outside laboratory in a reasonable time.

(iv) **Maintenance of Register of Test**:

(a) All the entries in the register of test are to be made by the designated QA Engineers of the Contractor and same is to be regularly reviewed by the field officers. as well as the Engineer-in-charge. The Contractor shall allow inspection

of such records any time as desired by Engineer-in-Charge or his authorized representative.

(b) All the tests carried out at construction site or outside laboratories areto be maintained by the Contractor in the prescribed format in the test registers provided by the contractor and duly authenticated by Engineer-in- Charge. The test reports shall also be maintained in hard file.

(c) Contractor is responsible for maintenance and safe custody of all the test registers and test records.

(d) Mandatory test conducted as per approved proforma shall be attached with each Running bill submission of copy of all test registers and materialat site register along with each alternate Running Account Bill and with Final Bill is mandatory.

(v) **Maintenance of Material at Site (MAS) Register**: MAS register of the key materials including Cement and Steel registers shall be maintained in the proforma approved by Engineer-in-Charge. All the entries in the MAS registers are made by the delignated staff of the contractor and same is regularly reviewed by the field officers as well as the Engineer-in-charge. Contractor is responsible for maintenance and safe custody of MAS registers.

(vi) The Contractor shall procure all relevant codes, publications apparatus and instruments, fuel consumables water electricity, labour, materials, samples and qualified personnel as are necessary for examining and testing the Works. Materials and workmanship in accordance with the Quality Assurance Plan.

(vii) All the cost of testing including, cost of samples, packaging, transportation, testing charges of Construction materials and workmanship under this clause shall be borne by the contractor.

(viii) The Contractor shall submit monthly quality progress report on implementation of the provisions of Quality Assurance Plan on the format approved by the Engineer-in-Charge.

Samples: The Contractor shall its own expense and without delay provide the samples of Materials and relevant information like Manufacturer's test repots standard samples of manufactured Materials and samples of such other Materials as the Engineer-in-charge may require for review and approvals in accordance with clause 10A of GCC before actual use.

Test:

(i) For determining that the Works conform to the Specifications and Standards, the Engineer-in-Charge shall require the Contractor to carry out or cause to be carried out tests at such time and frequency and in such manner as specified in this Agreement in accordance with sound engineering practice for quality assurance Frequency and the manner in which tests shall be conducted shall be in the following order of preference:

a) Contract provisions.
b) CPWD specifications.
c) BIS codes
d) IRC codes
e) MoRTH Specifications.
f) International Codes.
g) Manufacturer's specifications.

Outside tests shall be conducted at Government labs /IITs/NITs and other approved laboratories by the Engineer in charge for testing of materials

(ii) The Contractor shall, with due diligence, carry out all the tests in accordance with the Agreement and furnish the results thereof to the Engineer-in-Charge. The Engineer-in-Charge or his authorized representative shall witness or participate during the testing. The Contractor shall provide all necessary assistance for witnessing/participating in the field tests.

(iii) In the event that results of any tests conducted under this clause establish any defects or deficiencies in the Works, The Contractor shall carry out remedial measures at its own cost and furnish a report to the Engineer-in-charge in this regard. The Engineer-in-Charge shall require the Contractor to carry out or cause to be carried out tests to determine that such remedial measures have brought the works into compliance with the Specifications and standards and the procedure shall be repeated until such Works conform to the Specifications and Standards.

Method Statement: The Method statement, is a statement by which the construction procedures for important activities are stated checked, and approved. The method statement shall be prepared for important activities as identified by the contractor as mentioned in QAP or any other activity as instructed by Engineer-in-charge. The method statement, should have a description of the item with elaborate procedure in steps to implement the same the specification of the involved equipment to be deployed measures for ensuring safety their testing and acceptance criteria precautions to be taken, mode of measurement etc. The Contractor shall at least 15 (fifteen) days prior to the commencement of activities, submit to the Engineer-in- Charge for review, the method statement to be proposed adopted for executing the various items of work. The Engineer-in-charge shall complete the review and convey its, comments, if any, to the Contractor within a period of 7 (Seven) days from the date of receipt of the proposed methodology from the Contractor.

Inspection & review by the Engineer-in-Charge and External Audit: The Engineer-in-Charge, his authorized subordinates, Senior Officers of department, QA unit or any other third party may inspect and review the progress and quality of the work and issue appropriate directions to the Contractor for taking remedial action in the event the work is not in accordance with the provisions of this Agreement. The work may be inspected at any time/stage by external inspection teams like CTE or TE, Third Party Quality assurance agency, etc may conduct inspection of the quality of the works. The

findings of the inspections shall be notified to the Contractor for taking remedial action in accordance with the agreement. The Contractor shall provide all assistance as may be required by the inspection teams in the conduct of its inspection here under. Suitable actions shall be taken as per the provisions contained in the relevant clauses of the agreement, if the work is not found to be as per specifications or quality as specified in the agreement.

Inspection of Records: The Engineer-in-charge or his representative shall have the right to inspect the records of the Contractor relating to the works.

Inspection of Works

(i) The Engineer-in-Charge and his authorized subordinates shall at all times:

(a) have full access to all parts of the site and to all places from which natural materials are being obtained for use in the works: and

(b) during production. manufacture and construction at the site and at the place of production, be entitled to examine, inspect, measure and test the materials and workmanship and to check the progress of the manufacturer of Materials.

(ii) The Contractor shall give the Engineer-in-Charge and its authorized representative access, facilities and safety equipment for carrying out their obligations under this Agreement.

Examination of work before covering up/ Test Check of item of Work:

In respect of the work which the Engineer-in-Charge or his authorized representatives are required to examine, inspect, measure or test before it is covered up or put out of view or any part of the work is placed thereon, the Contractor shall give notice to the Engineer-in-Charge whenever any such work is ready and before it is covered up. The Engineer-in-Charge shall then either carry out the examination. inspection or testing without unreasonable delay within 7 days, or promptly give notice to the Contractor that the Engineer-in-Charge does not require him to do so. Provided, however, that if any work is of a continuous nature where it is not possibleor prudent to keep it uncovered or incomplete the Contractor shall notifythe schedule of carrying out such work to give sufficient opportunity, not being less than 3(three) business days, notice, to the Engineer-in-Charge to conduct its inspection, measurement or test while the work is continuing. Provided further that in the event the Contractor recerves no response from the Engineer-in-Charge within a period of 3 (three) business days from the date on which the Contractor's notice hereunder is delivered to the Engineer-in-Charge, the Contractor shall be entitled to assume that theEngineer-in-Charge would not undertake the said inspections.

Rejection

(i) If, as a result of an examination, inspection, measurement or testing, any Plant, Materials, design or workmanship is found to be defective or otherwise not in accordance with the provisions of this Agreement, the Engineer-in-Charge may reject such piece of work. Plant, Materials, design or workmanship

by giving notice to the Contractor, with reasons. The Contractor shall then promptly make good the defect and ensure that the rejected item complies with the requirements of this Agreement.

(ii) lf the Engineer-in-Charge requires a piece of work, plant, Material, designor workmanship to be retested, the tests shall be repeated on the same terms and conditions, as applicable in each case. lf the rejection and retesting cause the department to incur any additional costs, such costs shall be recoverable by the Engineer-in-Charge from the Contractor and may be deducted by the Engineer-in-Charge from any amount due to be paid to the Contractor.

(iii) The Contractor shall not be entitled to any extension of time on accountof rectifying any defect or retesting as specified in this clause.

(iv) Examination, inspection, measurement or testing of any plant, Material, design or workmanship by the Engineer-in-Charge or its failure to convey its observations or to examine, inspect, measure or test shall neither relievethe Contractor of its obligations and liabilities under this Agreement in any manner nor shall the Engineer-in-Charge be liable for the same in anymanner.

Remedial work

(i) Notwithstanding any previous test or certification, the Engineer-in_ Charge may instruct the Contractor to.

(a) remove from the site and replace any piece of work. Plant or materials which are not in accordance with the provisions of this Agreement.

(b) remove and re-execute any work which is not in accordance with the provisions of this Agreement and the Specification and Standards, and

(c) execute any work which is urgently required for the safety of the Project, whether because of an accident, unforeseeable event or otherwise.

(ii) lf the Contractor fails to comply with the instructions issued by the Engineer-in-Charge under aforesaid para, within the time specified in the notice or as mutually agreed, the Engineer-in-Charge may get the work executed by another agency. The cost so incurred by the Engineer-in- Charge for undertaking such work shall, without prejudice to the rights of the Engineer in Charge to recover damages in accordance with the provisions of this Agreement, be recoverable from the Contractor and may sbe deducted by the Engineer-in-Charge from any amount due to be paid to the Contractor.

Quality Control Records: The Contractor shall hand over authenticated copy of all its quality control records and documents to the Engineer-in- Charge before the Completion Certificate is issued.

Suspension of unsafe Construction Works:

(i) Upon recommendation of the Engineer-in-Charge to this effect, or on his own volition in cases of emergency or urgency, the Engineer-in-Charge may by notice require the Contractor to suspend forthwith the whole or any part of the Works if, in the reasonable opinion of Engineer-in-Charge, as the casemay be, such work threatens the safety of the Users and or other persons on or about

the Project. Provided, however, that in case of an emergency, the Engineer-in-Charge may *suomoto* issue the notice referred to hereinabove.

(ii) The Contractor shall, pursuant to the notice under above para, suspend the Works or any part thereof for such time and in such manner as may be specified by the Engineer-in-Charge and thereupon carry out remedial measures to secure the safety of suspended works, the Users, other persons and vehicles on or about the Project. The Contractor by notice require the Engineer-in-Charge to inspect such remedial measures forthwith and request for revocation of suspension Upon reviewing the remedial measures, the Engineer-in-Charge shall either revoke such suspension or instruct the Contractor to carry out such other and further remedial measures as may be necessary and reasonable and the procedure set forth in this Clause shall be repeated until the suspension hereunder is revoked.

(iii) Subject to other provisions of the agreement. all reasonable cost incurred for maintaining and protecting the Works or part thereof during the period of suspension (the "Preservation Costs") shall be borne by the contractor, if in the opinion of Engineer-in-Charge suspension is on account of reasons attributable to the contractor.

(iv) If suspension of Work is for reasons not attributable to the Contractor, the Engineer-in-Charge shall determine any Time Extension, if required, in accordance with the provisions of clause-5.

Online maintenance of Site records including testing records: The Engineer-in-Charge may require the contractor to upload all the site records in any online system devised by him. The contractor shall have to ensure that all the required site records, as desired by the Engineer-in-Charge shall be uploaded in this online system. Nothing extra on this account shall be payable to the contractor. In case these records are to be maintained in any online module then contractor shall comply with this.

Samples For Testing: -

(1) The Contractor shall procure and provide all the materials from the manufacturers / suppliers as per the list attached with the tender documents, as per the item description and particular specifications for the work. The equivalent brand for any item shall be permitted to be used in the work, only when the specified make is not available. This is, however, subject to documentary evidence produced by the contactor for non-availability of the brand specified and also subject to independent verification by the Engineer-in-Charge. In exceptional cases, where such approval is required, the decision of Engineer-in- Charge as regards equivalent make of the material shall be final and binding on the Contractor. No claim, whatsoever, of any kind shall be entertained from the Contractor on this account. Nothing extra shall be payable on this account. Also, the material shall be procured only after written approval of the Engineer-in-Charge.

(2) All materials whether obtained from stores or otherwise shall be got checked by the Engineer-in-Charge or his authorized supervisory staff on receipt of the same at site before use.

(3) The Contractor or his authorized representative shall associate in collection, preparation, forwarding and testing of such samples. In case he or his authorized representative is not present or does not associate him, the result of such tests and consequences thereon shall be binding on the Contractor. The Contractor or his authorized representative shall remain in contact with the Engineer-in–Charge or his authorized representative associated for all such operations. No claim of paymentor claim of any other kind, whatsoever, shall be entertained from the Contractor.

(4) The Contractor shall at his own risk and cost make all arrangements and shall provide all such facilities including material and labour, the Engineer-in-Charge may require for collecting, preparing, forwarding the required number of samples for testing as per the frequency of test stipulated in the contract specifications or as considered necessary by the Engineer-in-Charge, at such time and to such places, as directed by the Engineer-in-Charge. Nothing extra shall be payable for the above. Samples of all materials required for testing is included in the cost of work.

(5) All materials and fittings brought by the Contractor to the site for use shall conform to the samples approved by the Engineer-in-charge which shall be preserved till the completion of the work. Wherever brand / quality of material are not specified in the item of work, the Contractor shall submit the samples as per suggested list of brand names given in the tender document / particular specifications for approval of Engineer- In-Charge. For all other items, materials and fittings of ISI Marked shall be used with the approval of Engineer-In-Charge. Wherever ISI Marked material / fittings are not available, the Contractor shall submit samplesof materials / fittings manufactured by firms of repute conforming to relevant specifications or IS codes and use the same only after getting the approval of Engineer-In-Charge.

(6) If the Contractor does not provide adequate supporting staff or labour or both for carrying out field tests or collecting and forwarding samples to outside laboratory or for maintaining test records, Engineer in charge may carry out field tests or collect and forward sample to outside laboratory or appoint any person to maintain the registers at risk and cost of Contractor. The charges so incurred shall be entirely borne by Contractor and shall be deducted from Running or final bill of Contractor. Further, recovery of Rs. 2000/- for each default shall be levied to Contractor.

(7) All samples of materials, at construction site or in outside laboratories (in the factory of precast elements manufacturing), including cement concrete cubes shall be taken jointly with contractor by JE and out of this at least 50% samples shall be taken in presence of AE in charge. If there is no JE, all samples of materials including cement concrete cubes shall be taken by AE jointly with contractor. All the necessary assistance shall be provided by the contractor. Cost of sampling & testing are to be borne by the contractor and he shall be responsible for safe custody of samples to be tested at site/ outside laboratory.

(8) Samples of all materials required for testing is included in the cost of work. Similarly, expenditure for testing in house or through external lab shall be borne by the contractor.

(9) If any load testing or special testing is to be done for any sample whose strength is doubtful, the cost of the same shall also be borne by the contractor.

(10) In case there is any discrepancy in frequency of testing as given in list of mandatory tests and that in individual sub-heads of work as per CPWD Specifications, higher of the two frequencies of testing shall be followed.

(11) The contractor has to establish field laboratory at site as specified in CPWD Specifications and as per "List of Site Laboratory And Testing Of Materials Equipment" including all necessary equipment for field tests at his own cost within one month from the award of work.

(12) The contractor should submit for approval of Engineer-in-Charge shop drawings and samples of the work to be performed under the specified items of work before actually commencing the massexecution of the work under the item. For this they will prepare a sample room / quarters and toilet blocks for each type of building for approval of Engineer-in-charge of work. Nothing extra shall be payable on this account.

(13) BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the Engineer-in-Charge besides testing of other materials as per the specifications described for the item/material. Wherever BIS marked materials are brought to the site of work, the contractor shall, if required, by the Engineer-in-Charge furnish manufacturer's test certificate or test certificate from approved testing laboratory to establish that the material / procured by thecontractor for incorporation in the work satisfies the provisions ofspecifications/BIS codes relevant to the material and / or the work done.

(14) For certain items, if frequency of tests not mentioned in the CPWD Specifications, then relevant IS code shall be followed and tests shall be carried out as per the frequency specified therein.

(15) The contractor shall be fully responsible for the safe custody of materials brought by him/issued to him even though the materials may be under double lock and key system.

(16) The contractor shall procure the required materials in advance so that there is sufficient time for testing of the materials and approval of the same before use in the work. The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimensions as may be necessary for execution of work. The sealed samples are to be handed over to the testing lab by contractor in the presence of Junior Engineer/Assistant Engineer-in- Charge of work.

(17) Malba, rubbish & other waste materials shall be reused at site as directed by Engineer-in- Charge or disposed off to recycling agents. No deduction on this account shall be made from the agency as well as no extra payment will be made to agency if it is disposed at pre- defined location within the campus.

Testing:

(1) A site laboratory with the minimum equipment as specified in Schedule F of the bid document shall be established by the Contractor, made functional and maintained within ONE month from the award of work without any extra cost to the department. All the relevant and applicable standards and specifications shall be made available of the Contractor at his own cost in the field laboratory.

(2) All the test in field lab setup at Construction Site shall be carried out by the Quality control team to be engaged by the Contractor which can be witnessed by Engineer-in-charge or his/her designate. A daily report of

Tests to be conducted on a day shall be submitted to Engineer-in-charge or his/her designee.

(3) All the materials to be used in the work, to give the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per specifications as applicable or such specifications / standards asdirected by the Engineer-in-Charge.

(4) As and when any important item is taken up for execution, the Contractor shall submit the specifications and develop a checklistand Pour card. This sample checklist should be got approved from the Engineer-in-charge and should be used at site. This check list should be shown to the Engineer in charge or his/her designee during inspection. This procedure is to be followed for all hidden items, CC/RCC work, Steel-reinforcement, shuttering, cast-in-situ mosaic flooring, doors & windows, plumbing, including water supply pipe lines, roof treatment, earth filling etc.

(5) The tests, as necessary, shall be conducted in the laboratory of any Govt. Engineering Colleges or Institutes like IITs, NITs, or State / Central funded laboratories. The samples shall be taken for carrying out all or any of the tests stipulated in the particular specifications and as directed by the Engineer-in-Charge or his authorizedrepresentative.

(6) All the testing charges shall be borne by the Contractor and nothing extra shall be admissible and entertained by the Department.

(7) All the hidden items such as water supply lines, drainage pipes, electrical conduits, sewers etc. are to be properly tested as per the design conditions before covering.

(8) The Contractor shall give performance test of the entire installation(s) as per the standing specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the Contractor for the test.

(9) The Contractor shall arrange electricity at his own cost for testing of the various electrical installations as directed by Engineer-in-Charge and for the consumption by the Contractor for executing the work. Also all the water required for testing various electrical installations, fire pumps, wet riser / fire fighting equipment's, fire sprinklers etc. andalso testing water supply, sanitary and drainage lines, water proofing of underground sump, overhead tanks, water proofing treatment etc. shall be arranged by the Contractor at his own cost and inclusive in the quoted rate by contractor. Nothing extra shall be payable on this account.

(10) In case there is any discrepancy in frequency of testing as given in list of mandatory tests and that in individual sub-heads of work as per CPWD Specifications, higher of the two frequencies of testing shallbe followed and nothing extra shall be payable on this account.

(11) The Mandatory Tests of the materials involved in the Project forQuality Control shall be conducted as per the CPWD Specifications, 2019, Vol. I and Vol. II with upto date correction slips as on last dateof submission of Bid.

Miscellaneous:

(1) The Contractor shall make available, on request from the Department, the copies of challan, cash memos, receipts and other certificates, if any, vouchers towards the quantity and quality of various materials procured for the work. The Contractor shall also provide information and necessary documentation on the name of the manufacturer, manufacturer's

product identification, manufacturer's instructions, warning, date of manufacturing and test certificates (from manufacturers for the product for each consignment delivered at site), shelf life, if any etc., for the department to ensure that the material have been procured from the approved source and is of the approved quality, as directed by the Engineer-in-Charge. Wherever specified, day-to-day account of receipt of such material shall be maintained at site of work.

(2) Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to CPWD Specifications. The Contractor should engage licensed plumbers for the work and get the materials (fixtures/fittings) tested by the Municipal Body/Corporation authorities, wherever required, at his own cost. Nothing extra shall be paid on this account.

(3) The Contractor shall maintain all the work in good condition till the completion of entire work. The Contractor shall be responsible for and shall make good, all damages and repairs, rendered necessary due to fire, rain, traffic, floods or any other causes. The Engineer-in- Charge shall not be responsible for any claims for injuries to person/workmen or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the partof the Contractor or of any other of his representatives, in his employment during the execution of the work. The compensation, if any, shall be paid directly to the Department / authority / persons concerned, by the Contractor at his own cost. Nothing extra shall be paid on this account.

(4) The Contractor shall render all help and assistance in documenting the total sequence of this project by way of photography, slides, audio-video recording etc. nothing extra shall be payable to the Contractor on this account.

(5) Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to approved manufacturers specifications where CPWD Specifications are not applicable. The contractor should get the materials (fixtures/fittings) tested from approved labs wherever required at his own cost. The contractor shall submit for the approval of the Engineer-in-Charge, the name of the plumbing agency (along with their working experience in recent past) proposed to be engaged by him.

(6) The contractor shall give performance test of the entire installation(s) as per the standing specifications before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

3.0 Anti-termite treatment

Diluting and injecting chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment shall be carried out as per the BIS 6313.

Materials

Chemicals: Any one of the following chemicals in water emulsion to achieve the percentage
concentration specified against each chemical shall be used:

(i) Chlorphriphos emulsifiable concentrate of 20%
(ii) Lindane emulsifiable concentrate of 20%

Anti-termite treatment chemical is available in concentrated form in the market and concentration is indicated on the sealed containers. To achieve the specified percentage of concentration, Chemical should be diluted with water in required quantity before it is used. Graduated containers shall be used for dilution of chemical with water in the required proportion to achieve the desired percentage of concentration. For example, to dilute chemical of 20% concentration. 19 parts of water shall be added to one part of chemical for achieving 1% concentration.

4.0 CONCRETE WORK: -

The work shall be done in accordance with CPWD Specifications - 2019 - Vol.I & Vol. II withupto date correction slips.

1.0 R.C.C./P.C.C WORK (DESIGN MIX CONCRETE):-

The work shall be done in accordance with CPWD Specifications - 2019 - Vol. I & Vol. II with upto date correction slips.

The minimum grade of PCC shall be M 15/M20 or as per the directions of engineer in charge.

2.0 R.C.C. (DESIGN MIX CONCRETE):-

The RCC work shall be done with Design Mix Concrete. Wherever letter M has been indicated, the same shall imply for the Design Mix Concrete. The Design Mix Concrete will be designated based on the principles given in IS: 456, 10262 & SP 23. The condition and specifications stated herein shall have precedence overall conditions and specifications stated in relevant I.S codes/ CPWD specifications. The concrete mix shall be designed for specified target mean compressive strength in order to ensure that the work test results do not fall below the acceptance criteria specified for the concrete mix. The Contractor shall design mixes for each class of concrete indicating that the concrete ingredients and proportions will result in concrete mix meeting requirements specified. The mix shall be designed with quantities of admixture / plasticizer proposed to achieve required workability & strength. The specifications mentioned here in below shall be followed for Design Mix Concrete.

2.1 The sources of coarse aggregate, fine aggregate & water to be used in concrete work shall be identified by the contractor & he will satisfy himself regarding their conforming to the relevant specification & their availability before getting the same approved by the Engineer-in-Charge.

2.2 **Coarse Aggregate**: - As per CPWD Specifications - 2019 - Vol.I & Vol. II with upto date correction slips.

2.3 **Fine Aggregate:** -As per CPWD Specifications - 2019 - Vol.I & Vol. II with upto datecorrection slips.

2.4 **Water:** - It shall confirm to requirements laid down in IS:456-2000 / CPWD Specifications - 2019 - Vol.I & Vol. II with upto date correction slips.

2.5 **Cement:** - **OPC 53** shall be used for design mix concrete and shall conform to IS-8112.

2.6 **Admixtures / Plasticizers:** - The admixture shall confirm to IS: 9103, wherein required, the admixture of approved quality and approved make only shall be used to attain the required workability.

2.7 **Grade of Concrete:** - The various grades of concrete shall be as given below: -

For Precast Elements: Minimum grade of concrete shall be M40.

For RCC Works other than Precast Elements: Minimum Grade Shall be M25 or as per the approved Structural designs whichever is more and as per the directions of Engineer in Charge.

NOTE:-

i) . In the designation of a Concrete mix letter M refers to the mix and the number of the specified characteristic compressive strength of 15 cm - Cube at 28 days expressed in N/mm2

2.8 The contractor shall engage one of the following approved laboratories/ test house at their own expenses for designing the concrete mix in accordance with relevant IS Codes and to conduct laboratory test to ensure the target strength and workability criteria for a given grade of concrete.

2.8.1 IIT's

2.8.2 Any other Institute / Laboratory as approved by EIC.

2.9 The various ingredients for mix design / laboratory tests shall be sent to the lab / test houses through the Engineer-in-Charge and the samples of such aggregates sent shall be preserved at site.

2.10 The contractor shall submit the report on design mix from any of above approved laboratories for approval of Engineer-in-Charge within 30 days from the date of issue of letter of acceptance of the tender. No concreting shall be done until the design mix is approved. In case of change of source or characteristic properties of the ingredients used in the concrete mix during the work, a revised laboratory mix design report conducted at laboratory established at site shall be submitted by the contractor as per the direction of the Engineer-in-Charge.

2.11 **Trial Batches**

2.12 The designed mix proportion shall be checked for target mean compressive strength by means of trial batches.

2.13 The quantities of materials for each trial mix shall be sufficient for at least six specimens (cubes) and the concrete required for carrying out workability tests.

2.14 The workability of trial mix No. 1 shall be measured and mix shall be carefully observed for freedom from segregation, bleeding and its finishing characteristics. The water content, if required, shall be adjusted corresponding to the required changes in the

workability.

2.15 With the modified water content, the mix pro-portions shall be recalculated by keeping with water cement ratio unchanged. The mix proportions, as modified, shall form the Trial Mix No. 2 and tested for the specified strength and workability.

2.16 In addition, trial mix No. 3 and 4 shall be designed by keeping water contents same as that determined for trial mix 2 but varying the water cement ratio + 10 percent of the specified value and tested for their design characteristics.

2.17 All cost of mix designing and testing connected therewith including charges payable to the laboratory shall be borne by the Contractor including redesigning of the concrete mix wherever required and directed by Engineer-in-Charge.

2.18 **APPROVAL OF DESIGN MIX :-**

The mix design for a specified grade of concrete shall be done for a target mean compressive strength

Tck = Fck + s

Where Fck = Characteristic compressive strength at 28 days.

s = Standard deviation which depends on degree of quality control.

The degree of quality control for this work is "good" for which the standard deviation (s) obtained for different grades of concrete shall be as follows: -

GRADE OF CONCRETE	STANDARD DEVIATION(S)
M-10	3.5
M-15	3.5
M-20	4.0
M-25	4.0
M-30	5.0
M-35	5.0
M-40	5.0
M-50	5.0

Minimum three sets of seprate preliminary test shall be carried out for each trial batch of concrete mix. Each test shall comprise six specimens and only one test set of six specimens shall be made on any particular day. Out of the six specimen of each set, three shall be tested at seven days and remaining three at 28 days. The preliminary tests at seven days are intended only to indicate the strength to be attained at 28 days. While the design mix shall be approved only on the basis of test strength of 28 days. The design mix shall be considered satisfactory and approval if at least three preliminary test- sets individually satisfy the following strength and workability criteria.

(a) The average strength of each test sets is not less than the specified target mean compressive strength (TCK).

(b) The strength of any specimen cube is not less than 0.85 Tck.

(c) The concrete mix is required degree of workability and acceptance concrete finish.

2.19 All cost of mix designing and testing connected therewith including charges payable to thelaboratory shall be borne by the Contractor.

2.20 **WORK STRENGTH TEST: -TEST SPECIMEN: -**

Work strength test shall be conducted in accordance with IS:516 on random sampling. Each test shall be conducted on six specimens, three of which shall be tested at 7 days and remaining three at 28 days.

TEST RESULTS OF SAMPLES: -

The test results of the sample shall be the average of the strength of three specimens. The individual variation shall not be more than + 15% percent of the average. If variation is more, the test results shall be treated as invalid. 90% of the total tests shall be done at the laboratory established at site by the contractor and remaining 10% in any laboratory mentioned in para 2.8 above.

FREQUENCY OF TESTS: -

The minimum frequency of sampling of concrete of each grade shall be onesample for every 25 cum or part thereof.

NOTE: - At least one sample shall be taken from each shift.

2.21 **STANDARD OF ACCEPTANCE: -**

The acceptance criteria of Concrete shall be as per IS 456.2000

2.22 **Production of Concrete**

All concrete shall be produced at site/Factory through fully computerized weigh-batching plant of suitable capacity (not less than 30 cum/hr.) conforming to IS: 4925 with the arrangements for automatic dispensing of admixture and having facility of giving print out indicating weight / details of all ingredient of concrete in each lot/ batch and variations from the approved design mix if any.
The batching and mixing plants shall be dedicated plants for this project. Contractor shall make his own arrangements for the necessary infrastructure for installation of batching plant and other machineries.

Automatic batcher shall be charged by devices which when actuated by a single starter switch will automatically start the weighing operation of each material and stop automatically when the designated weight of each material is fed in the mixer. The batching plant shall have automatic arrangement for dispensing the admixture and shall be capable of discharging water in more than one stage.

A batching plant essentially shall consist of the following components:

- Separate storage bins for different sizes of aggregates, silo for cement and flyash; waterstorage tank.
- Batching equipment
- Mixers
- Control Panels
- Mechanical material feeding and elevating arrangements

The compartments of storage bins for aggregates shall be approximately of equal size. The cement compartment shall be centrally located in the batching plant. It shall be water tight and provided with necessary air vent, aeration fittings for proper flow of cement & emergency cut off gate. The aggregate and sand shall be charged by power operated centrally revolving chute. The entire plant from mixer floor upward shall be enclosed and insulated. The batch bins shall be constructed so as to be self-cleansing during draw-down. The batch bins shall in general conform to the requirements of IS:4925.

The batching equipment shall be capable of determining and controlling the prescribed amounts of various constituent materials for concrete accurately i.e. water, cement, sand, individual size of coarse aggregates etc. The accuracy of measuring devices shall fall within the following limits.

Measurement of Cement: ± 2% of the quantity of cement in each batch

Measurement of Water: ± 3% of the quantity of water in each batch

Measurement of Aggregate: ± 3% of the quantity of aggregate in each batch

Measurement of Admixture: ± 3% of the quantity of admixture in each batch

The batching and mixing plant shall have the provision of adjusting the plus / minus quantity of various ingredients in the next batch so that there is no variation in quantity of ingredients from design mix in a lot consisting of 5 to 6 batches.

The mixer in the batching plant shall be so arranged that mixing action in the mixer can be observed from the operator's station. The mixer shall be equipped with a mechanically or electrically operated timing, signaling and metering device which will indicate and assure completion of the required mixing period. The mixer shall have all other components as specified in IS: 4925.

However, if due to any reason, contractor wishes to supplement the concrete from Ready Mix Concrete (RMC) supplier, he is permitted to procure the same from the source approved by the Engineer-in-charge at his own cost. In such a situation nothing extra shall be paid to the contractor. All technical requirements such as cement type and minimum cement quantity, w/c ratio, slump, admixture etc. shall be conveyed to RMC supplier by the contractor and contractor shall be wholly responsible for ensuring the quality of concrete as required at site, nothing extra shall be paid to the contractor.

2.23 **Transportation, Placing and Compaction of Concrete**

a. Mixed concrete from the RMC / Batching plant shall be transported to the point of placement by transit mixers and placed in position through concrete pumps and/or steel closed bottom buckets capable of carrying minimum 0.6 cum concrete. In case the concrete is proposed to be transported by transit mixer, the mixing speed shall not be less than 4 rev / min. of the drum nor greater than a speed resulting in a peripheral velocity of the drum 70 m/minutes at its largest diameter. The agitating speed of the agitator shall be not less than 2 rev/min nor more than 6 rev/min of the drum. The number of revolution of the mixing drum or blades at mixing speed shall be between 70 to 100 revolutions for a uniform mix, after all ingredients, have been charged into the drum. Unless tempering water is added, all rotation after 100 revolutions shall be at agitating speed of 2 to 6 rev/min and the number of such rotations shall not exceed 250. The general construction of transit mixer and other requirement shall conform to IS:5892.

b. In case concrete is to be transported by pumping, the conduit shall be primed by pumping a batch of mortar through the line to lubricate it. Once the pumping is started, it shall not be interrupted (if at all possible) as concrete standing idle in the line is liable to cause a plug. The operator shall ensure that some concrete is always there in the pump receiving hopper during operation. The lines shall always be maintained clean and shall be free of dents at all stages. Special precaution shall be taken that surrounding temperature during concreting shall not exceed 30 degrees centigrade.

c. Except where otherwise agreed to by the Engineer-in-Charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 450 mm. Unless agreed to by the Engineer-in-Charge, concrete shall not be dropped into place from a height exceeding 1.5m. In order to avoid such situations chutes, tremie pipe or closed bottom buckets shall be used. These shall be kept clean and used in such a way as to avoid segregation. Slope of the chute shall be so adjusted that concrete flows without the use of excessive quantity of water. The delivery end of chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork. The concrete shall be compacted by using immersion type vibrators. When the concrete is being continuously deposited

to a uniform depth along a member, vibrator shall not be operated within one meter of free end of the advancing concrete. Every effort shall be made to keep the surface of the previously placed layer of concrete alive so that the succeeding layer can be amalgamated with it by the vibration process. The vibrator head shall not be brought more than 200 mm near to the formwork as this may cause formation of water stagnations. The formwork shall be strong and great care shall be exercised in its assembly. It shall be designed to take up increased pressure of concrete and pressure variations caused in the neighborhood of vibrating head, which may result in excessive local stress on the formwork. The joints of the formwork shall be made and maintained tight and close enough to prevent the squeezing out slurry or sucking in of air during vibration. The formwork to receive concrete shall be cleaned and made free from standing water, dust, etc. The contractor shall keep provision for screed and shutter vibrators at site.

d. No concrete shall be placed in any part of the structure until the approval of Engineer-in-Charge has been obtained. If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer- in-Charge. Concreting shall be done continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes.

2.24 In case of rejection of concrete on account of unacceptable compressive strength, governed by para "Standard of Acceptance" as above, the work for which samples have failed shall be redone at the cost of contractor. However, the Engineer-in-Charge may order for additional tests (like cutting cores, ultrasonic pulse velocity test, load test on structure on part of structure, etc) to be carried out at the cost of contractor to ascertain if the portion of structure wherein concrete represented by the sample has been used, can be retained on the basis of results of individual or combination of these tests.

STEEL REINFORCEMENT:

- The Steel Reinforcement work shall be carried out as per CPWD Specifications - 2019 - Vol.I & Vol. II with upto date correction slips. And as per the directions of the Engineer in Charge.
- The minimum grade of Reinforcement Steel shall be FE 500D.

5.0 Water Proofing

Before application of the any waterproofing treatment, the mother slab shall be flooded with water upto a depth of 50mm for a period of 48 hours. Leakages found shall be marked and grouted with cementitious grout admixed with cebex 100 or equivalent. After the curing period of the grout, the mother slab shall again be flooded with water as mentioned above for a period of 48 hours.
The above procedure shall be repeated till the mother slab is leak and seepage proof. Only after satisfactory inspection and clearance from the Engineer in Charge the below mentioned waterproofing procedures shall be followed for the respective areas of application.

a. On Terrace/ Mumty / Top slab of the Shafts etc., :

I. Grouting all the joints with nonl-shrink cement polymer based grout using CONBEXTRA GP2 of M/s Fosroc or equivalent, Bore packing of pipes, sleeves, etc applying a coat of styrene- butadiene based polymer coating of NITOBOND SBR of M/s Fosroc or equivalent.

II. Providing and applying at the junction of slab and vertical offsets with cement mortar 1:4 admixed with NITOBOND SBR of M/s Fosroc or equivalent at required dosage as recommended by manufacturer.

Providing and applying NITOPROOF 600 PF of M/s Fosroc or equivalent single component polyurethane of medium viscosity grade (approximately 600 poise), spray applied, to give a tough elastomeric waterproof membrane of minimum DFT of 1.30mm, properties conforming to ASTM standards.

III. Laying protective and slope making float finished concrete screed of average 120mm thick using M20 grade concrete, mixed with CONPLAST X4211C of M/s Fosroc or equivalent integral based water proofing admixture, with minimum thickness of 50mm at the rain water outlet, in proper slope of 1.5%, including making golas at the junctions of horizontal and vertical surfaces, finished with 12mm thick cement plastering in CM 1:4 mixed with CONPLAST X4211C of M/s Fosroc or equivalent integral based water proofing admixtureincluding floating coat of neat cement slurry mixed with CONPLAST X4211C of M/s Fosroc or equivalent, making cutting grooves and filling with polysulphide etc. all complete as per manufacturer"s specifications and directions of Engineer-in-charge.

IV. The water proofing treatment shall cover the entire surface area of the slab and shall be continued up to 300mm above the FFL on all Vertical surfaces.

b. In Sunken part of floor:

I. Grouting all the joints with non-shrink cement polymer based grout using CONBEXTRA GP2 of M/s Fosroc or equivalent, Bore packing of pipes, sleeves, etc., applying a coat of styrene - butadiene based polymer coating of NITOBOND SBR of M/s Fosroc or equivalent.

II. Providing and applying at the junction of slab and vertical offsets with cement mortar 1:4 admixed with NITOBOND SBR of M/s Fosroc or equivalent at required dosage as recommended by manufacturer.

III. Providing and applying NITOPROOF 600 PF of M/s Fosroc or equivalent single component polyurethane of medium viscosity grade (approximately 600 poise), spray applied, to give a tough elastomeric waterproof membrane of minimum DFT of 1.30mm, properties conforming to ASTM standards

IV. Filling the sunken portion after laying pipes etc, with RMC M-15 grade or cement concrete 1:2:4 one cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size.

V. The water proofing treatment shall cover the entire surface area of the slab and shall be continued up to 300mm above the FFL on all Vertical surfaces.

c. In water storage tank:

I. Grouting all the joints with non-shrink cement polymer based grout using CONBEXTRA GP2 of M/s Fosroc or equivalent, Bore packing of pipes, sleeves, etc., applying a coat of styrene - butadiene based polymer coating of NITOBOND SBR of M/s Fosroc or equivalent.

II. Providing and applying at the junction of slab and vertical offsets with cement mortar 1:4 admixed with NITOBOND SBR of M/s Fosroc or equivalent at required dosage as recommended by manufacturer.

III. Providing and applying on internal & external surfaces of walls and on top of bottom slab, NITOPROOF 600 PF of M/s Fosroc or equivalent single component polyurethane of medium viscosity grade (approximately 600 poise), spray applied, to give a tough elastomeric waterproof membrane of minimum DFT of 1.30mm, properties conforming to ASTM standards.

IV. Laying protective and slope making float finished concrete screed of using M20 grade concrete, mixed with CONPLAST X4211C of M/s Fosroc or equivalent integral based water proofing admixture, in proper slope including making golas at the junctions of horizontal and vertical surfaces, finished with 12mm thick cement plastering in CM 1:4 mixed with CONPLAST X4211C of M/s Fosroc or equivalent integral based water proofing admixtureincluding floating coat of neat cement slurry mixed with CONPLAST X4211C of M/s Fosroc or equivalent on top of bottom slab all complete as per manufacturer's specifications and directions of Engineer-in-charge.

V. NITOPROOF 600 PF coating on internal and external surfaces of walls shall be protected with 12mm thick cement plaster of 1:4 cement mortar (1 cement:4 coarse sand) finished witha floating coat of neat cement punning.

d. Entire Floor area at all levels of the Building Except the Terrace:

I) All surfaces should be dry and free from contamination such as oil, grease, loose particles, decayed matter, laitance, and all traces of mould release oils and curing compounds

II) Area to receive the treatment shall be ponded with water for 24 hours to observe any leakages

III) Identified areas where leakages were observed shall be grouted with cement slurry admixed with Cebex 100 of Fosroc make or equivalent

IV) After completion of Final set of cement slurry, Area shall be again ponded with water to observe any seepages

with water to observe any seepages

V) Above procedure shall be repeated till the mother slab is leakage and seepage proof

VI) Brush bond of Fosroc Make or equivalent shall be applied in two coats. Minimum thickness of waterproofing membrane shall be 2mm.

VII) After application of waterproofing membrane necessary protection shall be provided to waterproofing membrane by spreading cement slurry and area shall be restricted for movement of workmen

VIII) Flooring work shall be immediately commenced after completion of waterproofing treatment to avoid any damages to the waterproofing membrane

IX) The water proofing treatment shall cover the entire surface area of the slab and shall be continued up to Skirting top level on all Vertical surfaces.

e. Starter Joints and Construction Joints Treatment:

(i) The Starter Joints and Construction joints treatment shall be done using hydrophilic water swellable Gasket water stopper made from high performance synthetic elastomer strips. The swelling action is the result of contact between water and hydrophilic groups which are part of the 'Basic Polymer' molecular structure. The unique feature of the basic polymer is the expansion the water stop creates a positive pressure against the face of the concrete joint, thus preventing water passing through the protected joint. Minimum Cover of 80mm while placing the swellable bar system shall be provided.

(ii) Swellable water stop should be used to prevent the passage of water through non-movement joints in both new in-situ concrete and between new and existing concrete. The properties shallcomply with the following values:

S.N.	Properties	Values
1.	Form	Rectangular section elastomeric strips
2.	Size	10mm X 20mm
3.	Solid content	100%
4.	Hardness Shore 'A'	70
5.	Unrestrained volumetric expansion	Up to 200%
6.	Application temperature range	-20° to 50°C
7.	Service temperaturerange	-30° to 70°C
8.	Hydrostatic pressureresistance	100 meters (10 bar)

(iii) **Methodology for Application:**

(a) The construction joints in the cast in situ concrete shall be fixed with Swellable water stop of size 20mmx 10mm by using noncorrosive nails at regular intervals or at ends of the water stop.

(b) The water bar shall be placed leaving 70mm cover from the walls to allow for the required expansion in the product.

(c) The water bar shall be ensured that it is not dislocated during the concreting and shall allow compensating the shrinkage gaps during hardened stage

(d) The waterstop may also be installed either into a groove cast in the concrete or directly onto the concrete surface.

(e) Swelling of waterstop in fresh concrete is minimal and most of the volume swell takes place after the initial setting of the concrete has taken place

f. Vertical and Horizontal Joints in Precast Panel on External Side and locations exposed to weathering.

I. SUBSTRATE PREPARATION

The substrate must be sound, clean, dry and free of all contaminants such as dirt, oil, grease, cement laitance, old sealants and poorly bonded paint coatings which could affect adhesion of the adhesive / sealant. The substrate must be of sufficient strength to resist with the stresses induced by the sealant during movement. Removal techniques such as wire brushing, grinding, sanding or other suitable mechanical tools can be used. All dust, loose and friable material must be completely removed from all surfaces before application of any activators, primers or adhesive / sealant.

II. APPLICATION OF PRIMER

Prime the surface using Sika® Primer-3 or equivalent applied by brush. Before bonding / sealing, allow a waiting time of > 30 minutes (< 8 hours) or as per the manufacturer specifications and as per the directions of Engineer in Charge.

III. APPLICATION METHOD

Sealing Procedure
Masking
Use masking tape to maintain neat or exact joint lines. Remove the tape within the skin time after finishing.

Joint Backing
After the required substrate preparation, insert a suitable backing rod to the required depth.

Priming
Prime the joint surfaces as recommended above in the substrate preparation and application of Primer.

Application
Prepare the end of the cartridge / foil pack before or after inserting into the sealant gun then fit the nozzle. Extrude Sikaflex®-11 FC+ or equivalent into the joint ensuring that it comes into full contact with the sides of the joint and avoiding any air entrapment. Sealant application width and depth shall be maintained as per the manufacturer specifications and as per the direction of Engineer in Charge.

Finishing
As soon as possible after application, sealant must be firmly tooled against the joint sides to ensure adequate adhesion and a smooth finish. Use a compatible tooling agent to smooth the joint surface.

Curing
Allow the sealant to cure for sufficient amount of period as per the manufacturer specifications and as per the direction of Engineer in Charge.

Testing
All the joints shall be tested for leakages by water jetting and if any leakages found above mentioned procedure shall be followed.

g. **Vertical & Horizontal Pipe/ Sleeve Bore Hole Grouting:**

A: Grouting of the Bore Hole

SURFACE PREPARATION:
Clean the surface with wire brush to remove loose particles & hidden dirt on the concrete surface. Wash the grouting area with water and saturate it for at least 24 hours before starting the grouting operation. Roughen the surface of the pipe for proper adhesion of the Grout material.

Pouring Non Shrink Grout:
Prepare and pour Dr. Fixit Pidigrout 10M or equivalent high strength, non-shrink, free flow grout in annular space around the pipe /the bore hole to be grouted as per the manufacturer's specifications and as per directions of the Engineer in Charge.

Curing: Cover the exposed areas of grout by wet burlap (jute bag) upto the period as recommended by the manufacturer and as per directions of Engineer in Charge

Ponding Test: Fill the above area with water upto 50mm depth for 48 hours and check for any leakages. If any leakages found repeat the above mentioned procedure till the leakage is arrested.

B. Application of KEMPEROL 1K PUR & KEMPEROL 165

FLEECE System or Equivalent System

Preparing the substrate: The substrate must be dry (in concrete, the residual moisture in the upper 2 cm must be < 5 %), sound and free from any material that would hinder adhesion.

Primer: Prior to the application of the KEMPEROL 1K-PUR or equivalent Waterproofing, prime with KEMPERTEC Primer or equivalent according to the primer recommendations by the manufacturer.

Application: Apply approx. 2/3 of KEMPEROL 1K PUR or equivalent Waterproofing, roll in KEMPEROL 165 fleece or equivalent and embed it using a nylon roller. Ensure the fleece sections have a 5 cm overlap and are free from bubbles. Apply the remaining 1/3 of KEMPEROL 1K-PUR or equivalent Waterproofing onto the still wet first layer, ensuring saturation.

Ponding Test: Fill the above area with water upto 50mm depth for 24 hours and check for any leakages. If any leakages found repeat the above mentioned procedure till the leakage and seepage is arrested.

Note: For all water proofing systems for respective areas of applications as mentioned above, the treated surfaces shall be checked for any leakage and seepage by flooding with water upto a depth of 50mm for a period of 48 hours. Leakages/seepage found shall be Treated as per the approved methodology as per the directions of Engineer in charge.

Guarantee Bond

a) Five years guarantee bond in prescribed proforma attached with Bid document shall be Submitted by the Contractor which shall also be signed by both the specialized agency and the Contractor to meet their liability/ liabilities under the Guarantee Bond. However, the sole responsibility about efficiency of water proofing treatment shall rest with the main Contractor.

b) **10% (Ten percent) of the cost of Water Proofing work shallbe retained as Security Deposit and the amount so withheld would be released after five years from the date of completion of the entire work under the agreement, if the performance of the work done is found satisfactory**. If any defect is noticed during the guarantee period, it shall be rectified by the Contractor within seven daysof receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of Contractor.

c) However, the Security Deposit deducted may be released in full against Bank Guarantee of equivalent amount in favour of authority intimated by Engineer-in-Charge, if so decided by the Engineer-in- Charge.

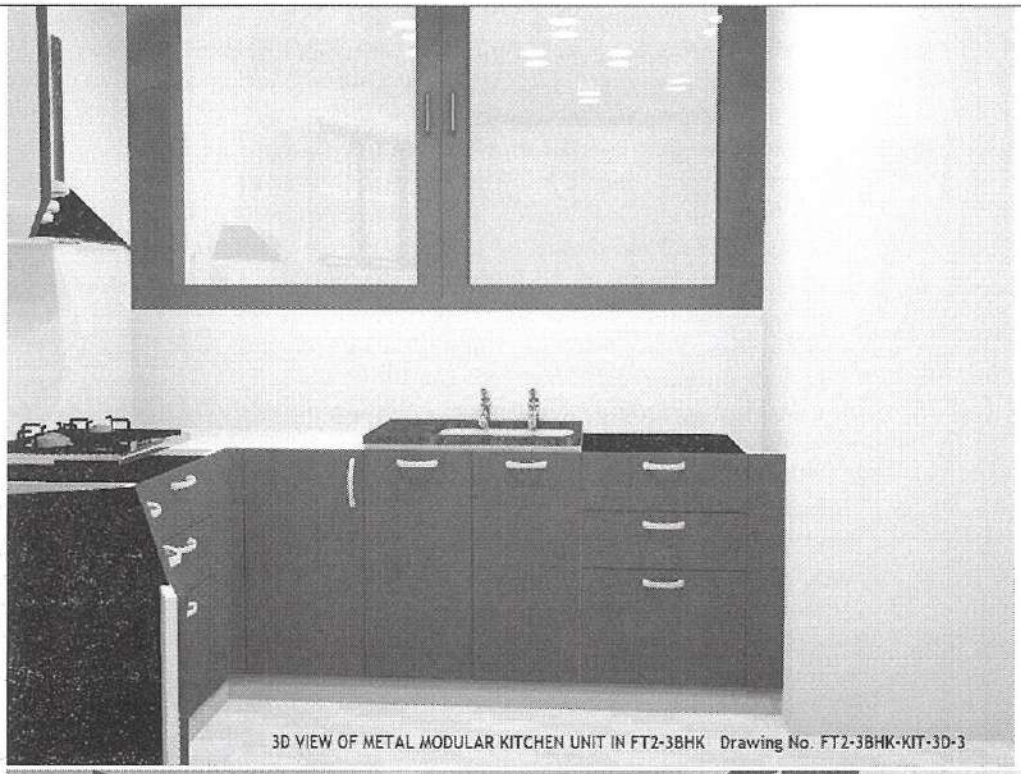
d) The Security Deposit against this item of work shall be in addition to the Security Deposit mentioned elsewhere in contract form.

6 Specifications for Metal Modular Wardrobes

A) for Faculty Housing

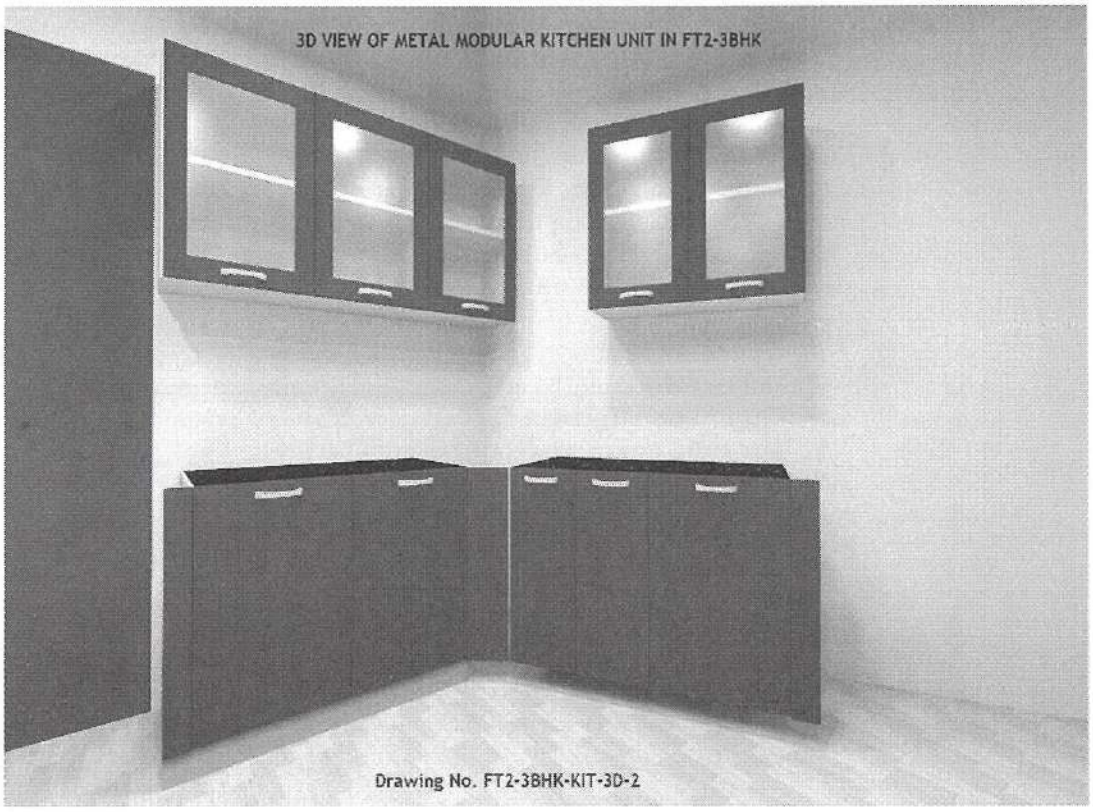
▪	▪ Modular Kitchen Units : **Make : Godrej**	
▪	▪	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL Modular kitchen unit of reputed brand of approved make of Galvanised CRCA Steel with Epoxy polyster powder coating carcass with Combination of 0.6mm (Body panels) and 1.2mm thick (Horizontal and vertical frames) zero spangles (as per ASTM A653), Post form look steel shutters using 0.6mm thick Galvanized steel and ABS end caps. Suasa Handle Zinc Alloy die cast with satin finish Hettich/equivalent make 202mm Pitch (for Floor Unit), Bow Handle Zinc Alloy die cast with satin finish standard make 128mm Pitch(for Top Unit), Pair of soft Closing hinges of 304 grade SS Hettich/equivalent for hinged doors, M10 screw type leveller with Hexagonal plastic base and all cooking, thali, bottle pullout baskets, soft closing Quadro Channels, etc of SS 304 grade Hettich make. Complete as per the approved color, dimensions, shapes, drawing Nos FT2-3BHK-KIT-2D, FT2-3BHK-KIT-3D-1 to 3 and attached detailed specification and warranties with overall allowable tolerance ranging from Length 100-150mm, Height 15-30mm and Depth 30-50mm, excluding transportation and installation. Fillers made up of similar material will be used to cover the cuddapah verticals, spaces/gaps as per the actual site requirements included. Fillers made up of similar material will be used to cover the cuddapah verticals, spaces/gaps as per the actual site requirements included complete. Top wall/floor units shall be fixed over AAC block masonary wall wherever necessary with HILTI/equivalent Anchor bolts. The gaps of unit and platforms shall be sealed with silicon sealant etc as required.
▪		▪ The floor units shall be accomodated and fixed in the existing space under the available kitchen platforms. As per the site conditions required and for optimum utilisation of space non load bearing cuddapah stone sandwich vertical partitions under platforms shall be removed. The modular kitchen works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/ requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of Engineer In-Charge.

▪		▪ Floor Unit : Constisting 5 CUSTOMISED METAL units of each depth 560mm, height 700mm and of lengths 1480mm(2 modules)/980mm(1 module)/2650mm(3 modules)/1530mm(1 module)/1640mm(2 modules) which comprises the following items as shown in the drawing. a) 900 mm wide Utensil Kit Set 2 Pain Baskets. b) 300mm wide Bottle Pull Out Kit with 2 baskets. c) 600mm wide Cooking Kit (2 nos Plain Basket of 100mm ht with 175mm ht drawer front & 1 no Plain Basket of 150 mm ht with 350mm ht drawer front + Hettich make PVC cutlery Tray). d) 1000mm wide corner gas cylinder storage unit with 1 no 450mm wide hinged door and 2nos SS gas cylinder trolley. e) 800mm wide plain sink unit with 2 nos 400mm wide hinged doors excluding sink, faucet, plumbing and any civil work. f) 600mm wide Thali Kit (Drawer+ Hettich make PVC Cutlery Tray + Cups & Saucer basket of 100mm ht with 175mm ht drawer front+ Thali Basket 150mm ht with 350mm ht drawer front). g) 1000mm wide plain shelf with 2 nos 500mm hinged door and 1 no adjustable metal shelf. h)600mm wide plain shelf with 2 nos 300mm wide hinged door and 1 no adjustable metal shelf. j) 500mm wide plain shelf unit with 500mm wide hinged door and 1 no adjustable metal shelf. ▪ Top Unit (Wall Cabinet) : Constisting 3 CUSTOMISED METAL units of each of depth 300mm, height 700mm and lengths 1300mm/1500mm/900mm which comprises the following items as shown in the drawing. a) 500mm wide metal plain shelf unit with 4mm Etched Glass and 1 adjustable metal shelf. b) 800mm wide metal plain shelf unit with 2 nos of 400mm of 4mm Etched Glass and 1 adjustable metal shelf. C) 1000mm metal plain shelf unit with 2 nos 500mm of 4mm Etched Glass and 1 adjustable metal shelf. D) 500mm metal plain shelf unit with 4mm Etched Glass and 1 adjustable metal shelf. e) 900mm metal plain shelf unit with 2nos 450mm of 4mm Etched Glass and 1 adjustable metal shelf.



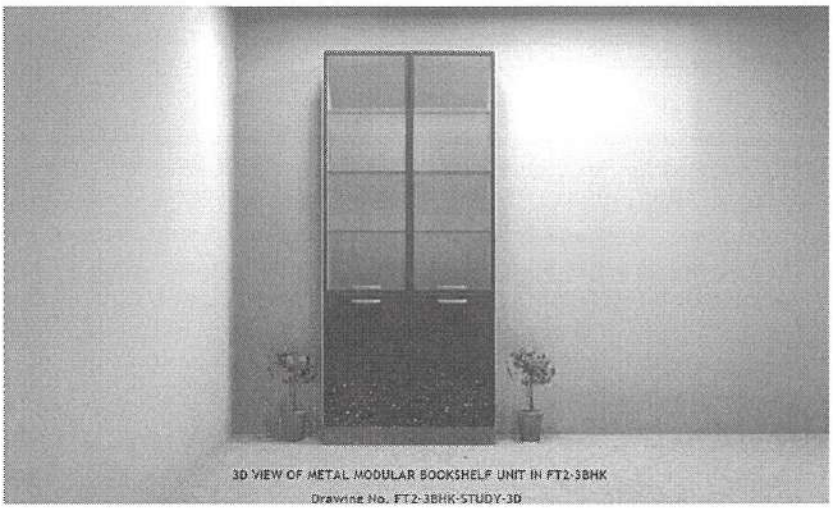
3D VIEW OF METAL MODULAR KITCHEN UNIT IN FT2-3BHK Drawing No. FT2-3BHK-KIT-3D-3

Drawing No. FT2-3BHK-KIT-3D-1



▪	▪TV Unit: **Make : Godrej**
	Manufacturing, providing & fixing of factory made CUSTOMISED METAL Modular TV unit of reputed brand of approved make of Galvanised CRCA Steel with Epoxy polyster powder coating carcass with Combination of 0.6mm (Body panels) and 1.2mm thick (Horizontal frame) zero spangles (as per ASTM A653), Post form look steel shutters using 0.6mm thick Galvanized steel and ABS end caps. Bow Handle Zinc Alloy die cast with satin finish standard make 128mm Pitch, Pair of soft Closing hinges of 304 grade SS Hettich/equivalent make for hinged doors, Hettich/equivalent make 100mm ht PVC legs with Poly Vinyl Chloride skirting fixed through C clamps. Complete as per the approved color, dimensions, shapes, specification, warranty and drawing Nos FT2-3BHK-TV-2D, FT2-3BHK-TV-3D, excluding granite, PVC foam board under the granite, transportation and installation. The modular TV Unit works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of Engineer In-Charge. Consisting of 4 units of 2400mm length, 560mm depth and of height of 700mm and 350mm. a) 450mm wide 4nos Multi utility drawers - 2 sets b) 900mm wide half height hinged door unit c) 600mm wide half hinged door unit  Drawing No. FT2-3BHK-TV-3D

	Bedroom Wardrobes:	
	3.3	Manufacturing, providing & fixing of factory made CUSTOMISED METAL wardrobe unit made of reputed brand of approved make of comibination of Dent resistant 0.5mm (back panel) and 0.8mm (frame work) CRCA steel with 50-60 microns of epoxy polyster powder coating, Hanging rod made of 0.1mm thick MS ERW oblong tube, metal Legs fitted with PVC leveler, Hardware like screws, washer, shelf support, lock etc of standard make, door hinge (Hettich/equivalent Make) & bumpers etc. in knock down condition as per the enclosed specifications and warranties. Body in Light cream, Doors in Shell wine red with Aluminium Handle, OHU push button and 50mm adjustable legs. Cost includes trasnportation of materials to site and Labour charges for lifting, placing, and fixing/installation at specified locations in all floors and levels etc. with necessary equipments like tools, instruments, machines as required in complete. Wherever reqired units shall be fixed over AAC block masonary wall with HILTI/equivalent Anchor bolts. The modular Wardrobe Unit works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/ requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of ENGINEER IN CHARGE. (Cost of fixing units on AAC blocks with HILTI Anchoring bolts and silicon sealants will be paid under relevant item. The required electrical modification works shall be dealt & executed separately with concerned)
	3.3.1	Master Bedroom : Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 2250mm length and Over Head Unit of 650mm height, 500mm depth, 2050mm length, as per the attached drawing no FT2-3BHK-WD. a) 400mm Main unit b) 450mm Dresser c) 400mm Additional unit d) 1000mm Addon unit e) 400mm Locker f) 800mm OHU Addon unit g) 450mm OHU Main Unit h) 800mm OHU Addon unit
	3.3.2	Bedroom 1 : Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 2200mm length and Over Head Unit of 650mm height, 500mm depth, 2200mm length, as per the attached drawing no FT2-3BHK-WD. a) 450mm Additional Unit b) 450 Dresser c) 500mm Main Unit d) 800mm Additional Unit e) 900mm OHU addon unit f) 500mm OHU Main Unit g) 800mm OHU addon

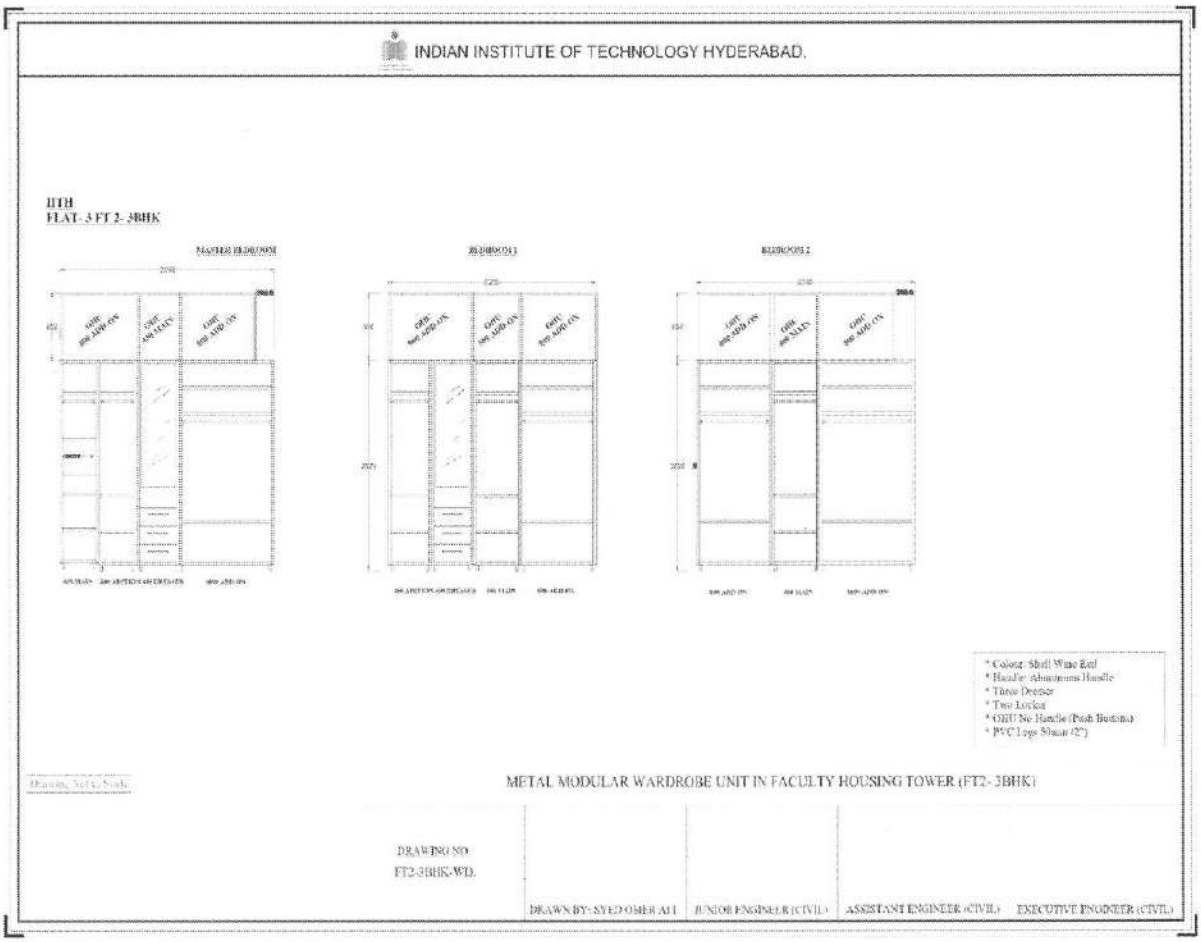
▪	▪ 3.3.3	▪ Bedroom 2 : Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 2200mm length and Over Head Unit of 650mm height, 500mm depth, 2000mm length, as per the attached drawing no FT2-3BHK-WD. a) 800mm Addon Unit b) 400mm Main Unit c) 1000mm Addon d) 800mm OHU Addon e) 400mm OHU Main unit f) 800mm OHU Addon Unit.  3D VIEW OF METAL MODULAR BOOKSHELF UNIT IN FT2-3BHK Drawing No. FT2-3BHK-STUDY-3D
▪	▪ Book-Shelf:	
▪	▪ 3.4	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL Modular Book-Shelf/Case unit of reputed brand of approved make of Galvanised CRCA Steel with Epoxy polyster powder coating carcass with Combination of 0.6mm (Body panels) and 1.2mm thick (Horizontal and vertical frames) zero spangles (as per ASTM A653), Post form look steel shutters using 0.6mm thick Galvanized steel and ABS end caps. Bow Handle Zinc Alloy die cast with satin finish standard make 128mm Pitch, Pair of soft Closing hinges of 304 grade SS Hettich for hinged doors, Hettich make 100mm ht PVC legs with Poly Vinyl Chloride skirting fixed through C clamps. Complete as per the approved color, dimensions, shapes, drawing Nos FT2-3BHK-STUDY-2D, FT2-3BHK-STUDY-3D, and attached detailed specification & warranty from M/s Godrej & Boyce Mfg. Co. Ltd., excluding transportation and installation. Wherever required units shall be fixed over AAC block masonary wall with HILTI Anchor bolts. Book-shelf : Consisting of 4 CUSTOMISED adjustable shelves making 5 compartments of 900mm wide hinged door unit with glass shutters, 2100mm height and 300mm depth, a) 2nos 450mm Glass shutters b) 2 nos 450mm hinged doors. (One set comprising 1 Unit) (Cost of fixing units on AAC blocks with HILTI Anchoring bolts and silicon sealants will be paid under relevant item. The required electrical modification works shall be dealt & executed separately with concerned)

	Miscellaneous Items for Faculty Housing Tower (FT2-3BHK):	
	2.5	Transportation of materials to site and Labour charges for lifting, assembling, placing and fixing/installation at specified locations in all floors and levels etc. with necessary equipment's like tools, instruments, machines as required in complete as per the directions of Engineer in charge.
	2.5.1	Kitchen floor & wall Units as specified in Item No.(2.1) [the cost of HILTI screws etc. as required will be paid under relevant item]
	2.5.2	Book-Shelf as specified in Item No.(2.4) [the cost of HILTI screws etc. if required will be paid under relevant item].
	2.5.3	TV unit as specified in Item No.(2.2) [the cost of Granite, Solid polymer panel under granite and Labour charges of which will be paid under relevant items (2.6) &(2.7)].
	2.6	Supply, fabrication, double edge moulding, and fixing of 20mm thick Black Galaxy granite slabs with 25mm granite strip attached under the granite over hang to make it look 40mm thick. as per the required sizes at the site for the TV unit counter top. Slab sizes 450x600mm - 2 nos, 1500x600mm - 1 no. Galaxy Granite sample to be approved by Engineer In Charge. (1 set comprising of 3 Units)
	2.7	Supply and fixing of solid polymer panel sheet of 18mm thick with Density of 500kg/m3 of BWP grade CenturyPly/greenply/equivalent make conforming to IS:710 as per attached annexure 1. (1 set comprising of 1 sheet of 2.4 x 0.6 meter)

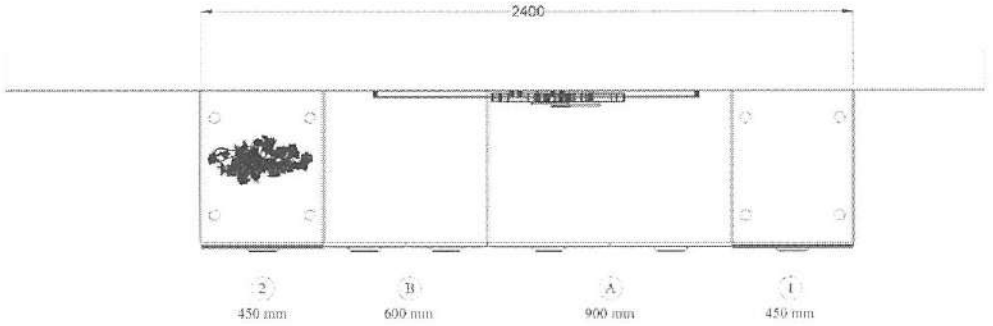
Feature	**Description/specification**
Cabinet (frame) Material	▪ Combination of 0.60mm (Body panels) and 1.20mm thick (Horizontal frame) Galvanized sheet with zero spangles (as per ASTM A653). ▪ The steel frames, panels & shutters should be made from Prime Quality Galvanized Steel. The Steel used is to be sourced from India's most reputed brand in steel manufacturing – like Tata Steel Ltd/equivalent. ▪ Important areas of quality 1. Prime quality Galvanized steel. 2. Processed in a special manner, galvanized in zinc with zero spangles. 3. Coated with epoxy paint which is a special encapsulated powder to avoid oil and finger print marks.

Unit Construction	▪ Floor and top units will be made using common frame open structure. With optional back & side panels. ▪ The frame & panel based construction coupled with well accessories ensure that there is no unnecessary wastage & hence helps reduce cost and makes units as per needs.
Metal Shutters:	▪ Post form look steel shutters using 0.60mm thick Galvanized steel and ABS end caps. ▪ 4mm etched glass in metal frame in case of glass door. ▪ Steel shutters are made so that they look sleek but at the same time the construction is such that it ensures strength. ▪ Post-forming (curved profile on the sides) to be provided to ensure a soft, contemporary look that visually adds to the depth & vastness of the kitchen.
Finish on metal surface	▪ Epoxy polyester powder coating with dry film thickness of 40 – 60 microns. ▪ Prime quality steel is further subject to a very special treatment called Galvanization wherein a coating of zinc/zinc alloys is to be given to the steel surface. ▪ The Galvanized Steel is then subject to a pretreatment process wherein all surface impurities are removed. ▪ Finally, this pretreated steel is painted with Epoxy Polyester paint with special encapsulated powder having a film thickness of 40-60 microns. The powder coating layer with this thickness imparts high scratch resistance & the special encapsulated powder ensures that oil or hand marks are not formed on the surface. The surface can be easily cleaned using wet Cloth.
Wire baskets	▪ Made of top quality grade Stainless steel wires with Ni Cr plating.
Shelves	▪ Galvanized steel shelves in case of metal hinged door unit. ▪ The load carrying capacity of shelves should be 80 kg & hence heavy utensils etc. can be safely placed in cabinets.
Slides	▪ High precision double extension ball slides to be used in drawers & baskets and drawers to open fully. These slides have to be surpassed more than 55000 cycles of drawer cycle test (forward & backward movements) with a 15kg load in the drawer.
Hinges	▪ German hinges with CED coating for extended corrosion resistance. ▪ Germany is well known for mechanical technology. Hence it is recommended to use German hinges. Moreover, special coating called CED (Cathode Electro-deposition) coating to be provided to these hinges which ensures very high corrosion resistance.
Wooden Cornice & Pelmets.	▪ Poly Vinyl Chloride membrane pressed MDF. ▪ Gives the kitchen a complete look and pelmet helps focus task lights on the work platform.
Handle	▪ Zinc Alloy die cast handle with satin finish. ▪ Handles are made of die cast handle made of zinc alloy. Zinc ensures a high resistance to corrosion & imparts an aesthetic finish.

Skirting	▪ **Poly Vinyl Chloride skirting** ▪ The skirting used in kitchen is to be made of Poly Vinyl chloride that is light in weight & is not affected by water that comes in contact while cleaning the kitchen floor.
Accessories made of Stainless Steel	▪ All storage accessories are to be made of 304 grade Stainless Steel with 8% nickel. ▪ Storage accessories made in 304 grade SS are to be surface treated with Nickel Chromium Plating. ▪ Accessories are designed to take care of all the storage needs in an organized manner. Ensure that accessories make "Place for Everything so that Everything is in Place" (PEEP).



INDIAN INSTITUTE OF TECHNOLOGY HYDERABAD.



LIST OF COMPONENTS

NUMBER	DESCRIPTION	SIZE
1	MULTI UTILITY UNIT	450 mm
2	MULTI UTILITY UNIT	450 mm
A	BRIDGE TOP UNIT	900 mm
B	BRIDGE TOP UNIT	600 mm

PROPOSED METAL MODULAR TV UNIT IN FACULTY HOUSING TOWER (FT2-3BHK)

DRAWING NO:
FT2-3BHK-TV-2D.

DRAWN BY: SYED OMER ALI | JUNIOR ENGINEER (CIVIL) | ASSISTANT ENGINEER (CIVIL) | EXECUTIVE ENGINEER (CIVIL)

B) Specifications for Metal Modular Wardrobes Staff Housing – ST2A & ST2B (Type – D)

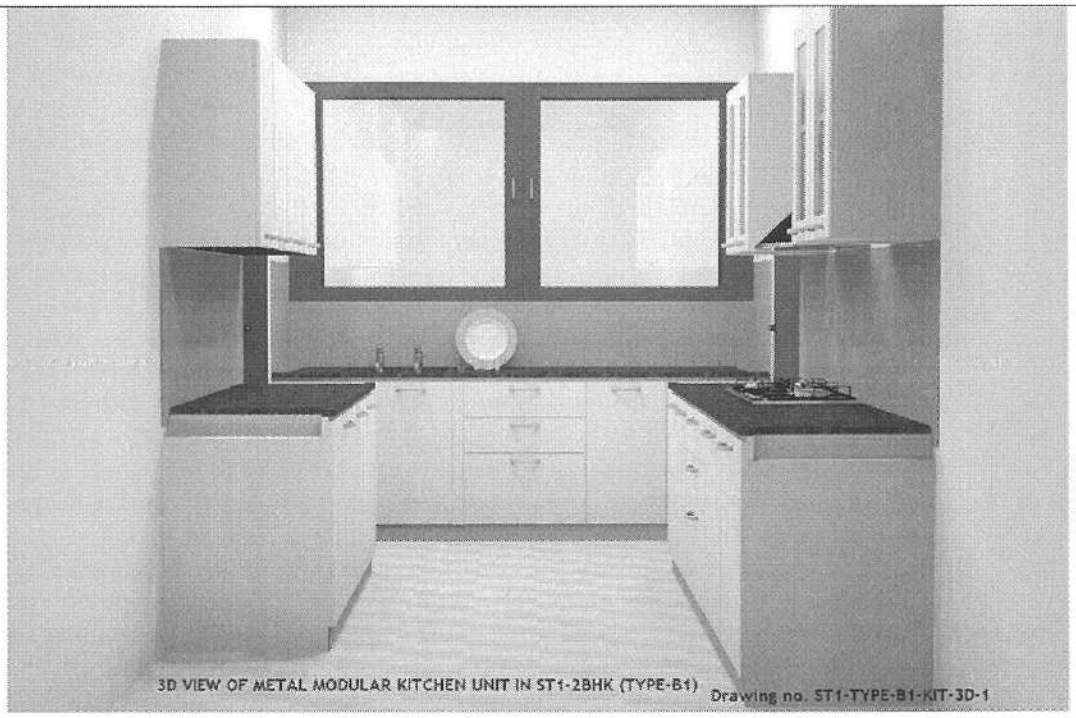
▪ Modular Kitchen Units : **Make : Godrej**	
▪	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL Modular kitchen unit of reputed brand of approved make of Galvanised CRCA Steel with Epoxy polyster powder coating carcass with Combination of 0.6mm (Body panels) and 1.2mm thick (Horizontal and vertical frames) zero spangles (as per ASTM A653), Post form look steel shutters using 0.6mm thick Galvanized steel and ABS end caps. Bow Handle Zinc Alloy die cast with satin finish Hettich/equivalent make 128mm Pitch (for Floor Unit), Bow Handle Zinc Alloy die cast with satin finish standard make 128mm Pitch(for Top Unit), Pair of soft Closing hinges of 304 grade SS Hettich for hinged doors, M10 screw type leveller with Hexagonal plastic base and all cooking, thali, bottle pullout baskets, soft closing Quadro Channels, etc of SS 304 grade Hettich make. Complete as per the approved color, dimensions, shapes, drawing Nos ST1-TYPE-A-KIT-2D, ST1-TYPE-A-KIT-3D-1 to 2, and attached detailed specifications and warranties from M/s Godrej & Boyce Mfg. Co. Ltd. with overall allowable tolerance ranging from Length 100-150mm, Height 15-30mm and Depth 30-50mm, excluding transportation and installation. Fillers made up of similar material will be used to cover the cuddapah verticals, spaces/gaps as per the actual site requirements included complete. Top wall/floor units shall be fixed over block masonary wall wherever necessary with HILTI/equivalent Anchor bolts. The gaps of unit and platforms shall be sealed with silicon sealant etc as required.
	▪ The floor units shall be accommodated and fixed in the existing space under the available kitchen platforms. As per the site conditions required and for optimum utilisation of space non load bearing cuddapah stone sandwich vertical partitions under platforms shall be removed. The modular kitchen works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/ requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of EIC.

- **Floor Unit :** Constisting 3 CUSTOMISED METAL units of each depth 560mm, height 700mm and of lengths 2585mm(4 modules)/1915mm(2 module)/2643mm(4 modules) which comprises the following items as shown in the drawing.

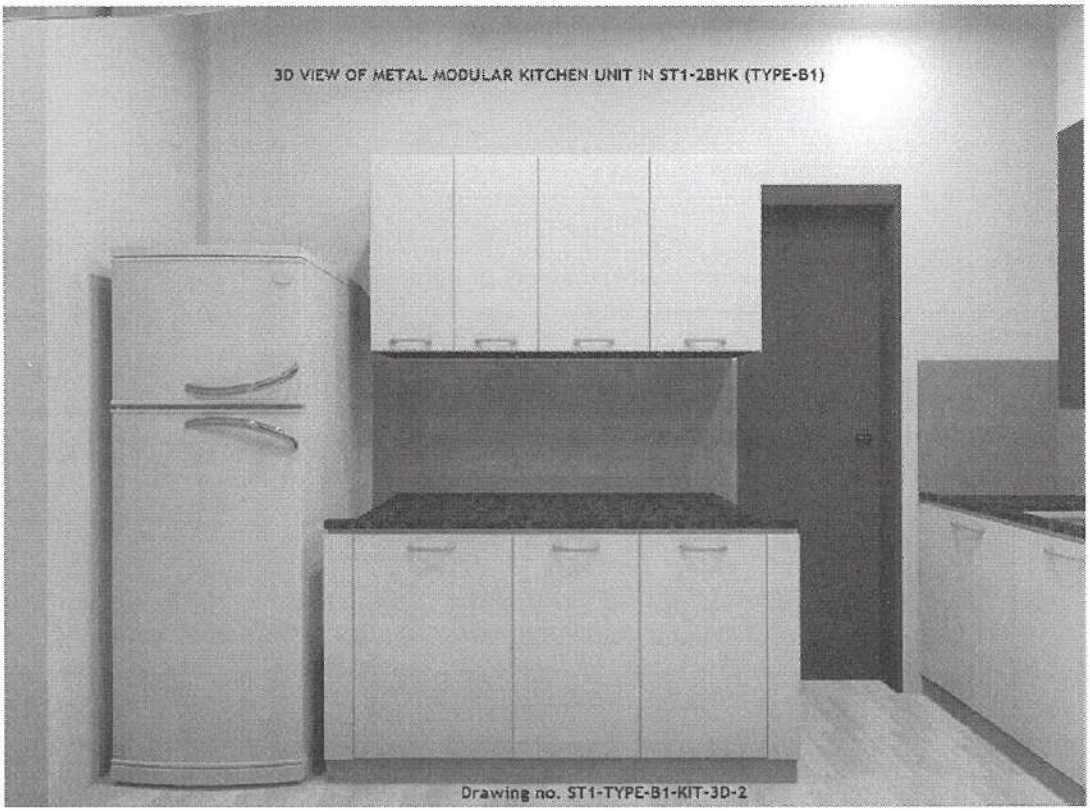
  a) 800mm wide plain shelf with 2 nos 400mm hinged door and 1 no adjustable metal shelf.
  b) 900mm wide plain shelf with 2 nos 450mm hinged door and 1 no adjustable metal shelf.
  c) 800mm wide plain sink unit with 2 nos 400mm wide hinged doors excluding sink, faucet, plumbing and any civil work.
  d) 600mm wide Thali Kit (Drawer+ Hettich make PVC Cutlery Tray + Cups & Saucer basket of 100mm ht with 175mm ht drawer front+ Thali Basket 150mm ht with 350mm ht drawer front).
  e) 500mm wide plain shelf unit with 500mm wide hinged door and 1 no adjustable metal shelf.
  f) 600mm wide plain shelf with 2 nos 300mm wide hinged door and 1 no adjustable metal shelf.
  g) 600mm wide gas cylinder storage unit with 2 nos 300mm wide hinged door and 1 no SS gas cylinder trolley..
  h)300mm wide Bottle Pull Out Kit with 2 baskets.
  i) 600mm wide Cooking Kit (2 nos Plain Basket of 100mm ht with 175mm ht drawer front & 1 no Plain Basket of 150 mm ht with 350mm ht drawer front + Hettich make PVC cutlery Tray).
  j) 900mm wide plain shelf with 2 nos 450mm hinged door and 1 no adjustable metal shelf.

- **Top Unit (Wall Cabinet):** Constisting 3 CUSTOMISED METAL units of each of depth 310mm, height 700mm and lengths 1800mm/800mm/800mm which comprises the following items as shown in the drawing.

  a) 900mm wide metal plain shelf unit with 2nos 450mm shutters and 1 adjustable metal shelf.
  b) 900mm wide metal plain shelf unit with 2nos 450mm shutters and 1 adjustable metal shelf.
  c) C) 800mm metal plain shelf unit with 2 nos 4mm Etched Glass and 1 adjustable metal shelf.
  d) D) 800mm metal plain shelf unit with 2 nos 4mm Etched Glass and 1 adjustable metal shelf.



3D VIEW OF METAL MODULAR KITCHEN UNIT IN ST1-2BHK (TYPE-B1) Drawing no. ST1-TYPE-B1-KIT-3D-1



Drawing no. ST1-TYPE-B1-KIT-3D-2

▪ Bedroom Wardrobes:	
▪ 3.3	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL wardrobe unit made of reputed brand of approved make of comibination of Dent resistant 0.5mm (back panel) and 0.8mm (frame work) CRCA steel with 50-60 microns of epoxy polyster powder coating, Hanging rod made of 0.1mm thick MS ERW oblong tube, metal Legs fitted with PVC leveler, Hardware like screws, washer, shelf support, lock etc of Godrej/equivalent make, door hinge (Hettich/equivalent Make) & bumpers etc. in knock down condition as per the enclosed specifications and warranties. Body in Light cream, Doors in Shell wine red with Aluminium Handle, OHU push button and 50mm adjustable legs. Cost includes trasnportation of materials to site and Labour charges for lifting, placing, and fixing/installation at specified locations in all floors and levels etc. with necessary equipments like tools, instruments, machines as required in complete. Wherever reqired units shall be fixed over AAC block masonary wall with HILTI/equivalent Anchor bolts. The modular Wardrobe Unit works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of Engineer In-Charge. (Cost of fixing units on AAC blocks with HILTI Anchoring bolts and silicon sealants will be paid under relevant item. The required electrical modification works shall be dealt & executed separately with concerned).
▪ 3.3.1	▪ Master Bedroom : Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 2200mm length as per the attached Model-1 in drawing no ST1-TYPE B1 -WD. ▪ a) 500mm Main unit ▪ b) 450mm Additional unit ▪ c) 450mm Dresser ▪ d) 800mm Addon unit ▪ e) 500mm Locker
▪ 3.3.2	▪ Bedroom 1 : Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 2100mm length and Over Head Unit of 650mm height, 500mm depth, 2100mm length, as per the attached Model-2 in drawing no ST1-TYPE B1-WD. ▪ a) 800 mm Additional Unit ▪ b) 500 mm Main Unit ▪ c) 800 mm Additional Unit ▪ d) 800mm OHU Add on unit ▪ e) 500mm OHU Main unit ▪ f) 800mm OHU add on unit
▪ Miscellaneous Items for Staff Housing Tower (ST1-2BHK-Type B1):	
▪ 2.5	▪ Trasnportation of materials to site and Labour charges for lifting, assembling,placing and fixing/installation at specified locations in all floors and levels etc. with necessary equipments like tools, instruments, machines as required in complete as per the directions of Engineer in charge.
▪ 2.5.1	▪ Kitchen floor & wall Units as specified in Item No.(5.1) [the cost of HILTI screws etc. as required will be paid under relevant item]

Feature	Description/specification
Cabinet (frame) Material	▪ Combination of 0.60mm (Body panels) and 1.20mm thick (Horizontal frame) Galvanized sheet with zero spangles (as per ASTM A653). ▪ The steel frames, panels & shutters should be made from Prime Quality Galvanized Steel. The Steel used is to be sourced from India's most reputed brand in steel manufacturing – like Tata Steel Ltd/equivalent. ▪ Important areas of quality 4 Prime quality Galvanized steel 5. Processed in a special manner, galvanized in zinc with zero spangles. 6. Coated with epoxy paint which is a special encapsulated powder to avoid oil and finger print marks.
Unit Construction	▪ Floor and top units will be made using common frame open structure. With optional back & side panels. ▪ The frame & panel based construction coupled with well accessories ensure that there is no unnecessary wastage & hence helps reduce cost and makes units as per needs.
Metal Shutters:	▪ Post form look steel shutters using 0.60mm thick Galvanized steel and ABS end caps. ▪ 4mm etched glass in metal frame in case of glass door. ▪ Steel shutters are made so that they look sleek but at the same time the construction is such that it ensures strength. ▪ Post-forming (curved profile on the sides) to be provided to ensure a soft, contemporary look that visually adds to the depth & vastness of the kitchen.
Wooden shutters	▪ Medium Density Fiber board 18mm thick shutters wrapped in durable foil eliminating moisture penetration and peeling ▪ 4mm etched glass in wooden frame in case of glass door. ▪ Kitchen provides the Strength & solidness of steel in the frame & panel based construction. At the same time, it has to offer the aesthetics of wood (warm looks) by Membrane Pressed Wooden Shutters coupled with matching Cornice & Pelmet. Wooden shutters are made of MDF & the Poly vinyl chloride laminate is to be pressed on to the MDF substrate using the most advanced technique called Membrane Pressing. ▪ It should be advocated that the body of the cabinets & the accessories should be of steel for durability & strength.

Finish on metal surface	▪ Epoxy polyester powder coating with dry film thickness of 40 – 60 microns. ▪ Prime quality steel is further subject to a very special treatment called Galvanization wherein a coating of zinc/zinc alloys is to be given to the steel surface. ▪ The Galvanized Steel is then subject to a pretreatment process wherein all surface impurities are removed. ▪ Finally, this pretreated steel is painted with Epoxy Polyester paint with special encapsulated powder having a film thickness of 40-60 microns. The powder coating layer with this thickness imparts high scratch resistance & the special encapsulated powder ensures that oil or hand marks are not formed on the surface. The surface can be easily cleaned using wet Cloth.
Wire baskets	▪ Made of top quality grade Stainless steel wires with Ni Cr plating.
Shelves	▪ Galvanized steel shelves in case of metal hinged door unit. ▪ The load carrying capacity of shelves should be 80 kg & hence heavy utensils etc. can be safely placed in cabinets.
Slides	▪ High precision double extension ball slides to be used in drawers & baskets and drawers to open fully. These slides have to be surpassed more than 55000 cycles of drawer cycle test (forward & backward movements) with a 15kg load in the drawer.
Hinges	▪ German hinges with CED coating for extended corrosion resistance. ▪ Germany is well known for mechanical technology. Hence it is recommended to use German hinges. Moreover, special coating called CED (Cathode Electro-deposition) coating to be provided to these hinges which ensures very high corrosion resistance.
Wooden Cornice & Pelmets.	▪ Poly Vinyl Chloride membrane pressed MDF. ▪ Gives the kitchen a complete look and pelmet helps focus task lights on the work platform.
Handle	▪ Zinc Alloy die cast handle with satin finish. ▪ Handles are made of die cast handle made of zinc alloy. Zinc ensures a high resistance to corrosion & imparts an aesthetic finish.
Skirting	▪ **Poly Vinyl Chloride skirting** ▪ The skirting used in kitchen is to be made of Poly Vinyl chloride that is light in weight & is not affected by water that comes in contact while cleaning the kitchen floor.
Accessories made of Stainless Steel	▪ All storage accessories are to be made of 304 grade Stainless Steel with 8% nickel. ▪ Storage accessories made in 304 grade SS are to be surface treated with Nickel Chromium Plating. ▪ Accessories are designed to take care of all the storage needs in an organized manner. Ensure that accessories make "Place for Everything so that Everything is in Place" (PEEP).

C) Specifications for Metal Modular Wardrobes Staff Housing –

ST1A (Type – E)

▪ Modular Kitchen Units () : **Make : Godrej**	
▪	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL Modular kitchen unit of reputed brand of approved make of Galvanised CRCA Steel with Epoxy polyster powder coating carcass with Combination of 0.6mm (Body panels) and 1.2mm thick (Horizontal and vertical frames) zero spangles (as per ASTM A653), Post form look steel shutters using 0.6mm thick Galvanized steel and ABS end caps. Bow Handle Zinc Alloy die cast with satin finish Hettich/equivalent make 128mm Pitch (for Floor Unit), Bow Handle Zinc Alloy die cast with satin finish standard make 128mm Pitch (for Top Unit), Pair of soft Closing hinges of 304 grade SS Hettich for hinged doors, M10 screw type leveller with Hexagonal plastic base and all cooking, thali, bottle pullout baskets, soft closing Quadro Channels, etc of SS 304 grade Hettich make. Complete as per the approved color, dimensions, shapes, drawing Nos ST2-TYPE-C-KIT 2D, ST2-TYPE-C-KIT 3D-1 to 3, and attached detailed specification and warranties with overall allowable tolerance ranging from Length 100-150mm, Height 15-30mm and Depth 30-50mm, excluding transportation and installation. Fillers made up of similar material will be used to cover the cuddapah verticals, spaces/gaps as per the actual site requirements included complete. Top wall/floor units shall be fixed over AAC block masonary wall wherever necessary with HILTI/equivalent Anchor bolts. The gaps of unit and platforms shall be sealed with silicon sealant etc as required.
	▪ The floor units shall be accomodated and fixed in the existing space under the available kitchen platforms. As per the site conditions required and for optimum utilisation of space non load bearing cuddapah stone sandwich vertical partitions under platforms shall be removed. ▪ Top Wall cabinets shall be fixed with HILTI Anchor bolts as required. The modular kitchen works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/ requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of EIC.

Floor Unit : Constisting 2 CUSTOMISED METAL units of each depth 560mm, height 700mm and of lengths 2140mm(4 modules)/1375mm(2 module) which comprises the following items as shown in the drawing.

a) 450mm wide gas cylinder storage unit with 1 no 450mm wide hinged door and 1 no SS gas cylinder trolley.

b) 200mm wide Bottle Pull Out Kit with 2 baskets.

c) 600mm wide Cooking Kit (2 nos Plain Basket of 100mm ht with 175mm ht drawer front & 1 no Plain Basket of 150 mm ht with 350mm ht drawer front + Hettich make PVC cutlery Tray).

d) 800mm wide plain shelf with 2 nos 400mm hinged door and 1 no adjustable metal shelf.600mm wide

e) 450mm wide plain shelf unit with 450mm wide hinged door and 1 no adjustable metal shelf.

f) 800mm wide plain sink unit with 2 nos 400mm wide hinged doors excluding sink, faucet, plumbing and any civil work.

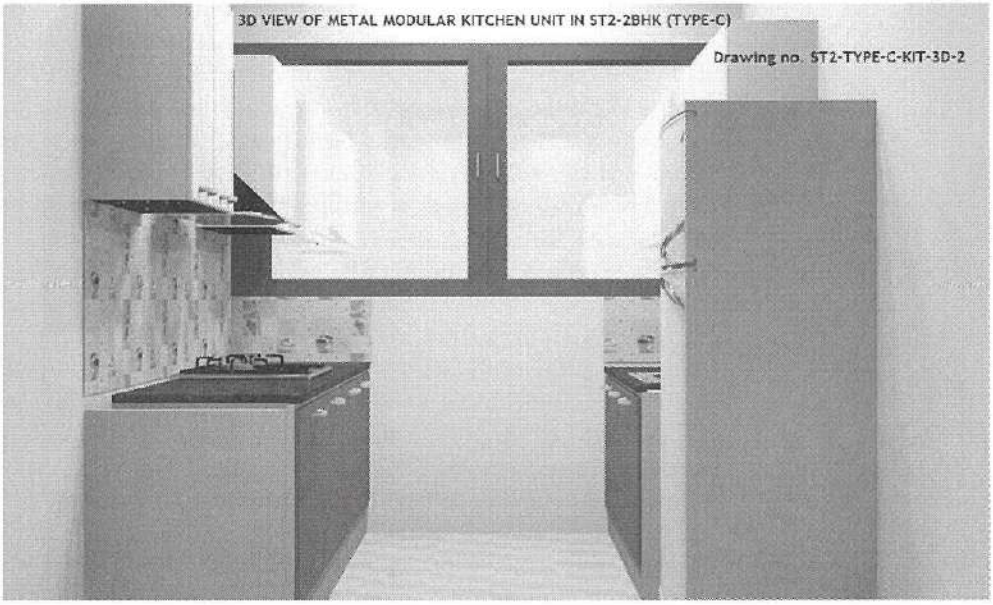
- **Top Unit (Wall Cabinet) :** Constisting 3 CUSTOMISED METAL units of each of depth 310mm, height 700mm and lengths 600mm/600mm/1350mm which comprises the following items as shown in the drawing.

a) 600mm metal plain shelf unit with 2 nos 4mm Etched Glass and 1 adjustable metal shelf.

b) 600mm metal plain shelf unit with 2 nos 4mm Etched Glass and 1 adjustable metal shelf.

c) 450mm wide metal plain shelf unit with 1no 450mm shutter and 1 adjustable metal shelf.

d) 900mm wide metal plain shelf unit with 2nos 450mm shutters and 1 adjustable metal shelf.



▪ Bedroom Wardrobes:	
▪ 3.3	▪ Manufacturing, providing & fixing of factory made CUSTOMISED METAL wardrobe unit made of reputed brand of approved make of comibination of Dent resistant 0.5mm (back panel) and 0.8mm (frame work) CRCA steel with 50-60 microns of epoxy polyster powder coating, Hanging rod made of 0.1mm thick MS ERW oblong tube, metal Legs fitted with PVC leveler, Hardware like screws, washer, shelf support, lock etc of Godrej/equivalent make, door hinge (Hettich/equivalent Make) & bumpers etc. in knock down condition as per the enclosed specifications and warranties. Body in Light cream, Doors in Shell wine red with Aluminium Handle, OHU push button and 50mm adjustable legs. Cost includes trasnportation of materials to site and Labour charges for lifting, placing, and fixing/installation at specified locations in all floors and levels etc. with necessary equipments like tools, instruments, machines as required in complete. Wherever reqired units shall be fixed over AAC block masonary wall with HILTI/equivalent Anchor bolts. The modular Wardrobe Unit works shall be carried out in co-ordination with the occupants/working civil prime contractor of the towers. As per the demand/requirement necessary modifications to electrical points/fixtures shall be carried out by concerned teams as per the directions of Engineer In-Charge. (Cost of fixing units on AAC blocks with HILTI Anchoring bolts and silicon sealants will be paid under relevant item. The required electrical modification works shall be dealt & executed separately with concerned).
▪ 3.3.1	▪ Master Bedroom: Consisting of METAL wardrobe Floor unit of 2020mm height, 500mm depth, 1400mm length as per the attached Model-1 in drawing no ST2-TYPE C -WD. ▪ a) 500mm Additional unit ▪ b) 450mm Dresser ▪ d) 450mm Main unit ▪ e) 500mm Locker
▪ Miscellaneous Items for Staff Housing Tower (ST1-2BHK-Type B1):	
▪ 2.5	▪ Transportation of materials to site and Labour charges for lifting, assembling, placing and fixing/installation at specified locations in all floors and levels etc. with necessary equipments like tools, instruments, machines as required in complete as per the directions of Engineer in charge.

Feature	Description/specification
Cabinet (frame) Material	▪ Combination of 0.60mm (Body panels) and 1.20mm thick (Horizontal frame) Galvanized sheet with zero spangles (as per ASTM A653). ▪ The steel frames, panels & shutters should be made from Prime Quality Galvanized Steel. The Steel used is to be sourced from India's most reputed brand in steel manufacturing – like Tata Steel Ltd/equivalent. ▪ Important areas of quality 7. Prime quality Galvanized steel. 8. Processed in a special manner, galvanized in zinc with zero spangles. 9. Coated with epoxy paint which is a special encapsulated powder to avoid oil and finger print marks.
Unit Construction	▪ Floor and top units will be made using common frame open structure. With optional back & side panels. ▪ The frame & panel based construction coupled with well accessories ensure that there is no unnecessary wastage & hence helps reduce cost and makes units as per needs.
Metal Shutters:	▪ Post form look steel shutters using 0.60mm thick Galvanized steel and ABS end caps. ▪ 4mm etched glass in metal frame in case of glass door. ▪ Steel shutters are made so that they look sleek but at the same time the construction is such that it ensures strength. ▪ Post-forming (curved profile on the sides) to be provided to ensure a soft, contemporary look that visually adds to the depth & vastness of the kitchen.
Finish on metal surface	▪ Epoxy polyester powder coating with dry film thickness of 40 – 60 microns. ▪ Prime quality steel is further subject to a very special treatment called Galvanization wherein a coating of zinc/zinc alloys is to be given to the steel surface. ▪ The Galvanized Steel is then subject to a pretreatment process wherein all surface impurities are removed. ▪ Finally, this pretreated steel is painted with Epoxy Polyester paint with special encapsulated powder having a film thickness of 40-60 microns. The powder coating layer with this thickness imparts high scratch resistance & the special encapsulated powder ensures that oil or hand marks are not formed on the surface. The surface can be easily cleaned using wet Cloth.
Wire baskets	▪ Made of top quality grade Stainless steel wires with Ni Cr plating.

Shelves	▪ Galvanized steel shelves in case of metal hinged door unit. ▪ The load carrying capacity of shelves should be 80 kg & hence heavy utensils etc. can be safely placed in cabinets.
Slides	▪ High precision double extension ball slides to be used in drawers & baskets and drawers to open fully. These slides have to be surpassed more than 55000 cycles of drawer cycle test (forward & backward movements) with a 15kg load in the drawer.
Hinges	▪ German hinges with CED coating for extended corrosion resistance. ▪ Germany is well known for mechanical technology. Hence it is recommended to use German hinges. Moreover, special coating called CED (Cathode Electro-deposition) coating to be provided to these hinges which ensures very high corrosion resistance.
Wooden Cornice & Pelmets.	▪ Poly Vinyl Chloride membrane pressed MDF. ▪ Gives the kitchen a complete look and pelmet helps focus task lights on the work platform.
Handle	▪ Zinc Alloy die cast handle with satin finish. ▪ Handles are made of die cast handle made of zinc alloy. Zinc ensures a high resistance to corrosion & imparts an aesthetic finish.
Skirting	▪ **Poly Vinyl Chloride skirting** ▪ The skirting used in kitchen is to be made of Poly Vinyl chloride that is light in weight & is not affected by water that comes in contact while cleaning the kitchen floor.
Accessories made of Stainless Steel	▪ All storage accessories are to be made of 304 grade Stainless Steel with 8% nickel. ▪ Storage accessories made in 304 grade SS are to be surface treated with Nickel Chromium Plating. ▪ Accessories are designed to take care of all the storage needs in an organized manner. Ensure that accessories make "Place for Everything so that Everything is in Place" (PEEP).

Note : Drawings and images shown are indicative only. As per the actual site condition and dimensions, drawings shall be prepared and submitted for the approval of Engineer In charge.

7 uPVC DOORS, WINDOWS& VENTILATORS

All openable and fixed window system shall have minimum 3 hollow chambers from front to back. The sliding system frames shall have minimum 3 chambers from front to back. The Sliding System Sashes shall have minimum 2 chambers from front to back. The outer profile shall not be less than 56 mm.
All sections of the frame and sash shall be reinforced in accordance with the system supplier's recommendations using galvanized mild steel in a single continuous length.

GENERAL REQUIRMENT

Profile

The profile is to be extruded from a compound that has been blended to ensure quality and consistency. The material shall be pristine white high impact modified window grade uPVC and shallbe conform to BS EN 12608:2003 as below

Description	Required Value
Flexural modulus of Elasticity Resistance to impact by falling mass at – 10°C for Class II (falling mass 1000g ; falling height 1500mm – as per BSEN 12608:2003)	Shall not be less than 2200 N/mm^2 not more than 1 test specimen shall show rupture in wall
Mean Breaking Stress for welded corners	Shall notbe less than $35N/mm^2$ for compression bending test or $25N/mm^2$ fortensile bending test

The profile shall be a hollow 3-chamber (across depth) profile with a outer wall thickness not less than 2.2 mm. The profile shall be of first grade/quality uniform and free from foreign bodies, cracks or marks.

Fabrication of Window

i) The window units shall be designed with all corner joints, transom joints andmullion joints being mitred and fusion welded.

ii) All excess material is to be neatly trimmed and neatly feature grooved/raised nibfinish at corners, transom joints and mullion joints.

iii) There will be no mechanical joining of the profile.

iv) No polishing flush of any joints will be permitted.

v) The window units shall be designed so that the route of drainage is preventedfrom passing through the reinforcement chamber.

vi) The finished product shall be free from all sharp edges, burrs and the like thatmay be hazardous to the user.

vii) The dimensional tolerances on the finished outer frame height and width shall be
±3mm. Frame assemblies shall be such that they can be installed square within a maximum difference in the diagonals of 4mm. Minimum overlap of sash on frame shall be 8mm.

viii) In all window units, adequate drainage should be provided to permit the escape of water from platforms or horizontal members beneath each sealed unit. The drainage slots shall not penetrate into the reinforcement chambers Rain water Stop to be provided wherever necessary to provide barrier to excess rain water.

Reinforcement

i) Reinforcement shall be made from GI tube of not less than 2.0 mm thickness as per strength requirement unless otherwise approved by Engineer in Charge.

ii) Steel reinforcement shall conform to IS 277:2003 or equivalent. Base material of steel shall conform to IS 513:2008 – Drawing Grade.

iii) The reinforcement shall be installed in accordance with the recommended actions. The reinforcement shall conform to the wind load requirements of IS 875: Part 3. The reinforcement shall be in one continuous length and should be installed minimum 5mm and maximum 10mm from the face of the profile to be welded.

iv) The reinforcement shall be secured to the profile so that it does not move or rattle and it maintains the structural integrity of the frame and satisfactory thermal separation. Reinforcement is to be fixed at a maximum of 100mm from the ends and then at a maximum of 300mm centers.

Glazing and Weather Seals

GLAZING

i) Window shall be such that glazing or re-glazing on site is possible without the need to remove the outer frames from the structure of the building.

ii) All glazing is to be packed in accordance with the system supplier's recommendations to prevent any kind of damage during handling.

WEATHER SEALS

The weather seals shall be EPDM/ Silicone seals. ASTM- D412 and ASTM-D2240 are standard specifying test methods for Tensile strength and Hardness of the gasket whereas the required value shall be specified

Ultimate tensile strength min >7.5 N/mm2

The weather seals are to be fitted in continuous lengths and grooves. The joints in the ventweather seal are to be positioned at

the bottom and in the outer frames at the top.

Security and Safety
Fasteners shall be designed so that they cannot be released from the outside by the insertion of a thin blade.
No opening light shall be openable or removable from the outside, when it is fastened in the closed position, except by use of special tools or breaking part of the window.

QUALITY CONTROL AND TESTING OF MATERIALS

Raw Material
The material from which the profiles are made shall consist substantially from white polyvinyl chloride as per BS EN 12608:20003. Only those additives and pigments may be used that are needed for the manufacture of the compound and its subsequent conversion into sound, durable extrusions of good surface finish and mechanical strength, as assessed by the requirements of this specification.

Profile

Properties

Appearance

and Finish
The color of the profile shall be uniform and the color of all profiles in a system shall be uniform.
The profile shall be free from foreign bodies, cracks or sink marks when viewed by normal corrected vision at 90° to the surface and at a distance of 1 meter in normal diffused north light.

Dimensions and Weights
The profiles shall be straight such that the longitudinal axis of the profile, as measured on the face surfaces, may deviate from the straight line by no more than 1mm per meter.
The cross section of the profile shall conform in shape and dimensions and may deviate by no more than ± 0.5mm; glazing channels and seal grooves may deviate by not more than ± 0.3mm. The weight of the profile per meter shall not be more than 5% below the nominal value.
Window properties:
U-Value: The total Uw – U value of complete window
shall be 3.3 W/ m^2 K Resistance to wind load:
All load bearing members shall be adequately reinforced so as to resist the wind load requirements of IS 875: Part 3. Calculations shall be submitted for all window designs.
Air Tightness:
The air infiltration for windows shall not exceed 1 litres/ second m^2 @ 75 Pa for both positive and negative pressures (certified for use in air conditioned buildings)
Water Tightness:
The water penetration for windows shall be minimum 15 minutes @ 150 Pa as per AS 4420.5.

Installation of Frame

i) Before installation the Installation Team is to make sure that the opening has been prepared and any repair work has been carried out. Allow a 5mm gap between the frame and the opening. The new window shall be set in the prepared opening. Allow for suitable packing blocks.

ii) The window shall be fixed into the aperture, by drilling and fixing through the outer frame, to the existing structure using „Fischer" fixings, F8S type bolts.

iii) The fixings shall be no less than 150mm from corners or transoms/mullions and at no more than 600mm centers.

iv) When the frame is securely fixed in position then fit glass and glazing beads. Allow for any necessary glazing blocks and glass lock devices.

v) Check windows for correct operation before proceeding with making good.

vi) No fixings are to penetrate the drainage channels.

vii) The windows shall be first treated with Polyurethane Foam (PU Foam) to enhance insulation against heat and Noise. The gap between masonry and the frame is to be filled with Neutral Cure Silicon (exposed to sun surface) and/or Acrylic Sealant (only for the internal surface). The windows shall be first treated with Polyurethane Foam (PU Foam) to enhance insulation against heat and Noise.

viii) The silicone joints should be covered with Architraves / trims as per direction of Engineer-in-charge.

Making Good

i) Making good to the external surface of the window frame and finish with a compatible approved low modular silicone sealant to BS5889. All trims and quadrants are to be approved by the Engineer- in- Charge prior to fixing.

ii) Allow for making good any disturbed plaster, brickwork and decorations internally and externally including color wash to brickwork.

iii) Clean off excess material and check fittings and gearing.

iv) Leave installation clean and in good working order.

GENERAL ITEMS

i) This specification is to be read in conjunction with any other relevant documents anddrawings.

ii) Sizes are not to be scaled from any drawings or sketches but should be measured on siteprior to manufacture.

Window Accessories

i) Window should be designed and reinforced such that it can withstand the wind load requirements by providing suitable strengthening accessories.

ii) The window shall meet the requirements of water tightness.

iii) Trims Shall be used to cover the window to masonry joints.

Window Hardware

i) All slider door/windows are to be provided with multi point locking arrangement with/without key locking facility as per the requirement. The hardware shall be provided as per preferred list attached. The slider locking mechanism handles are of projected/flush type.

ii) Casement window friction stays are to be of G-U or Securistyle or equivalent make of appropriate size and weight bearing capacity, made of SS304. The stack height of friction stay is to be 16 + 0.5mm.

iii) The casement windows are to be provided with multi point locking mechanism of shallbe provided as per preferred list attached.

Mock up Test:

Provide shop drawings and design calculations to carry out the full Scale Mock-up test at an approved Laboratory in India based on the Design Criteria set out in the specification of External facade system and the test methodology as described in ASTM E 283-04,330-02,331-00,501-1,501-4 & 501-05 & 6-01.Methodology supported by relevant copy of codes & standards along with shop drawing shall be submitted for the approval of Engineer-in-Charge. Supply the test specimen to the approved laboratory in India and install the test specimen on the test rig with minimum 3 bays of panels and for 2 floor heights with the combination of vision panel with IGU, spandrel panel with Monolithic glass and openable window with IGU, the glass for testing shall be clear heat strengthened. Installed specimen shall be tested to the design wind pressure of (Testing pressure shall be 1.5 times of the design wind pressure) as per IS 875 and the lateral displacement as per IS 1873 and as per the methodology approved by the Engineer-in-charge. Conduct Pre- test to the chamber /test rig as part of Mock up test and record the test results and submit the same as part of the Mock up test final report. Conduct full scale Mock up test as per design criteria set out in the specification of External Facade system and as per the Methodology described in ASTM E 283-04,330-

02,331-00,501-1,501-4 & 501-05 & 6-01. Necessary clearance from the Laboratory shall be arranged by the contractor for the inspection of Engineer-in-Charge to witness the test. If Mock up test fails, the defects revealed shall be corrected to the satisfaction of the performance data as set out in the Specification of External facade system with prior approval of Engineer-in-Charge on defects rectification Methodology. Upon approval of methodology, retesting shall be done at laboratory to the satisfaction of the performance data as set out in the specification of external facade system and relevant code with prior approval of Engineer-in-Charge. Any charges on account of rectification of test specimen and test rig due to failure of the test shall not be paid for. Contractor shall submit the final test report duly certified by Lab in charge supported by the copy of relevant codes & standards to the Engineer in charge. Testing charges shall be paid only after the satisfactory completion of the test and submission of the final test report to the Engineer in charge under respective item separately.

Testing shall be carried out at Façade India Testing Inc, Murbad, Maharashtra, India.

Field Test:

The Field test shall be conducted at site on the installed glazing system as per the criteria set out in the specification of the external facade system and as per the Methodology described in ASTM 501-2. Test shall be carried out in the presence of Engineer in charge. Methodology for carrying out the test shall be submitted to Engineer-in-Charge for approval prior to testing. The results shall be recorded and the reports shall be submitted to the Engineer in charge for approval. If Field test fails, contractor shall submit the rectification methodology to correct the defects as per the performance data set out in the Specification of external facade system and as per the methodology described in the relevant code for the approval of Engineer-in-Charge. Defects, if any noticed shall be rectified to the full satisfaction of Engineer-in-charge.

General Guideline:

System design in total, including Aluminum extruded frames, finishing to the aluminum frames, type & thickness of Glass pane, Aluminum sleeves at connections, inserts, EPDM/Silicon

Gaskets, Adhesive tapes, Sealant, Supporting system / bracket including fastening and anchoring system & Materials specified in the schedule and the system details as shown in the tender drawing are only tentative and is meant to set out a general outline of the system and minimum requirements/ properties of the system and component parts. The general guidelines governing the system design and performance parameters as set out in the Specification relating to External Façade System and the contents therein. Since the External Façade system in terms of Design, materials, all fixing details, methodology of execution are proprietary in nature, the onus of the design and Performance requirements, shop drawing, execution etc satisfying the design intent and specification of external facade system including conducting the site survey prior to and after preparation of shop drawing and accommodating the site conditions in the system at appropriate levels etc lies solely with the Contractor.

8 SPECIFICATIONS FOR CALCIUM SILICATE TILES FALSE CEILING

i) General

This section covers the requirements for all materials, labour, tools, scaffolding and equipment complete in all respect for suspended false ceiling as per nomenclature of the item.

ii) Codes and Standards:

The codes and standards generally applicable are:
BS -476-PART IV –Calcium Silicate – IncombustibilityI S -277-1982- For Galvanizing of MS Sheets

The following clauses are intended to amplify the requirements of the reference documents listed above and the contractor shall comply with these clauses.

iii) **MATERIALS**

a) **Frame work:**

A grid of section 600 mm x 600 mm is to be made up of G.I T sections wherein the Main tee is duly suspended from the RCC slab roof. The sizes of the members shall be as under and the entire grid should be able to take a suspended load of minimum 18 kg/sq m.

i) Perimeter wall angle: 0.40 mm thick gauge having equal flanges of size 22 mm made from pre-coated G.I. coil of length 3.0m.

ii) Main tees of 3.60m / 3.0m length having a web height of 38 mm with an 8mm bulb at the top having an exposed bottom of 24mm capped with a pre-coated G.I. coil wherein the coil thickness is 0.33 mm.

iii) Cross tees of length 1.20 m and 0.60 m having a web

height of 28mm and an exposed bottom of 24mm capped with pre-coated G.I. coil wherein the coil thickness is 0.33 mm.

The grid shall be of standard quality like METAWORTH / TECHNO T GRID
/ ARMSTRONG / GRID LINE

b) **Ceiling Tile:**
Light weight calcium silicate tiles and made from hydrated calcium silicate, reinforcing fibers natural fillers free from formaldehyde and other harmful materials shall not contain any toxic ingredients. The tiles shall be of size 595 mm x 595 mm having reinforced edges of 15 mm thickness all around in a collar of width 24 mm and 10 mm thickness at the center. The tiles shall have an overall density of 350 kg/m^3 in the body and 450 kg/m^3 at the edges. The tiles shall be primer coated on both sides and the fair surface shall be having a factory finish in two coats of white dispersion type solvent free paint.
The tiles should be characterized with 100% relative humidity resistance, incombustibility as per BS 476, Part IV, thermal conductivity of 0.043w / m°KC, and light reflectance > 85%, and an NRC of 0.50 (sound attenuation: 32 dB). The tiles should weight approx. 5.5 kg/m^2.

iv) **FIXING THE G.I. SUSPENSION SYSTEM TO THE CEILING:**

The main runners of size 38 mm x 24 mm x 3.60mm length spaced at 1200 mm centers shall be securely suspended with G.I. suspension wire of 4 mm dia. With necessary level adjusters made from spring steel with adequate tension in one direction. The G.I. wire is to be suspended at 1200 mm centers from the soffit with the aid of soffit cleats made of zinc alloy having dimension 25 mm x 35 mm x 1.6 mm secured to the soffit with metal dash fasteners of size 6 mm x 50 mm. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. Then flush fitting cross tees of size 28 mm x 24 mm x 1.20 m length are to be inserted in the main tees at 600 mm centers at right angles to the main tees. 600 mm x 600 mm modules are then to be formed by fitting cross tees of size 28mm x 24 mm x 0.6 m length centrally between the longer cross tees.

The system shall rest on periphery walls / partition on the wall angle of section
0.40 mm thick gauge having equal flanges of 22mm made from pre-coated G.I. coil of length 3.0m. The entire grid system shall be designed to bear a distributed load of minimum15kg / sq.m.

v) **Storage and Handling precautions:**

i) Ceiling tiles shall have been supplied in neatly packed cartons.
ii) Not to store the cartons in flat and wet locations.
iii) Handle cartons and individual tiles with care.
iv) Do not drop or stand cartons or tiles or edges or corners.
v) Open cartons completely and using both hands with protective gloves, remove tiles in pairs with fair faces together.

b) **Installation Precautions:**

The following to be ensured before installation of the ceiling system i)The area is dry prior to ceiling installation work.
ii) All wet trades are completed such as plastering, flooring etc.
iii) Air conditioning duct work is completed.
iv) Electrical chasing or drawing lines etc are in place.
v) No unauthorized weight is put on ceiling. Lighting fixtures tobe suspended independently.
vi) Calcium Silicate Tiles should be installed by experienced contractors in compliance with manufacturers specifications and conditions.
vii) Installations shall be done in areas free from chemical fumes / freezing temperatures and vibrations.
viii) Calcium Silicate Tiles shall not be used to support any unauthorized loads. ix) Calcium silicate Tiles shall be mechanically suspended properly and shall not be cemented nor glued to the surface of any other material.

vi) **Cutouts for light and A / C fixtures:**

Tendered cost shall include the cost of making cut outs required for fixing light fixtures, air-conditioning diffusers, and fire detectors, etc. No extra payment shall be made for making cut outs.

vii) **Fire Resistance:**

The ceiling tiles should be as per BS: 476 (Part IV) and to be classified in class 1 for spread of flame as per BS: 476 (Part VII) and class O for propagation as per BS: 476 (Part VI).

a) Thermal Properties: The tiles should have a low thermal conductivity of 0.43 w / m^2KC.
b) Acoustic properties: The tiles offer an average NRC of .50 and a soundattenuation STA – 32 dB.

viii) **Effect of temperature:**

The tiles should be suitable for use in high temperature area due to their low heat conductivity. They can also be subjected to freezing temperatures without risk of damages.

9 FIRE RATED DOORS

Providing, supplying and fixing internal metal fire rated doors (double/ single leaf) of approved make with Fire Resistant 120 minutes

1.0 Scope:

This specification covers the preparation of shop drawings, Manufacture and installation of factory made metal fire rated Doors with all accessories as approved by the Engineer-in-Charge.

2.0 Applicable Codes:

1. IS : 277 Galvanised steel sheet (plain and corrugated) with Z 120 Coating
2. IS : 2062 Steel for General Structural purpose
3. IS : 4351 Specification for Steel Door Frame
4. IS : 4376 Hot Dip Zinc Coating on Mild Steel Clips
5. IS : 3614 (Part – II) Metallic & Metallic Fire Check Doors, Resistant Test & Part – II Performance Criteria.

3.0 Material:

3.1 Frame

Frame shall be manufactured from 1.60 mm galvanised steel sheets complying to latest IS 277 Code with Z 120 sheet to the specified profiles and dimensions.
Door frame profile shall be double rebated of dimensions 143 mm X 57 mm (+ / - 0.3) with bending radius of 1.4 mm.
Frames shall be provided with a 3 mm thick Soffit bracket plates on all jambs with provision for anchor bolt fixing to wall openings.
All frames shall have reinforcement pads for fixing of door closer, at appropriate location as per manufacturer's details.
Frames shall be provided with hinge plates 3 mm thick pre-drilled to receive hinges for screw mounted fixing. All cut outs including hinge plates, strike plates shall have mortar guard covers from inside to prevent cement, dust ingress into cut outs at the time of grouting.
Frames shall have factory finish pre-punched cut outs to receive specified hardware and ironmongery.
Frame shall be filled with foam concrete.
Individual frame members shall be protected with Co-extruded PE film, low tack adhesive. PE film shall be minimum 56 micron thick.
The frame shall be pre-painted with Zinc Phosphate storing primer (35 DFT) & Polyurethene paint (35 DFT) of approved shade.

3.2 Shutter

Fire door shutter shall be manufactured from minimum 1.2 mm thick galvanized sheets conforming to latest IS: 277 Code with Z 120 coating.
Shutters shall be press formed not less than 46 mm thick, double skin hollow door with lock seam joints at stile edges. Shutters shall have no visible screws or fasteners on either face. Internal reinforcement shall be provided at top bottom and stile edges for desired fire rating.
Shutters shall be provided with Mineral Wool which shall be bonded to the inner faces of the shutter.

Shutters shall be factory prepared with pre-punched cutouts and reinforcements to receive ironmongery (like panic bar, external trim, lever action flush bolt, door closer, door co-ordinators etc.,) as specified in the drawings. The shutter should have an interlocking arrangement at this stile edges for flat surface on either side.

Shutters shall have pre-drilled hinge plates with hinge guard covers. Shutters with locks shall have concealed lock box with lock fixing brackets with pre-tapped holes.

For shutter with door closer, reinforcement pads shall be provided at appropriate location as per manufacturer's design.

The shutter shall be pre-painted with Zinc Phosphate storing primer (35 DFT) & Polyurethene paint (35 DFT) of approved shade.

3.3 Vision panel

Vision panel sizes shall be as per drawings. Vision panel shall be provided with toughened Boro Silicate Clear Fire Rated Clear Glass of thickness 6 mm. Glass to be fixed with clip on frames for square and rectangular vision panels with no visible screws and fixed with spin turned rings for vision panels and Glazing Tape with one side adhesive. Shutters shall be protected with Co-extruded PE film, low tack adhesive. PE film shall be minimum 56 micron thick. All frames and shutters shall be duly marked as per door schedule for easy identification at site.

4.0 Workmanship:

4.1 General

The Contractor shall furnish all materials, labour, operations, equipment, tools & plant, scaffolding and incidentals necessary for the completion of all metal work in connection with steel doors, as called for in the drawings, specifications and BOQ.

All metal work shall be free from defects, impairing strength, durability, appearance and shall be of the best quality for purposes specified, made with structural proprieties to withstand safety, strains, stresses to which they shall normally be subjected to.

All fittings shall be of high quality, as specified and as per approval.

The Contractor shall strictly follow, at all stages of work, the stipulations contained in the Indian Standard Safety Code or its Equivalent British Standard, the provisions of the safety code and the provision of the safety rules as specified in the General Conditions of the Contract for ensuring safety of men and materials.

Any approval, instructions, permission, checking, review, etc., whatsoever by the Engineer-in-Charge, shall not relieve the Contractor of his responsibility and obligation regarding adequacy, correctness, completeness, safety, strength, quality, workmanship, etc.

All knocked down frames shall be stacked flat and shutters vertically on wooden runners and suitably covered as per the instructions of manufacturer to prevent rust and damage.

4.2 Installation

4.2.1 Door Frame

It shall be ensured that all threaded preparations are covered from the back of the frame using self-adhesive strip to prevent penetration of mortar back-fill into screw threads. The head member of assembled frame shall be positioned against

jambs ensuring correct alignment and secured using M8 x 200 long plated bolts together with nuts, spring and flat washers.
The assembled frame shall be kept in position within the opening by means of bracing. In order to correctly position the frame against finished floor level or equalise on adjustable floor anchors where specified, shim shall be used under jambs. The frame shall be checked for squareness, alignment, twist etc. with carpenters bevel and plumb.
A tie rod shall be fixed to the frame during installation to ensure the correct dimensions between the frame rebated and the same may be removed after installation as per instructions of the Engineer – in - charge.

4.2.2 Door Shutters

The shutter shall then be fixed to the frame which has already been installed. The shutter shall be aligned so as to match the hardware to the cutouts in the frame.

5.0 Testing:

The Contractor shall arrange a mock up specimen of the door frame and shutter along with all iron mongeries, fittings, fixtures at any testing lab in India, approved by Engineer – in – charge for testing the fire rating. The testing shall be carried out as per IS: 3614 Part-II 1992 and test result report issued by the Lab shall be submitted to the Engineer – in - charge.

10 FLOORING

(i) All flooring, skirting, dado and window sill works shall be done in accordance with CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid. The provision of BIS Codes listed in CPWD Specifications shall form a part of this document with all latest codes.

(ii) Whenever flooring is to be done in patterns of tiles and stones, the Contractor shall get samples of each pattern laid and approved by the Engineer-in-charge before final laying of such flooring. Nothing extra shall be payable on this account.

(iii) Different stones / tiles used in pattern flooring, skirting, dado and window sill work shall be executed as defined in the Schedule of finishes, floor finishing layouts and Detailed Architectural Drawings. Contractor needs to refer room data sheet / schedule of finishes and material palette attached with Bid document. Nothing extra for laying pattern flooring shall be paid over and above the quoted rate. No additional wastage, if any, shall be accounted for any extra payment.

(iv) Samples of flooring stones/ Tile (Kota/ Marble/ Granite/ Ceramic tiles/ Vitrified tiles etc.) shall be brought to site well in advance for approval of the Engineer-in-charge. The sizes of stones for flooring shall be of size mentioned in Schedule of finishes & Detailed Architectural Drawings or as approved by Engineer-in-charge. Approved samples should be kept at site with the Engineer-in-charge and the same shall not be removed except with the written permission of Engineer-in-charge. No payment whatsoever shall be made for these samples.

(v) The Marble/ Kota/ Granite or any other stone shall be fully supported by the

details establishing the quarry and its location or source.

(vi) Full width Marble/ Kota/ Granite stone over kitchen platform shall be provided except to adjust for closing pieces. The marble / stone flooring in treads and risers of staircase is to be laid in single piece.

(vii) The rate of items of flooring is inclusive of Providing Sunken Flooring in Bathrooms, Kitchen, W.C., etc. and nothing extra on this account is admissible.

(viii) Chasing of required width and thickness shall be made in brick work at skirting location so as to flush the external surface of skirting with internal plastering. No extra payment towards making chases in brick work at skirting shall be made.

(ix) Proper gradient shall be given to flooring for toilets, verandah, kitchen, courtyard etc. so that the wash water flows towards the direction of floor trap. Any reverse slope if found, shall be made good by the Contractor by dismantling the defective floor/grading concrete and nothing shall be paid for such rectifications.

(x) The flooring and skirting will be executed as per pattern shown in the Architectural drawings and as per approval of Engineer-in-charge and nothing extra shall be payable on this account.

(xi) The rate shall include the cost of all materials and labour involved in all the operations. Nothing extra shall be paid for use of cut/sawn stone/ tiles in the work

(xii) Contractor shall need to protect the finished floor surface during execution of other activities using Cello or approved equivalent bubble guard of minimum 500 gsm thick (minimum size 2400 x1200 mm), fixing the same over floor surface with mastic tape or another approved adhesive. The protective layer shall be removed and cleared of all debris out of site including cleaning the entire covered flooring area at the time of handingover as directed by the Engineer-in-charge.

(xiii) Stone for Window Sills should be of approved premium quality asmentioned in Schedule of finishes & Detailed Architectural Drawings or as approved by Engineer-in-charge. Stone for sill should be minimum 18mm thick granite stone and all exposed edges of sills shall be chamfered, half or full bull nosing with mirror polishing should be factory finished and brought to site. All polishing work and laying details for stone work shall beas per CPWD specifications and as directed by Engineer-in-charge.

(xiv) Pattern for any type of flooring / dado shall be as per Detailed Architectural Drawings. The cost of flooring work is inclusive of all material, workmanship, labour, pattern, colour, style, skirting etc. complete. No extra payment shall be made on this account. The joints for all flooring to run in a straight line and should follow as mentioned below:

(a) **For Marble stone flooring and dado**: 0 mm (Zero mm) joint filledwith approved adhesive or as specified in the Bid document.

(b) **For any type of Granite / Kota Stone floor & dado**: 1mm (one mm)

joint filled filled with MYK Laticrete SP – 100 or Equivalent approved adhesive as per the Directions of Engineer in Charge

(c) **For any type of Vitrified / Ceramic tile floor & dado**: 3mm spacer joint filled with MYK Laticrete SP – 100 or Equivalent approved adhesive as per the Directions of Engineer in Charge.

(xv) Vitrified / Ceramic Tile Flooring:

(a) The work of Vitrified / Ceramic Tile Flooring, Skirting, Dado and wall lining, in general, shall be done as per CPWD Specifications, 2019 Volume-I & Volume-II with upto date correction slips as on last date of submission of Bid document.

(b) The tiles shall be of approved make and shall generally conform to Table 12 of IS:15622. The Vitrified tiles of specified sizes shall be used and sample of tiles shall be got approved from the Engineer-in-charge. The Mandatory tests for vitrified tiles shall be got done as per CPWD Specifications, 2019 Volume-I & Volume-II with upto date correction slips as on last date of submission of Bid document / relevant BIS Code.

(b) The vitrified/ceramic tiles shall be as specified in the drawing. The tiles shall be of specified colours as shown in the drawings or asapproved by Engineer-in-charge and will be laid in pattern as per architectural drawings. Nothing extra shall be paid for laying tiles in specific pattern. The tiles shall be first quality of approved make.

(c) Contractor to obtain prior approval of Engineer-in-charge for tiles make, sizes, shade and colour as per Architectural drawings and material palette before bringing it to site. The tiles shall be laid as specified in the Schedule of Finishes including grouting of joints with pigmented epoxy grouts. Tiles joints shall be as per the pattern provided in Architectural drawings.

(xvi) Grouting:

(a) **All Horizontal and Vertical Joints of the Flooring and Dadoing shall ne filled with Grouting** with MYK Laticrete SP – 100 or Equivalent approved adhesive as per the Directions of Engineer in Charge.

11 STONE WORK: -

- The execution of stones work shall be in general as per CPWD Specifications - 2019 - Vol.I & Vol. II with upto date correction slips.
- All holes, rebates, recesses etc. for providing fixing and inserts shall be predrilled and precut and worked using precision machine tools.
- Samples of each item of stone work either individually or in combination shall be prepared for approval of Engineer-in-Charge before commencement of work.
- Sequence of execution for cladding work shall be submitted by the contractor for approval of Engineer-in-Charge.

Vacuum Dewatered Concrete Flooring (VDF):

(i) Flooring shall be laid as shown in the Schedule of finishes and Detailed Architectural Drawings or as directed by the Engineer-in-charge with required thickness as per design requirement to sustain load of vehiclemovement and other impact load.

(ii) Concreting shall be of RMC M30 Grade. Flooring shall have hard top on the concrete base. Flooring shall be laid in panels as per the directions of Engineer-in-charge, expansion joint shall be provided as per requirement. Specification for RMC and cement will remain same as mentioned technical specifications in contract/RCC sub head

(iii) De-vacuumization shall be done for removing the voids. The wholeconcrete surface shall be leveled, compacted by ramming and troweling. Prepared surface shall be allowed to set.

(iv) Hard top to be prepared as per the specifications with Nito hardener and one part of dry cement, the hard top shall be provided over concrete base immediately after it is set, compacted and leveled with a steel trowel. The surface shall be troweled to bring the hardener coat to a leveled Surface. Excessive troweling shall be avoided. After the initial set, further compaction shall be done by steel troweling. Final brushing where required (to achieve desired surface finish) shall be made before the floor top becomes too hard. Curing shall be done as per CPWD Specifications.

Filling the joints with gun grade epoxy material as approved by Engineer-in-charge.

Staircase and Entrance Steps, Risers, Ramp at Entrance for Physically challenged:

Stone for Staircase and Entrance Steps, Risers, Ramp at Entrance for Physically challenged shall be in one single piece in approved premium quality as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings or as directed by the Engineer-in-charge. All exposed edges of treads shall be chamfered, half or full bull nosing with mirror polishing should be factory finished and brought to site. All staircase treads or any entry steps shall have three numbers of "V" grooving for anti- slip purpose and brought to site. All polishing work and laying details for stone work shall be as per CPWD specifications, 2019 Volume-I & Volume-II with upto date correction slips as on last date of submission of Bid.

12 Stainless Steel Railing/Handrails:

(i) Th The work of Stainless Steel Railing/Composite Railing /Handrails (weldless), in general, shall be done in accordance with CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid.

(ii) The Contractor shall supply all materials, labour, tools, ladders, scaffolding and other equipments necessary for the completion and protection of all stainless steel work.

(iii) All stainless steel pipes and plates shall conform to **SS 304 grade** and the relevant clauses associated with this grade of steel to be followed.

(iv) Surface finish of all the stainless steel materials will be in 240 grit satin finish / matt finish.

(iv) Fixing shall be done by stainless steel expansion bolts/dash fastners of approved size and make as directed by Engineer-in-charge and welding to be done by using organ welding rods and the surface being duly finished and cleaned by K2 passivation, which is nitric acid plus floric acid solution treatment by which the chances of corrosion will be eliminated and any burn out marks on the metal will also be eliminated.

(v) All stainless steel material will have to be coated by a solution of Inox to avoid finger in prints and avoidance of settlement of environment / atmospheric dust.

13 WOOD WORK: -

- The wood work in general shall be carried out as per CPWD Specifications - 2019 Vol.I & II with upto date correction slips.
- All fittings and fixtures shall be got approved from the Engineer-in Charge before procurement well in advance and the approved samples shall be kept at site till completion of the work for which nothing extra shall be paid.
- The shape and size of beading shall be as per drawings. The joints of beading shall be mitred.

14 STEEL WORK: -

The Work shall be carried out as pre CPWD Specifications – 2019 with all latest correction slips and as per the direction of Engineer in Charge.

15 FINISHING

(i) All finishing works, in general, shall be done in accordance with CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid.s

(ii) For plastering work, 43 grade PPC may be used.

(iii) All painting material shall have brought to the site of work in the original sealed containers. The material brought to the site of work shall be sufficient for at least 30 days of work. The empty containers shall not be removed from the site till the completion of the work without permission of the Engineer-in-charge.

(iii) Paint Register shall be maintained as per CPWD proforma for periodical verification by CPWD.

(iv) Contractor needs to refer Detailed Architectural Drawings, elevations, sections (both interior and Architectural related), Schedule of finishes, room data sheet and material palette attached with Bid document for the location and finishing specifications recommended. No deviations in design, pattern, and

colour shall be permitted without approval of Engineer-in-charge. Contractor shall provide minimum three samples for each finishing items to Engineer-in-charge for approvals prior to execute the work.

(v) All types of paint, polish, primer to have low VOC content as per the requirement of GHAR rating. The Contractor will need to submit all relevant documents to Engineer-in-charge in charge pertaining to the same.

(vi) All painting finish works will be got done by the Contractor from the approved applicator.

a. Premium Acrylic Smooth Exterior Grade Paint

This paint shall be done on all exterior building surface, exposed soffits, wherever required as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings or as directed by the Engineer-in-charge. The work shall be carried out as per CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid.

b. Exterior Grade Texture Paint

This paint shall be executed on all exposed surfaces of building like parapet, machine room, Staircase mumty, RCC Terrace tanks, compound wall, other locations, exposed soffits etc. as mentionedin Schedules of finishes, room data sheet document & Detailed Architectural Drawings or as directed by the Engineer-in-charge, in three coats of finishing paint, approved texture pattern, with one primer. Shade and colour of paint and texture pattern shall be as per material palette. The work shall be carried out as per CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid.

c. Premium Acrylic Emulsion Smooth Interior grade Paint

This paint shall be executed on all internal / External areas as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge in at-least three coats of finishing paint, with one primer, one coat of internal putty. Shade and colour of paint shall be as per material palette. The work shall be carried out as per CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid. The BIS Codes listed in CPWD specifications 2019 shall form a part of this document with all latest codes.

d. Melamine/ Sprit polish

This Melamine / sprit Polish shall be executed on all internal wood works as specified for like veneer surfaces, any wood door, panels, wall cladding, wooden skirting, wooden door leaping Patti, etc. as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings, material palette

or as directed by the Engineer-in-charge. The work shall be carried out as per CPWD Specifications, 2019 Volume-1 and Volume-II with uptodate correction slips as on last date of submission of Bid. The BIS Codes listed in CPWD specifications 2019 shall form a part of this document with all latest codes.

e. PU Polishing to Wood works

This PU Polish shall be executed on all internal wood works like veneer surfaces, any wood door, panels, wall cladding, wooden skirting, wooden door leaping Patti, etc. as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge. General Holes and indentations on surface shall be filled with putty made of whiting and linseed oil. The pad shall be moistened with polish and rubbed hard on the surface applying the polish sparingly but uniformly and completely over theentire surface. Another coat shall be applied in the same way after the first coat has dried sufficiently. Finishing coats shall be sprayedon the surface in 2 coats or as required till the satisfied result, using PU polish of approved make. PU Polish shall be zero Matt finish as per the satisfaction of Engineer-in-charge.

f. PU Polish to have minimum following requirement:

- Versatility and ease of use Spray, roller, curtain-coater or electrostatic application
- Excellent chemical/physical resistance
- Excellent transparency
- High solid residue (42-65%)
- Formaldehyde-free
- NMP-free
- APEO-free
- Hardness factor minimum 1.5

g. Thermoplastic Paint

This paint shall be executed for road marking, parking area demarcation, kerb stone painting, zebra crossing etc. as mentioned in Schedules of finishes, room data sheet document & DetailedArchitectural Drawings, material palette or as directed by the Engineer-in-charge. The Paint shall be 2.5mm thick (retro-reflective) of specified shade / colour using hot thermoplastic material by fully/ semi-automatic thermoplastic paint. The work shall be carried out as per CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid. The BIS Codes listed in CPWD specifications shall form a part of this document with all latest codes.

16 INTERNAL SANITARY, WATER SUPPLY AND DRAINAGE WORKS:

(1) accordance with CPWD Specifications, 2019 Volume-1 and Volume-II with upto date correction slips as on last date of submission of Bid.

(2) The entire responsibility for execution of Sanitary, Water Supply and Drainage works including the protection of the sanitary and water supply fittings and other fittings and fixtures against pilferage and breakage during the period of installation and thereafter until the building is handed over, maintaining highest standard of Quality and Workmanship, shall rest on the Contractor.

(3) The Contractor shall furnish all labour, materials and equipment, transportation and incidental necessary for supply, installation, testing and commissioning of the complete Plumbing / Sanitary system as described in the Specifications and as shown on the drawings. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/Documents as being furnished or installed, but which are necessary and customary to be performed under this contract. The Plumbing / Sanitary System shall comprise of following:

(a) Sanitary Fixtures and Fittings.

(b) Internal and External Water Supply.

(c) Internal and External Drainage.

(d) Balancing, testing & commissioning. (e)Test reports and completion drawings.

(4) For the work of water supply and sanitary installations, the Contractor shall engage the approved licensed plumbers and submit the name of proposed plumbing agencies with their credentials forapproval of the Engineer-in-charge. For quality control & monitoring of workmanship, Contractor shall assign at least one Plumbing Engineer who would be exclusively responsible for ensuring strict quality control, adherence to specifications and ensuring top class workmanship forthe installation.

(5) The Scope of work shall include the cost of cutting holes in walls, floors, RCC slabs etc. Wherever required and making good the same for which nothing extra shall be paid.

(6) Providing & fixing CP Brass caps /extension pieces wherever required for CP Brass fixtures shall be done for corresponding CP Brass fittings. Nothing extra shall be paid on this account.

(7) The Contractor shall examine all architectural, structural, plumbing, electrical and other services drawings and integrate properly usingBIM Model before starting the work for addressing any discrepancies and obtain clarifications from all stakeholders. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Engineer-in-charge without additional cost to the department.

(8) The Contractor shall furnish, for the approval of Engineer-in- charge, the two sets of detailed shop drawings of complete work and materials including layouts for Plant room, Pump room, Typical toilets drawings showing exact location of supports, flanges, bends, tee connections, reducers, detailed piping drawings showing exact location and type of supports, valves, fittings etc; external insulation details for pipe insulation etc.

(9) These shop drawings shall contain all information required to complete the work. These Drawings shall contain details of construction, size, arrangement, operating clearances, performancecharacteristics and capacity of all items of equipment, also the detailsof all related items of work by other Contractors. Each shop drawing shall contain tabulation of all measurable items of equipment/materials/works and progressive

cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings. Minimum 4 sets of drawings shall be submitted after final approval along with softcopy Harddisk/pendrive. When he makes any amendments in the above drawings, the Contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check prints, for approval. The Contractor shall submit further four sets of shop drawings to the Engineer-in-charge for the exclusive use by the Engineer-in-charge and all other agencies. No material or equipment may be delivered or installed at the job site until the Contractor has in his possession, the approved shop drawing for the particular material/equipment / installation.

(10) Shop drawings shall be submitted for approval four weeks in advance of planned delivery and installation of any material to allow the Engineer-in-charge In-Charge ample time for scrutiny. No claimsfor extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.

(11) Samples of all materials like valves, pipes and fittings etc. shallbe submitted to the Engineer-in-charge prior to procurement for approval and retention by Engineer-in-charge In-Charge and shall be kept in their site office for reference and verification till the completion of the Project. Wherever directed a mockup or sample installation shall be carried out for approval before proceeding for further installation without any extra cost.

(12) Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the Contractorof the responsibility or requirement to furnish material and perform work as required by the contract.

(13) All materials and equipment shall conform to the relevant Indian Standards and shall be of the approved make and design. Makes shall be in conformity with list of approved manufacturers as per the Bid document.

(14) Balancing of all water systems and all tests as per for the CPWD Specifications shall be carried out by the Contractor through a specialist group, in accordance with the Specifications and Standards. The installation shall be tested and shall be commissioned only after approval by the Engineer-in-charge In-Charge. All tests shall be carried out in the presence of the representatives of the Engineer-in- charge and nothing extra shall be payable on this account.

(15) The Contractor shall submit completion plans for water supply, internal sanitary installations and building drainage work as specified in the GCC. These drawings shall be submitted in the form of two sets of hard disk/pendrive and four portfolios (300 x 450 mm) each containing complete set of drawings on approved scale indicating the work as installed. These drawings shall clearly indicate complete plant room layouts, piping layouts and sequencing of automatic controls, location of all concealed piping, valves, controls and other services. In case, the Contractor fails to submit the completion plans as aforesaid, security deposit shall not be released and these shall be got prepared at his risk and cost.

(16) The CCI/CI/PVC pipe and GI pipe etc. wherever necessary, shall be fixed to RCC columns, beams etc. with rawl plugs and nothing extrashall be paid for this.

(17) The variation in consumption of material shall be governed as per CPWD specification and clauses of the contract to the extent applicable.

(18) The pig lead to be used in joints of 150mm,100mm, 75mm, 50mm dia of sand cast iron, centrifugally cast (Spun) iron pipes shall be as per relevant CPWD Specifications.

(19) The Contractor shall bear all incidental charges for cartage, storage and safe custody of materials and shall construct suitablegodowns, yards at the site of work for storing materials so as to be safe against damage by sun, rain, fire or theft etc., at his own cost and also employ necessary watch and ward establishment for the purpose at his own cost.

(20) All fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Finishes,specifications, elsewhere in this Bid document & drawings. The quoted rates shall be deemed to be all inclusive for a complete item fit for use including all materials, labour, T&P, specials, equipment, testing &commissioning etc. Accessories shall include proper fixing arrangement, brackets, nuts, bolts, screws and required connection pieces. Nothing extra whatsoever shall be payable on this account.

(21) Fixing screws shall be half round head chromium plated brass screws with C.P. washers where necessary or otherwise as providedin the item.

(22) Porcelain sanitary ware shall be glazed vitreous china of first quality free from warps, cracks and glazing defects and shall conform to relevant BIS codes. Colour of sanitary ware, shall be specified or as selected by the Engineer-in-charge. Nothing extra shall be payable on this account.

(23) Horizontal pipes running along ceiling shall be fixed on structural adjustable clamps of approved design. Horizontal pipes shall be laid to uniform slope and the clamps adjusted to the proper levelsso that the pipes fully rest on them and are properly secured.

(24) Contractor shall provide all nuts, bolts, welding material and paint the Clamps with one coat of red oxide and two or more coats of black enamel paint.

(25) Slotted angle/channel supports on walls shall be provided wherever shown on drawings. Angles/channels shall be of sizes shown on drawings or specified in schedule of quantities. Angles/channels shall be fixed to brick walls with bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. The spacing of support bolts horizontally shall not exceed 1 m.

(26) Wherever M.S. clamps are required to be anchored directly to brick walls, concrete slabs, beams or columns, nothing extra shall be payable for clamping arrangement and making good with cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 stone aggregate 20mm nominal size) or as directed by the Engineer-in-charge.

(27) The ground colour shall be applied throughout the entire length of pipe. Colour bands shall be superimposed on the ground colour and shall be applied near valves, junctions, joints, service appliances, bulkheads, valves, etc. for clear identification of fluid being carried and to avoid confusion. The relative proportional widths of the first colour band to the subsequent bands shall be 4:1.The minimum width of the narrowest colour band shall be 25 mm.

(28) Rates for all items quoted shall be inclusive of all work and items given in the above mentioned specifications and Schedule of finishes and applicable for the work under floors, in shafts or at ceilinglevel at all heights and depths. All rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same. All rates are inclusive of pre-testing and on site testing of theinstallations,

materials and commissioning.

(29) Cleaning and Disinfection of Pipelines: -

On completion of hydraulic tests and before a pipe is disinfected, it shall be proved to be free from obstruction, debris and sediment by scouring or by any other process which the Engineer-in-charge may prescribe. Upon satisfactory completion of testing and cleaning, the pipelines shall be disinfected as ordered. Chlorine solution shall be applied at the charging point as the pipeline is being filled and dosing shall be continued until the pipeline is full and at least 50 parts of chlorine per million parts of water have been made available and distributed evenly If ordinary bleaching power is used, proportions will150 gms of power to 1000 litre of water. If a proprietary brand is used,the proportion shall be as specified by the manufacturer. The treated water shall be left in pipeline for a period as directed but not exceeding 24 hours chlorine residual tests shall be taken at various points along the pipeline. The disinfection process shall be repeated until the sample of water taken from the pipeline are declared fit for human consumption by a recognized laboratory.

(30) Opening, cut out in slabs, beams as required shall be left out by inserting PVC spouts of required size before casting of RCC members. Nothing extra shall be paid on this account.

General Requirements:

(i) All materials, sanitary fixtures and fittings shall be new and of best quality confirming to CPWD specification and subject to the approval of Engineer- in-charge. Wherever particular makes are mentioned, the choice ofselection shall remain with the Engineer-in-charge.

(ii) Sinks for pantry or kitchen shall be stainless steel or as specified in the Schedules of finishes, room data sheet document & Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge

(iii) Chromium plated fittings shall be cast brass chromium plated of the best quality approved by Engineer-in-charge.

(iv) All Appliances, fittings and fixtures shall be fixed in a neat workman like manner true to level and heights shown on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all inlet and outlet pipes at correct positions at proper location and height. Faulty locations shall be made good and any damage to the finished floor, plaster, paint, insulation shall be made good by the Contractor at his own cost.

(v) Sanitary appliances, subject to the type of appliance and specific requirements, shall be fixed in accordance with the relevant standards and the following:

(a) Contractor shall, during the entire period of installation and afterwards protect the appliances by providing suitable cover or any other protection so as to absolutely prevent any damage to the appliances until handing over. (The original protective wrapping shall be left in position, for as long as possible).

(b) The appliance shall be fixed in a manner such that it will facilitate subsequent removal if necessary.

(c) All appliances shall be securely fixed. Manufacturers' brackets and fixing methods shall be used wherever possible. Compatible rust- proofed fixings shall be used. Fixing shall be done in a manner that minimizes noise transmission.

(d) Pipe connections shall be made with demountable unions. Pipe work shall not be fixed in a manner that it supports or partially supports an appliance.

(e) Appliances shall be fixed so that water falls to the outlet.

(f) Appliances shall be fixed true to level, firmly fixed to anchor or supports provided by the manufacturer and additional anchors or supports where necessary.

(vi) Sizes of Sanitary fixtures given in CPWD specifications or in the Drawings are for identification with reference to the catalogues of makes considered. Dimensions of similar models of other makes if allowed will not vary more than 2% of dimension and the same shall be provided and no claim for extra payment shall be entertained nor shall any payment bededucted on this account.

Sanitary Fixtures

(i) WC, Urinal, wash basins, sinks, showers, toilet paper holder, towel rail, grab bars, soap dispansers/trays, hand drier etc. shall be of premium quality of approved make, as mentioned in Schedules of finishes, room data sheet document & Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge considering requirement of space, location complete in all respects including accessories, labour, workmanship etc.

(ii) Colour, shade, shape, size shall be as decided by the Engineer-in- charge.

(iii) All appliances, fixtures and fittings shall be tested before and after installation. Water seals of all appliances shall be tested. The Contractor shall block the ends of waste and ventilation pipes and shall conduct an air test with a pressure of 38mm water gauge for minimum of 3 minutes in accordance with BIS: 5572.

Grease Traps

(i) Prefabricated Grease traps shall be provided in the basement. These shall be used for oil and grease removal of kitchen area wastes.

(ii) They shall be made of Polypropylene material and shall be designed for the appropriate number of meals and users in the cafeteria.

(iii) Sizing shall be as per manufacturer's recommendations.

(iv) Treated water outflow shall be sent to the STP to be mixed with other wastes.

(v) Makes shall be as per list of makes provided.

Fixture and flow Rates

Supplying, installation testing and commissioning of all fixture of given flow rates as per Green Building requirements including SITC of all accessories, bottle trap, WC pan connector etc. Contractor shall apprise the above mentioned vendors of the following flow rates. Makes and model recommended by competent authority shall be as per drawing: -

Sl. No.	Type of Fixtures	Flowrate Litres per Minute (LPM), Litres per Flow (LPF)
1.	WC Concealed Cistern	3/6 LPF
2.	Urinal	2.1 LPF or Less
3.	Sensor Faucet	1.5 LPM or Less

4.	Health Faucet	1.5 LPM or Less
5.	Kitchen Sink	6 LPM or Less
6.	Shower	1.75 LPM or Less

Internal Drainage

(i) Internal drainage shall be designed by the Contractor and got approved by Engineer-in-charge. The Contractor has to associate specialized agency. Who has executed and designed internal drainage system, the shop drawings layout plans.

(ii) Work under this section shall consist of providing and fixing all labour, materials, equipment's and appliances necessary and required to completely install all soil, waste, vent, rain water pipes and fittings as per relevant BIS code and CPWD specification.

(iii) Without restricting to the generality of the foregoing, the soil, waste, vent,rain water pipe system shall include the following:

(a) Soil, waste and vent pipes, Vertical and Horizontal and fittings, joints, clamps and connection to sewer line as shown in the drawings at Ground Floor level.

(b) Floor and Urinal traps, Cleanout plugs and inlet fittings.

(c) Waste pipe connection from all fixtures i.e., wash basins, sinks, urinals, kitchen equipments and plant room equipment.

(d) Rain water pipes & fitting (Terrace Rain Water and Balcony Drain).

(e) All pipe fittings exposed on wall shall be painted with two or more coat of desired shade and colour. All sanitary fittings, hanger where no sunken floor is provided.

(f) Testing of all pipes shall be as per relevant codes from external labs.

(iv)The scope also include access doors/opening for clean out, accessible for maintenance including MS ladder, platform etc. at suitable locations with primer and painting complete.

Soil, Waste, Vent and Rain Water Pipe System:

(i) The soil, waste system above ground has to be planned as "Two Stack System" [Double Stack System] as defined in IS: 5329 having separate pipes for waste from wash basins, showers, bath tub, kitchen sinks, Floor drains, AHUs, condensate drain and separate pipe for soil discharge. All piping work shall be executed as per CPWD Specification, 2019 Vol. I & Vol. II with upto date corrections with as on last date of submission of Bid, and shall be got tested

(ii) POLYPROPYLENE RANDOM CO-POLYMER (PP-R) PIPES

(a) All Soil, waste, vent, anti-siphonage, rain water pipes, fittings and accessories like P-traps, bends, elbows, Y/Tees, swept tees etc., of required diameter as per design shall Polypropylene Random Co-Polymer (PP-R) Pipes.

(b) The execution of work shall be in general as per CPWD Specifications - 2019 - Vol.I & Vol. II with upto date correction slips.

(c) All pipes shall be straight and smooth and their inside free from irregular bore, blow holes, cracks and other manufacturing defects.

(d) All vertical stacks shall be 100 mm away from the wall by providing adjustable clamps/angle etc whichever required.

(e) All pipe supports and clamps shall be as per specifications and recommendations of the manufacturer.

Water Supply work:

(i) Work under this section consists of providing and fixing, pipes and fittings all labour, materials equipment and appliances necessary and required for water supply system (Domestic Water Supply (Internal) + Flushing Water Supply (Internal) as required as per design and water supply system. The Contractor shall submit plan of water supply distribution system of the building both internal and external in accordance with relevant BIS Code and duly approved by Engineer-in-charge.

(ii) Without restricting to the generality of the foregoing, the water supply system shall include the following:

(a) Complete WTP system piping.

(b) Pumping supply from Domestic / Flushing/ RO/ Soft Water/Irrigation/Water/ Under Ground Tank to all fixtures/appliances.

(c) Thermal insulation to hot water pipes and valves.

(d) Connections to all fixtures etc.

I. Ball valve/butterfly valve/Non Return valve/Pressure ReducingValve/Water Meter.

a. All supports made of galvanized iron.

b. All concealed pipes fittings bends for water supply shall be of CPVC of appropriate grade of required diameter as per drawing & design. The scope includes smooth flow of water supply pipes with equitable and proper distribution of pressure.

II. Valves and other appurtenances shall be located as to provide easy accessibility for operations, maintenance and repairs.

III. Pipe shall be securely fixed to wall and ceiling by suitable and adjustable clamps at intervals specified.

(iii) **CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES**

(a) CPVC pipes & fittings used in hot & cold potable water distribution system shall conform to requirement of IS 15778. The material from which the pipe is produced shall consist of chlorinated polyvinyl chlorides. The polymer from which the pipe compounds are to be manufactured shall have chlorine content not less 66.5%

(b) 66.5%. chlorine content CPVC Pipes including Fittings and Valves shall be provided as mentioned in Schedules of finishes, room data sheet document & Detailed as per Architectural Drawings, material palette or as directed by the Engineer-in-charge.

(c) All pipes inside the buildings and outside the building shall be CPVC Pipes conforming to IS: 15778.

(d) Fittings shall be of malleable galvanized iron of approved make. Each fitting shall have manufacturer's trade mark stamped on it. Fittings for G.I pipes shall include couplings, bends, tees, reducers, nipples, unions, bushes etc. Fittings etc. shall conform to IS : 1879. (Part 1 to X) 1987.

(e) All excavation, trenching, painting, sand filling, pipe protection and pipe installation shall be as per CPWD specifications and directions of Engineer-in-charge.

(iv) Pipe Support: Steel Wire Rope Hangers & Supports:

(a) Wire Hangers shall be used to suspend all static HVAC & Mechanical services. Wire Hangers should consist of a pre-formed wire rope sling with a range of end fixings to fit various substrates and service fixings, these include a ferruled loop, permanently fixed threaded M6 (or M8, M10, M12) stud, permanently fixed nipple end with toggle, at one end or hook or eyelet, cladding hook, barrel, wedge anchor, eyebolt anchor or any other end fixture type or size as per manufacturer's recommendation and design. The end fixings and the wire must be from the same manufacturer with several options available. The system should be secured and tensioned with a Hanger self-locking double channel grip at the other end. Once the grip is locked for safety purpose, unlocking should only be done by using a separate setting key and should not be an integral part of the self-locking grip. Only wire and/or supports supplied and/or approved, shall be used with the system.

(b) Wire Hangers should have been independently tested by Lloyds Register. APAVE, TUV, UL, CSA, Chiltern International fire, ADCAS,

Intertek, ECA, and SMACNA, approved by ULC and CSA and comply with the requirements of DW/144 and BSRIA - wire Rope Suspension systems. Wire rope should be manufactured conforming to BSEN 12385: 2002

(c) The Contractor shall select the correct specification of wire hanger to use for supporting each particular service as directed by Engineer- in-charge. Each size is designated with a maximum safe working load limit (which incorporates a 5:1 safety factor).

(d) The correct specification of wire hanger required is determined using the following formula:

(1) Weight per metre of object suspended (kg) X distance between suspension points (m) = weight loading per Hanger suspension point (kg).

(2) Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations give in the manufacturer's handbook.

(3) The Contractor shall select the correct length of wire rope required to support the service. Specials can be made, check with manufacturer. No in–line joints should be made in the rope.

(v) Ball Valves:

All ball valves shall be heavy duty of approved make. Valves shall withstand test pressure of 25 Kg/Sqcm. Ball valves shall conform to the following specifications.

Size	Construction	Ends
15 to 50 mm	Bronze body S.S. Working Part stainless steel balls, spindle, teflon seating and gland packing, steel handle (to BS 5351).	Screwed

(vi) Butterfly Valve:

(a) All butterfly valves shall be heavy duty cast iron of approved make. The valves shall be suitable for 15 Kg/Sqcm test pressure and shall conform to the following specifications Butterfly valve shall be of best quality conforming to IS: 13095:

(b) Butterfly Valves shall be of cast iron body with following details:

(1) Disc shall be CI heavy duty electrolyses nickel plated abrasionresistant.
(2) The shaft shall be of EN-8 Carbon Steel with low friction nylonbearings.
(3) The seat shall be drop tight constructed by bonding resilientelastomer inside a rigid backing.
(4) Built in flanged rubber seals.
(5) Actuator to level operated for valves above ground and T Keyoperated for valves below ground.
(6) Built in flanges for screwed on flanged connections.
(7) Manufacturer's details on fixing and installation will be followed.

(vii) Ductile Iron (DI) Pipe:

(a) Ductile Iron (DI) Pipe shall be provided as mentioned in Schedules of finishes, room data sheet document and Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge.

(b) Pipe laid in ground for water supply of municipal connection shall be laid in trenches/underground, shall be of DI class K-9 of required dia and size as per drawing/design including trenching necessary fittings like union, collar, bends and tees with appropriate joints. The technical specification of ductile iron pipe conform to Indian standard IS : 8329-1994, IS : 2531-1998 and EN : 545-1994

(c) The ductile iron pipe shall be strong, both inner & outer surfaces shall be smooth, free from lumps, cracks, blister and scars.

(d) The ductile iron pipe shall be lined with cement mortar in the manufacturing unit by centrifugal process.

(e) The ductile iron fitting shall conform to IS: 9523-1980.

(f) The joints for ductile iron pipe shall be suitable for rubber gasket conforming to IS :5383

(g) Laying and jointing shall be similar to cast iron pipes.

(h) The test pressure shall be 1.5 times the maximum sustained operating pressure and the test pressure shall be as per IS: 8329-1994

(i) Slotted angles/ channels shall be measured per linear metre of finished length and shall include support bolts and nuts, length embedded in the cement concrete blocks of 1:2:4 (1cement:2coarse sand:4 stone aggregate 20mm nominal size) formed in the masonry walls. Nothing extra shall be paid for the cement concrete block and making good the masonry wall, anchor fasteners etc. complete.

(viii) Non-Return Valves:

All non-return valves shall be provided as mentioned in Schedules of finishes, room data sheet document and Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge, conforming to relevant Indian Standards and in accordance with the following specifications. Non-return valves shall be of approved make.

Size	Construction	Ends
Upto 50 mm.	Gun metal	Screwed
65 mm and above	Gun metal/cast iron	Flanged

(ix) Technical Specification of Pressure Reducing Valve:

(a) Pressure Reducing Valves shall be provided as mentioned in Schedules of finishes, room data sheet document and Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge.

(b) Pressure Reducing Valve in brass housing (DZR) with G¼ "pressure gauge connection part, spring bonnet with adjustable opening having adjustable knob for pressure adjustments. The diaphragm shall be in fibre- reinforced NBR and seals in NBR. The adjustment spring shall not be in touch with water at any given time.

(x) Electrical Water Meter

(a) Water meters shall be of multi jet magnetic drive (turbine type), displacement and accumulative reading type, conforming to local water works Authority standards.

(b) Working pressure shall be corresponding with piping system.

(c) Standard: ISO 4064, AWWA, EEC

(d) Maximum working pressure: Standard – 16bar

(e) Maximum liquid temperature: 60 degree centigrade

(f) Body MOC: Cast Iron, Polyester Coated

(g) Application: Potable and Drinking Water Supply

(h) Accuracy: The minimum Flow Meter shall be 35-58% below the ISOstandard and maximum flow rate shall be ISO-233%.

(i) Ratio: The ratio between the extreme flow rates (Qmin and Qmax) shall be as per manufacturer's specifications.

(xi) Insulation of Hot Water Pipes:

(a) Hot Water Pipes inside the building shall be provided as mentioned in Schedules of finishes, room data sheet document and Detailed Architectural Drawings, material palette or as directed by the Engineer-in-charge.

(b) All hot water supply pipes. shall be wrapped with thermal insulation tubing, light weight closed cell polyethylene foam conforming to BS 476 Part 7 and ASTM E84. The work shall be done as per CPWD Specification, 2019 Vol. I and Vol.II with upto date correction slips as on last date of submission of Bid, and manufacturer's recommendation as directed by Engineer-in-charge.

(c) Application: All preparation method and polished proactive coat shall be done in supervision and instruction of Engineer-in-charge or manufacturer's instructions

17 FACADE ACCESS CLEANING SYSTEM

SCOPE

Supply and installation of Facade Access cleaning system covering external façade area, to enable easy access to all parts of the elevation area to facilitate cleaning and maintenance of the proposed buildings in the IIT, Hyderabad campus. The system is intended to be installed for three Academic buildings which are of approximately 30 m height from ground level and five housing buildings which are approximately 60 m height. The components of the façade access system viz. Jibs, Cradle and brackets shall be suitable for all buildings specified above and hence accordingly designed and manufactured. All the components of the system shall be designed to be compatible with one another and to the specified working loads. The scope of work covers supply, deliver at site and erect the complete system including design, manufacture, testing, commissioning, and training EIC personnel.

The system shall comprises the following:

A. Jibs: (Item no. 17.20 and 17.21)

• Portable Jib made out of Aluminium alloy sections with arm length and boom with required out- reach to clean the façade (but not less than 1 M) and as specified in the BOQ and as per drawing. The Aluminium jibs (pair of Jib) shall be suitable for mounting on brackets which shall be fixed to the RCC parapet wall, or on brackets fixed to the terrace RCC slab at the required centre to centre distance (the c/c shall be compatible to the c/c of the Cradle system) .

B. Cradle: (Item no. 17.22)

The overall length of the Cradle shall be 2300 mm, which shall be locally fabricated with imported motor, winch, controls and rope of reputed make. The cradle shall be capable of taking the load of 2 persons (@70 kg/each) and additional load of 40 Kg (Total working load shall be 180 Kg). Cradle shall be constructed with Powder coated mild steel alloy box section; the base of the cradle shall be aluminum chequered plate and fitted with necessary accessories. The cradle shall be provided with PVC covered foam buffer and soft rubber rollers. Cradle shall be cladded with stainless steel perforated sheet of suitable thickness and to the profile with necessary stiffeners and the cradle shall be provided with slewing mechanism and castors (heavy duty). The specification of the cradle shall be as follows:

Capacity	:	Two Man (Two Operatives)180 Kg Safe working load (Live Load)
Power Requirement	:	Plug and Socket outlet 5 pin (IP 64 protected) 415V, 3phase, 50Hz. , AC Power 1.5Amp
Running Current:		7.5 Amp

Starting Current:

Power Cable required at site	:	PVC insulated copper flexible cable 6 core x 2.5 Sqmm . Length of the cable shall be sufficient to serve the Faculty and Staff housing buildings which are of height 60 m approximately from ground level.
Size of Cradle	:	2300 mm length x 620 mm wide and 1000 mm height excluding buffers
Construction	:	MS hollow pipe section & MS angle with fully welded construction. The base (flooring) shall be with 4mm thick Aluminium chequered plate with toe board; Fitted with PVC covered foam buffering on three sides of the cradle. All round cladding shall be with 1.0mm thick perforated sheet made of stainless steel grade 304. .
Traction Hoist	:	Two No Titan PI503 Model. Shall conform to EN 1808. Two number Power Winches of capacity 500 Kg. each.
Motors	:	Winches fitted with 0.75 kw Motor, 415V, 3 phase 50 Hz supply. (as per EN 1808)
Climbing Speed	:	8.5 M / Minute
Wire Ropes	:	Two Nos. Main suspension ropes Two Nos. Secondary (safety) suspension rope. Factor of safety shall be minimum 10(as per EN 1808 March 1999) Size: Dia.8mm (IWRC, RHO), 6 x 19 Galvanized steel Minimum Breaking Force shall be 42 KN The wire ropes shall be enough length to be used for buildings of height 60 m from ground level. The wire ropes shall be of Usha Martin or approved make with galvinised finish
Rope winder	:	Of required capacity, Motorized Wire Winder of 3 Phase, 415V, 50 Hz, AC Power, Type of motor shall be Bonfiglioli make geared motor with 100% duty cycle, power rating-0.37KW , output speed 22 RPM, Motor protection –IP 56
Rope Reeving	:	Rope winding/unwinding onto power reelers fitted below the winches for both, main suspension and secondary safety wire. Torque Limiters provided for slack free reeving.
Controls	:	Central control in the cradle for traction hoists with IP55 protection, Main Switch, Phase Protection & Push Buttons.

Castor for movement:		2 Nos. fix castors 100mm x 45mm wide 2 Nos. Slew castors 100mmx45mm wide
Safety Features	:	1. Built in stack rope safety device. 2. Emergency descent at controlled speed in case of power failure by operating primary brake lever. 3. Automatic trip device (fitted underside of cradle) to operate in case of cradle meeting obstructions during descent. 4. Upper limit switch's to halt the ascent at predetermined height. 5 Cradle fitted with safety harness anchorages 6. Automatic lock on safety rope in case of abnormal lift of platform. 7. Mechanical overload detection device.

The contractor shall arrange at site, hands-on training to the designated staff of EIC in proper use of the system. The warranties and O&M manuals shall be handed over to the EIC.

C. Brackets: (Item no. 17.23 and 17.24)

The brackets shall be made of galvanised MS sections. The galvanisation to the brackets shall be 80 microns. The size and thickness of the bracket sections shall be as per Jib and Cradle manufacturer's specifications. A set of brackets shall comprise of upper and lower brackets for parapet mounted Jibs and front and rear brackets for slab mounted Jibs.The brackets shall be anchored in RCC wall/slab with stainless steel anchor fasteners of grade 304 during the casting of the RCC. The size of the anchor fasteners (Hilti or approved equivalent make) shall be M16 of required length (not less than 150 mm) depending on the thickness of RCC parapet wall / thickness of water proofing treatment. The number of anchor fasteners shall be as per the design of the bracket (minimum shall be 2 nos). The brackets shall be designed to safely take the load from Jibs and cradle with a live load of 180 Kg (as per EN 1808)

The specification given above is indicative and it is the responsibility of the contractor to evaluate the Elevation and its features and provide the façade access cleaning system with all accessories with safety systems for accessing entire façade area including projecting surfaces.

18 DEVELOPMENT WORKS AND BULK SERVICES

- **ROAD WORK**

A. **Planning, Designing and Construction of Road of width 7.0m / 6.0 m / 4.5 m / 3.0 m along with kerb etc**

SUB GRADE

Construction of subgrade using approved available soil within the IITH Compound, spread the earth layer by layer, mix with water to achieve MDD at Optimum Moisture Content and compacting it with vibratory roller of 8-10 tonnes capacity to required percentage of MDD (IS:2720-Part 8) as per MORTH Clause 305 including all leads and lifts complete.

SUB-BASE CONSTRUCTION

Providing and construction of granular sub base (GSB) of Grading -II of Table 400-1 including mixing in a mechanical mixing plant at OMC, carriage of mixed Material to work site, spreading in uniform layers as per drawing with motor grader on prepared cum subgrade and compacting with vibratory roller to achieve required percentage of MDD (as per IS:2720: Part 8), complete as per Clause 401 of MORTH Specifications and as per approved drawing and as per direction of Engineer in Charge

CEMENT CONCRETE PAVEMENT CONSTRUCTION

Providing and laying design mix cement concrete Vacuum Dewatered pavement of M-30 grade, in roads/ taxi tracks/ runways, using cement content as per design mix, using coarse sand and graded stone aggregate of 40 mm nominal size in appropriate proportions as per approved & specified design criteria, providing dowel bars with sleeve/ tie bars wherever required, laying at site, spreading and compacting mechanically by using needle and surface vibrators, levelling to required slope/ camber, finishing with required texture, including steel form work with sturdy M.S. channel sections, curing, making provision for contraction/ expansion, construction & longitudinal joints (10 mm wide x 50 mm deep) by groove cutting machine, providing and filling joints with approved joint filler and sealants, complete all as per direction of Engineer-in-charge

a) Formation of road alignment as per approved drawing including cutting and embanking as per profile, rolling and preparing the sub-grade fit for laying road.

b) Providing and fixing Factory made Kerb stone of approved brand and manufacture with M-30 grade concrete on both side of 6.0 m wide road.

c) Cutting 6mm wide and 50 mm deep groove in Vacuum dewatered concrete pavement and filling with polysulphide etc. complete as per specification and as directed by the Engineer – in – charge.

d) 75 mm wide thermo-plastic mark paint for indicating divider line and edge line, speed breakers, road crossing for pedestrians at junction etc., all complete.

e) Chambers, road longitudinal slopes etc shall be followed as per CPWD Specification

f) Details Specification of road work: CPWD Specifications 2019, Vol. I and II shall be followed.

GLOW STUDS

Providing and fixing Glow studs of size 100x20 mm made of heavy duty body shall be moulded ASA (Acrylic styrene Acryloretrite) or HIP (High impact polystyrene) or ABS having electronically welded micro- prismatic lens with abrasion resistant coating as approved by Engineer in charge. The glow stud shall support a load of 13635 kg tested in accordance with ASTM D4280. The slope of retro- reflective surface shall be 35 +/-5 degress to base. The reflective panels on both sides with at least 12 cm of reflective area up each side. The luminance intensity should be as per the specification and shall be tested as described in ASTM I: 809 as recommended in BS: 873 part 4 : 1973. The studs shall be fixed to the Road surface using the adhesive conforming to IS, as per procedure recommended by the manufacturer complete and as per direction of Engineer-in-charge.

- **External Sewerage System:**

(i) Planning, Designing and Construction of Sewerage systems consisting of 150mm/200mm/250mm/300mm/350mm/400mm/450mm dia NP2 RCC Pipes of spigot and socket ends including Manholes of required size, shape and depth complete as per approved drawings and layout of the campus etc by preparation of preliminary and detailed working drawings, structural analysis and design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with External Developmental works all complete as per directions of Engineer-in- Charge based on the drawings enclosed in the Bid document as applicable for this work.

(ii) Planning, Designing and Construction of all cross drainage works that falls within the alignment of the Sewerage systems as per approved layout plan of the campus, which are essential and necessary to keep the Sewerage systems in position as per the approved layout.

(iii) The invert level of Sewerage systems shall be as per approved design keeping minimum gradient for self-cleaning velocity.

(iv) Necessary Manholes/inspection/ intercepting chambers shall also be included in the scope wherever required as per approved drawing.

(v) The cutting, supply and filling of earth to maintain levels of ground in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shall be paid on this account.

(vi) The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, existing sewerage pipes, manholes, drainage pipes and chambers, communication cables, power supply cables etc. met during the course of excavation shall be properly supported and adequately protected, so that these services

remain functional. However, if any service is damaged during excavation, it shall be restored in a reasonable time.

(vii) The length of sewer line shall be measured nearer to centimetre for Payment.

(viii) The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.

- **Detailed Specification for Sewerage System:**

1. The Contractor has to plan, design, prepare the drawings for Sewerage System and get the same approved from Engineer – In –Charge before execution.

2. The Sewerage lines of ancillary buildings shall be considered in buildings upto and including first manhole.

3. Garbage and Waste Water from Kitchen and Mess shall not be directly discharged in the Sewerage System. For garbage, a separate storage bin shall be provided. For pretreatment of Waste Water, Gulley Trap, Screen Chamber, Grit Chamber shall be designed and constructed.

4. This item is operated from the first manhole of the buildings to the Sewage Treatment Plant which includes the following operations.

   (a) Excavation of trench for laying Pipes and refilling after laying pipes as per CPWD specifications.
   (b) Earth excavation for Manholes and refilling after construction.
   (c) Providing, Laying and fixing NP2 pipe line of various diametersfor sewage disposal over M – 15 grade PCC bed of 100 mm thick as per approved design and drawing by the Engineer-in-charge.
   (d) Constructing Manholes, drop manholes of required size (shape based on depth as per invert levels, gradient and interval) etc., as per CPWD specifications including construction of gully trap, grit chamber, screen chamber etc., complete including plastering on external surface of all manholes and chambers, making connection from and to the manholes wherever required.
   (e) Disposal of building rubbish or malba or excess earth received from cutting/filling including unserviceable, dismantled or waste material by mechanical means including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge for all leads and lifts involved.

- **Filtered Water Supply Network:**

  (i) Planning, Designing and Construction of Filtered Water Supply network consisting Water Supply main, branch and distribution lines consisting of 25/32/40/50/65/80mm dia CPVC pipes and peripheral grid of appropriate dia DI Pipes including chambers and fittings/specials such as Tees, Bends, collars, Unions, tappers, caps, Sluice Valves, Gate Valves, scour valves, non-return valves, air-relief valves, thrust blocks etc. as per approved drawing by preparation of preliminary and detailed working drawings, structural analysis & design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with other Developmental works all complete as per directions of Engineer-in-Charge based on the drawings enclosed in the Bid document applicable for this work.

  (ii) Planning, Designing and Construction of all cross drainage works that falls within the alignment of the Filtered water supply network as per approved layout plan of the campus, which are essential and necessary to keep the Filtered water supply network in position asper the approved layout.

  (iii) Necessary inspection chambers are also be included in the scope wherever required as per approved drawing.

  (iv) The cutting, supply and filling of earth to maintain levels of ground in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shall be paid on this account.

  (v) The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.

- **Detailed Specification for Filtered Water Supply Network:**

  a) The water supply network should cater to the needs of supplying water from RCC UG Sumps (from various locations) to RCC Terrace Water Storage Tanks and from there to individual buildings. Thesystem shall consist of peripheral grid running in the entire campus from RCC Terrace Water Storage Tanks from which distribution feeding system upto individual buildings will take off.

  b) The Contractor has to plan, design, prepare the drawings for Water Supply System and get the same approved from Engineer — in — Charge before execution.

  c) Excavation of trench for laying Pipes and refilling after laying pipesas per CPWD specifications.

d) Earth work excavation for chambers, D.I. Specials, valves, thrustblocks etc. and refilling after construction/ laying.

e) Providing and laying Ductile Iron Pipe line with push joint from RCC Terrace Water Storage Tank outlet to make outer main grid with alround campus as per the approved drawing along with specials like Tees, Bends, sockets, Tappers, sluice valves, scour valves, Air relief valves, Non return valves, Thrust blocks etc.

f) Providing and laying Ductile Iron Pipe line with push joint from RCC UG Sump to RCC Terrace Water Storage Tank as per the approved drawing along with specials like Tees, Bends, sockets, Tappers, sluice valves, scour valves, Air relief valves, Non return valves, Thrust blocks etc.

g) Construction of chamber for sluice valves, scour valves, Air relief valves, Non return valves shall be as per CPWD specification and as per approved drawing.

h) All buildings are to be connected with nearest water supply lines by CPVC pipes of dia 80 mm and 50 mm so that water supply shouldbe made to the building along with fittings, Gun metal gate valves, Gun metal non return valves, masonry chambers for valves, including excavation, providing sand alround and refilling after laying etc.

i) All pipe work shall be so designed, laid or fixed, and maintained so that it remains completely watertight, thereby avoiding wastage of water, damage to property and the risk of contamination of the water is eliminated.

j) The design of the pipe work shall be such that there is no possibility of backflow towards the source of supply from any cistern or appliance whether by siphonage or otherwise, and reflux or non-return valves shall not be relied upon to prevent such back flow.

k) There shall, therefore, be no cross connection whatsoever between a pipe or fitting for conveying or containing wholesome water and a pipe or fitting for conveying or containing impure water or water liable to contamination or of uncertain quality of water which has been usedfor any purpose. The provision of reflux or non-return valves or closedand sealed valves shall not be construed a permissible substitute for complete absence of cross-connection.

- **Unfiltered Water Supply Network:**

1. Planning Designing and Construction of Unfiltered water supply network distribution lines as per approved drawing by preparation of preliminary and detailed working drawings, structural analysis and design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with other Developmental works all complete as per directions of Engineer-in-Charge based on the drawings enclosed in the Bid document applicable for this work.
2. Planning Designing and Construction of all cross drainage works that falls within the alignment of the Unfiltered water supply network as per approved layout plan of the campus, which are essential and necessary to keep the Unfiltered Water Supply Network in positionas per the approved layout.
3. The cutting, supply and filling of earth to maintain levels of ground in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shall be paid on this account.
4. The length of water supply line shall be measured nearer to centimetre for Payment.
5. The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.

- **Detailed Specification for Unfiltered water supply network:**

a) Providing and laying treated water supply (from STP) grid alround campus with suitable dia CPVC pipe of schedule 80 and branches with 40mm dia CPVC pipe of SDR 11 along with fittings, Gun metal gate valves, Gun metal non return valves, masonry chambers for valves, including excavation, providing sand alround and refilling after laying etc. complete for horticulture and flushing purpose and to fill artificial pond (Water body) created in the campus.

b) The Contractor has to plan, design, prepare the drawings for water supply system and get the same approved from Engineer – in – Charge before execution.

c) Excavation of trench for laying Pipes and refilling after lying pipes as per CPWD specifications.

d) All buildings are to be connected with nearest unfiltered water supply lines by CPVC of schedule 80 pipes of dia 80 mm and 50

mm so that unfiltered water supply should be made to the dual plumbing system of building along with fittings, Gun metal gate valves, Gun metal non return valves, masonry chambers for valves, including excavation, providing sand alround and refilling after laying etc.

e) All pipe work shall be so designed, laid or fixed, and maintained so that it remains completely watertight, thereby avoiding wastage of water, damage to property and the risk of contamination of the wateris eliminated.

f) The design of the pipe work shall be such that there is no possibility of backflow towards the source of supply from any cistern or appliance whether by siphonage or otherwise, and reflux or non-return valves shall not be relied upon to prevent such back flow.

g) There shall, therefore, be no cross connection whatsoever betweena pipe or fitting for conveying or containing wholesome water and a pipe or fitting for conveying or containing impure water or water liable to contamination or of uncertain quality of water which has been usedfor any purpose. The provision of reflux or non return valves or closedand sealed valves shall not be construed a permissible substitute for complete absence of cross-connection.

- **Storm Water Drains:**

1. Planning, Designing and Construction of RCC Storm water drain as per approved drawings and layout of the campus etc by preparation of preliminary and detailed working drawings, structural analysis and design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with External Developmental works all complete as per directions of Engineer-in-Charge based on the drawings enclosed in the Bid document applicable for this work. The drains are to be connected to the rain water harvesting sump/pits or municipal storm water drains/outfalls.
2. Planning, Designing and Construction of all cross drainage works that falls within the alignment of the Storm water drain as per approved layout plan of the campus, which are essential and necessary to keep the Storm water drain in position as per the approved layout.
3. The minimum width of drain shall be 300mm. However, sizes of drain shall be followed as per approved design. The invert level

of drain shall be as per approved design keeping minimum gradient of self- cleaning velocity. The bottom surface of inside drain shall have 50mm benching.

4. Necessary inspection/ intercepting chambers shall also be included in the scope wherever required as per approved drawing.
5. The cutting, supply and back filling of earth to maintain levels of ground in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shallbe paid on this account.
6. The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, existing sewerage pipes, manholes, drainage pipes and chambers, communication cables, power supply cables etc. met within the course of excavation shall be properly supported and adequately protected, so that these services remain functional. However, if any service is damaged during excavation shall be restored in reasonabletime.
7. The length of storm water drain shall be measured along centre line nearer to centimetre for Payment.
8. The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.
9. Use of Recycled aggregate confirming to IS: 383-2016 is permitted for use in the work subjected to their conformation of quality standards & their extent of utilization in concrete shall be as specified in IS: 383-2016 and maximum upto 25% in road/sub-base/WMM work. Recycled aggregates of size upto 150mm may be used for sub-base

- **Detailed Specification for Storm Water Drain:**

a) Earth work in excavation in all kind of soil by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as per direction of Engineer in charge.

b) Providing and laying or more as per design in position cement concrete including the cost of centering and shuttering.

c) Providing and laying in position RCC storm water drain in cement concrete including the cost of centering, shuttering,

finishing, transportation, laying and fixing in position with Cement mortar of 1:3 as per approved design, drawings.

d) The bottom portion of inner surface of drain shall have 50mm thick benching in CC 1:2:4 in required slop with floating coat of neat cement punning.

e) Providing and fixing RCC perforated drain covers of appropriate size as per design with necessary reinforcment complete, all as per direction of Engineer-in-charge

f) However, in curves, bends etc or in places where it is difficult to go for precast sections, Contractor is permitted to use brick work for which nothing extra is payable.

g) Disposal of building rubbish or malba or excess earth received from cutting/filling including unserviceable, dismantled or waste material by mechanical means including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in- charge for all leads and lifts involved.

- **Utility Ducts / Service Trenches:**

1. Planning, Designing and Construction of RCC Service trenches of various sizes, as per approved drawings and layout of the campusetc by preparation of preliminary and detailed working drawings, structural analysis and design, planning, and execution of all services including chilled water supply and return insulated pipe grid, Low Voltage (LV) cables etc by incorporating stipulated specifications and integrating all services with other Developmental works all complete as per directions of Engineer-in-Charge based on the drawings enclosed in the Bid document applicable for this work.
2. Planning, Designing and Construction of all cross drainage works that falls within the alignment of the Service trench as per approved layout plan of the campus, which are essential and necessary to keep the Service trench in position as per the approved layout.
3. The minimum width of trench shall vary from 3.00 m to 4.50 m However, sizes of trench shall be followed as per approved design. Provision shall be made in the design to separate and dispose the rain water, collected if any, to keep away from the service lines. The service lines like cables, pipes etc., shall run on the sides of trench with suitable supporting system like structural steel brackets, but not directly on the side walls.
4. Necessary inspection/ intercepting chambers/ Junctions shall

also be included in the scope wherever required as per approved drawing.

5. The cutting, supply and back filling of earth to maintain the Service trench levels in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shallbe paid on this account.
6. The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, existing sewerage pipes, manholes, drainage pipes and chambers, communication cables, power supply cables etc. met within the course of excavation shall be properly supported and adequately protected, so that these services remain functional. However, if any service is damaged during excavation, it shall be restored in reasonable time.
7. The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.

- **Detailed Specification of trenches for Services:**

a) Earth work in excavation in all kind of soil by mechanical means (Hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift upto 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as per direction of Engineer in charge.

b) Providing and laying as per design in position cement concrete of including the cost of centering and shuttering.

c) Providing and laying in position RCC storm water drain in cement concrete of including the cost of centering, shuttering, finishing, transportation, laying and fixing in position with Cement mortar of 1:3 as per approved design, drawings.

d) Reinforced cement concrete work as per design Factory made cover on service trench including the cost of centering, shuttering, finishing and reinforcement, with with 6 mm cement plaster in 1:3 (1 cement: 3 coarse sand) on RCC surface.

e) Structural steel work in single section, fixed to the flyash brick side wall of service trench to support cables, pipes etc including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.

f) Disposal of building rubbish or malba or excess earth received from cutting/filling including unserviceable, dismantled or waste material by mechanical means including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in- charge for all leads and lifts involved.

- **Foot Paths:**

1. Planning, Designing and Construction of **Foot path** as per approved drawings and layout of the campus along with kerb etc by preparationof preliminary and detailed working drawings, structural analysis and design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with External Developmental works all complete as per directions of Engineer-in-Charge based on the drawings enclosed in the Bid document applicable for this work.
2. Planning, Designing and Construction of all cross drainage works that falls within the alignment of the roads as per approved layout plan of the campus, which are essential and necessary to keep the roads in position as per the approved layout.
3. The cutting, supply and filling of earth to maintain the road levels in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shall be paid on this account.
4. The detailed Specifications mentioned below are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothing extra shall be payable.

5. Use of Recycled aggregate confirming to IS: 383-2016 is permitted for use in the work subjected to their confirmation of quality standards& their extent of utilization in concrete shall be as specified in IS: 383-2016 and maximum upto 25% in road/sub-base/WMM work. Recycled aggregates of size upto 150mm may be used for sub-base applications in road work.

- **Detailed Specification for Foot path (Uncovered):**

a) Earth work in surface excavation in all kind of soil not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including getting out and disposal of excavated earth as directed by Engineer-in- Charge.
b) Preparation and consolidation of sub grade with power road

roller of 8 to 12 tone capacity, dressing to camber and consolidating with road roller including making good the undulation and re-rolling the sub grade.

c) Providing and laying in position cement concrete including the costof centering and shuttering.

d) Providing and laying at or near ground level kerb stone of cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge.C.C. kerb stone shall be approved by Engineer- in-charge.

e) Providing and laying tactile tile (for vision impaired persons as per standards) of size 300x300x9.8mm having with water absorption less than 0.5% and conforming to IS:15622 of approved make in all colours and shades in for outdoor floors such as footpath, court yard, multi modals location etc., laid on 20mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) in all shapes & patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction of Engineer-in-Charge.

f) Providing and laying factory made chamfered edge Cement Concrete paver blocks of 60mm thick with approved colour, design& pattern in footpath, parks, lawns, drive ways or light traffic parking etc, of required strength, thickness and size/ shape, made by table vibratory method using PU mould, laid in required colour and pattern over 50mm thick compacted bed of sand, compacting and proper embedding/laying of inter locking paver blocks into the sand bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand complete all as per direction of Engineer-in-Charge.

g) Disposal of building rubbish or malba or excess earth received from cutting/filling including unserviceable, dismantled or waste material by mechanical means including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in- charge for all leads and lifts involved.

- **PAVER BLOCKS**

SUB GRADE

Construction of subgrade using approved available soil within the IITH Compound, spread the earth layer by layer, mix with water to achieve MDD at Optimum Moisture Content and compacting it with vibratory roller of 8-10 tonnes capacity to required percentage of MDD (IS:2720-Part 8) as per MORTH Clause 305 including all leads and lifts complete.

SUB-BASE CONSTRUCTION

Providing and construction of granular sub base (GSB) of Grading -II of Table 400-1 including mixing in a mechanical mixing plant at OMC, carriage of mixed Material to work site, spreading in uniform layers as per drawing with motor grader on prepared cum subgrade and compacting with vibratory roller to achieve required percentage of MDD (as per IS:2720:Part 8), complete as per Clause 401 of MORTH Specifications and as per approved drawing and as per direction of Engineer in Charge

CC Pavers

Providing and laying 60mm thick factory made cement concrete paver block of M -30 grade made by block making machine with strong vibratory compaction, of approved size, design & shape, laid in required colour and pattern over and including 50mm thick compacted bed of coarse sand, filling the joints with line sand etc. all complete as per the direction of Engineer-in-charge.

- **RCC Underground Sumps:**

1. Planning, Designing and Construction of RCC Under Ground Sumps with pump house as per details given below consisting of **1** Lakhs capacity with internal separation for Domestic, Fire and STP Treated water requirements all complete as per approved drawings using the specifications mentioned below by preparation of preliminary and detailed working drawings, structural analysis & design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with External Developmental works all complete as per directions of Engineer-in-Charge.
2. The cutting, supply and filling of earth to maintain the UG sump levels in position as per the approved layout plan shall be considered as included in the scope of work and nothing extra shall be paid on this account.
3. The Specifications mentioned are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothingextra shall be payable.

General:

1. The Contractor has to plan, design, prepare the drawings for RCC UG Sump of required capacity and get the same approved from theEngineer – In – Charge before execution.

2. The cost of structural design and drawing shall be got proof

checked by IITs/NITs/ any other Govt Engineering college or Institute as per decision of the Engineer-in-charge and Nothing extra shall be payable on this account.

3. Any other drawing required by the department for execution of work, from time to time, will be furnished by the Contractor as per relevant IS codes and sound engineering practice without hampering the progress of work. Such drawings shall be used in the work only after approval of the Engineer in charge. All necessary help and cooperation shall be provided by the Contractor for incorporating any changes in such drawings, if any, as suggested by the Engineer in charge. Nothing extra shall be payable on any account.

4. The structural designing shall be carried out considering the safe bearing capacity of soil. In case the nature of soil is found such which need some additional measures/modifications in structural design and drawing due to less bearing capacity of soil or due to any other reason whatsoever, the work shall be executed accordingly by the Contractor as per modified design & drawing without any extra cost. Such changes if any, shall be done as per relevant IS Code provisions and sound engineering practice as approved by Engineer- in-charge. Nothing extra shall be payable on any account.

5. The designs and execution of work shall be in accordance with the provisions of the following I.S. Codes, incorporating subsequent revisions, if any.
(i) I.S. 456-2000
(ii) I.S. 875
(iii) I.S. 1893 (Part-I) 1984 with revisions
(iv) I.S. 3370 (Part-I & II) with
revisions(v) I.S. 2309

   Where I.S. Codes are not applicable the sound Engineering practices shall apply. The decision of Engineer in charge in this regard shall be final and binding on the Contractor.

6. To make the tanks water tight against seepage and leakage, water proofing treatment of approved quality shall be mixed with concrete and plaster during mixing as per the manufactures specifications.

7. After completion of the construction work, the Terrace tank, underground tank and pipe lines shall be fully disinfected before commissioning. All expenditure in this regard shall be borne by the Contractor.

8. In case of any dispute on interpretations of any provision of the Indian Standard above, the decision of the Engineer in charge shall be final and binding on the Contractor and not open to the arbitration.

9. The Engineer in charge or his representative will carry out the testsas and when considered necessary for quality of work done andmaterial used / to be used in the work and the Contractor shall haveto provide every facility in this connection at his own cost. The Contractor shall also provide C.I. moulds for casting concrete cubes and sets of sieves for fine and coarse aggregate.

10. All the centering and shuttering shall be of steel only, good in line & level, shape & size and should be free from any undulations etc. In overall, the quality of centering and shuttering should be such that after removal of forms, the exposed concrete surface gives a uniform appearance true to lines, levels and curvature free from any pitting etc.

11. Nothing extra shall be paid for centering and shuttering required for RCC slabs, beams, walls, columns, domes, shafts, staircase, bracings, all coffers etc. curved in plan and / or in elevation and providing holes, slits, coffers etc. wherever required.

12. After physical completion of work the Contractor shall have to fill the tanks with water to show that it is completely watertight. The tanks shall be kept filled for a minimum period of three days (or as desired by the Engineer in charge) and no leakage, seepage or dampness shall be there in the tank. Nothing extra shall be paid for arrangingthe water and for filling it in the tanks for testing of making other arrangement.

13. If any leakage, seepage or dampness is observed during testing, necessary rectification shall have to be done by the Contractor at his own cost and the tanks shall be re-tested in the manner stated above.Nothing extra shall be paid for arranging the water and for filling it in the tanks for re-testing.

14. The Contractor shall guarantee the safety and water tightness of the structure and in the event of the tank developing leakage or any otherdefects on the completion and filling up the same shall be rectified by the Contractor without any other cost.

15. In the event of the tank not conforming to the above requirements and if the Contractor fails to rectify the defects to the satisfaction of the Engineer in charge. The Contractor shall not be eligible for any payment under the contract and all sums which might have been paid by way of work done shall be recovered from the dues of the Contractor either under this contract or any other contract with the Govt. In the event of the amount available with the Govt. does not cover the full amount due from the Contractor or if no amount is available with the Govt. against the Contractor, the Contractor shallon demand from the Engineer in charge remit the required amount within ten days.

16. The Contractor must take all precautions to avoid all accidents

by exhibiting day and night necessary caution boards red flag, red lights and providing barriers. He shall be responsible for all damages and accidents due to negligence on his part.

17. The Contractor shall maintain in good conditions all work during execution till completion of the entire work allotted to him.

18. Any damage done by the Contractor to any existing work during the course of execution of the work tendered for, shall be made good by him at his own cost.

19. The sand charcoal filling alround the copper plate of lighting conduction shall be done as per CPWD specifications for electrical works.

20. The UG Sump should be designed so that no adverse effects develop below the foundation, when tank is constructed upto top (without top dome) and is empty and wind blows with design speed, re-distribution of stresses will not be allowed.

21. Continuity effect of various structural components shall be requiredto be taken into account in design.

22. Only Elastic theory of design shall be used for design of RCC structures on no crack basis.

23. Wherever any reference of any IS Code / National Building Code / Any other published documents related to engineering has been made, the provisions contained thereof as per their latest versions shall be considered.

24. The cost of Raising head from ground, Delivery pipe with sluice valve up to ground level and chamber, Scour pipe with sluice valve and chamber, over flow pipe upto ground, ladder etc. shall be included in this job and nothing extra shall be on this account.

25. Projected slab with railing shall be provided at bottom and of top tank for maintenance purpose.

The rates shall include all the operations above mentioned and also not mentioned but required for making the Underground sumps functional. Nothing extra shall be paid on this account.

Guarantee Bond for RCC Underground Sump: -

Five years Guarantee bond in prescribed proforma **given in the Bid document** shall be submitted by the Contractor which shall also be signed by both the specialized agency and the Contractor to meet their liability / liabilities under the guarantee bond. However,

the sole responsibility about efficiency of water proofing treatment shall rest with the Building Contractor. **10% (Ten per cent) of the cost of water- proofing work shall be retained as Security Deposit and the amountso deducted would be released after 5 (Five) years from the date of completion of the entire work under the agreement, if the performance of the treatment is found satisfactory.** If any defect is noticed during the guarantee period, the Contractor shall rectify it within 15 days of receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of Contractor. However, this Security Deposit can be released in full, if Bank Guaranteeof equivalent amount for Full **05 (Five) years** is produced and deposited with the department.

Detailed Specifications for RCC Under Ground Sump:

(1) **General**: The tentative location of UG Sump has been shown in thelayout plan enclosed in the Bid Document. The scope of work includes, planning, designing, construction, testing and commissioning including all necessary connections, fittings and fixtures of UG sump.

(2) **Foundation**:

(a) Foundation shall be designed with RCC Cast in situ base slab and walls using appropriate grade of Design Mix cement concrete (not less than M 30) and Fe 500D reinforcement as per structural drawings or any other methods of construction suitable to the structural system. The foundation shall rest at a minimum depth below natural ground level as mentioned in the structural drawing.The depth of foundation is variable as per site condition.

(b) Levelling course for foundation as per design.

(c) The Design Mix for concrete shall adopt use of GGBS / fly ash (The Physical & Chemical properties of GGBS shall confirm to IS: 12089-1987 and that of fly ash shall confirm to IS: 3812-2003. Uniform blending with cement to be ensured in accordance with clause 5.2 & 5.2.1 of IS: 456-2000) of minimum 30% by weight as part replacement of OPC and the Design Mix is to be got approved by CPWD before actual construction.

(3) **Structural System**:

(a) The structure shall be with conventional RCC cast-in-situ construction. The structure shall be Earthquake resistant RCC Cast in situ structure, which shall be constructed with M 30 or more grade of Design Mix cement concrete and Fe 500D Reinforcement. The Design Mix for concrete shall adopt use of GGBS / fly ash (The Physical & Chemical properties of GGBS shall confirm to IS: 12089-1987 and that of fly ash

shall confirm to IS: 3812-2003. Uniform blending with cement to be ensured in accordance with clause 5.2 & 5.2.1 of IS: 456-2000) of minimum 30% by weight as part replacement of OPC and the Design Mixis to be got approved by CPWD before actual construction. The Contractor is permitted to use RMC in place of Design Mix concrete for RCC in both foundation and superstructure but nothing extra is payable on this account.

(b) The RCC UG Sump shall be executed as per Structural drawings to be submitted by the Contractor and approved by Engineer-in- Charge. The Sump shall conform to NBC 2016 Guidelines/ Specifications.

(c) RCC in walls beams and slabs shall be as per the approved structural drawings with design mixed concrete/ RMC mixed with permissible admixtures, centering, shuttering & reinforcement.

M.S. Centering /shuttering and scaffolding material unless and otherwise specified shall be used for all R.C.C. work to give an even finish of concrete surface. However, rubber coated marine- ply shuttering in exceptional cases as per site requirement maybe permitted to be used on specific request from Contractor to be approved by the Engineer-in-charge The detailed dimensions and mix for building elements to be adopted shall be as per provisions of IS: 456, IS:1642, IS: 1893, IS: 3792, IS: 6073, IS: 13920, IS:11447, IS: 15916, IS: 15917 and as per approved structural design. RCC leaner than M-30 shall not be used.

(4) <u>Finishing:</u>

a. The bottom and the side walls of the sump shall be Ceramic Tile Flooring, Dado and wall lining, in general, shall be done as per CPWD Specifications, 2019 Volume-I & Volume-II with upto date correction slips.

b. The tiles shall be of approved make and shall generally conform to Table 12 of IS:15622. The Vitrified tiles of specified sizes shall be used and sample of tiles shall be got approved from the Engineer-in-charge. The Mandatory tests for vitrified tiles shall be got done as per CPWD Specifications, 2019 Volume-I & Volume-II with upto date correction slips as on last date of submission of Bid document / relevant BIS Code.

c. The vitrified/ceramic tiles shall be as specified in the drawing. The tiles shall be of specified colours as shown in the drawings or as approved by Engineer-in-charge and will be laid in pattern as per architectural drawings. Nothing extra shall be paid for laying tiles in specific pattern. The tiles shall be first quality of approved make.

d. Contractor to obtain prior approval of Engineer-in-charge for tiles make, sizes, shade and colour as per Architectural drawings and material palette before bringing it to site. The tiles shall be laid as

specified in the Schedule of Finishes including grouting of joints with pigmented epoxy grouts. Tiles joints shall be as per the pattern provided in Architectural drawings.

(5) **Water Supply Pipes, Pump Sets & Foot Rest:**

(a) The Contractor shall make all necessary connections of Inlet, Outlet, Overflow pipes as per CPWD specifications with GI/CIpipes as per the schedule of Quantities and as per directions of the Engineer-in-charge.

(b) The Contractor shall provide suitable capacity Pump Sets (with one working and one standby) along with suitable control Panel, cabling, connections, testing and commissioning etc., as per the approved scheme and as per directions of the Engineer-in- charge.

(c) Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910, on 12 mm dia steel bar conforming to IS: 1786, having minimum cross section as 23mmx25 mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to with stand the bend test and chemical resistance test as per specifications and having manufacture's permanent identification mark to be visible even after fixing, including fixing in UG sump with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.

(6) **Water Proofing Treatment:**

The Water Proofing Treatment shall be done as per methodology and specifications as mentioned in Water Proofing Sub-Head provided in the Bid Document.

- **RCC Terrace Tanks:**

1. Planning, Designing and Construction of RCC Terrace tanks consisting of **1,00,000 Litres capacity** all complete as per approved drawings using the specifications mentioned below by preparation of preliminary and detailed working drawings, structural analysis and design, planning, designing and execution of all services by incorporating stipulated specifications and integrating all services with External Developmental works all complete as per directions ofEngineer-in-Charge.

2. The RCC Terrace Tank levels shall be as per the approved layout plan shall be as per the scope of work and nothing extra shall be paidon this account.

3. The Specifications mentioned are indicative only. The items, that are necessary to complete the scope of said work but not mentioned below, shall be considered as included in the quoted rate and nothingextra shall be payable.

General:

1. The Contractor has to plan, design, prepare the drawings for RCC Terrace Tanks of required capacity and get the same approved from the Engineer – In – Charge before execution.

2. The cost of structural design and drawing shall be got proof checked by IITs/NITs/ any other Govt Engineering college or Institute as per decision of the Engineer-in-charge and Nothing extra shall be payable on this account

3. Any other drawing required by the department for execution of work, from time to time, will be furnished by the Contractor as per relevant IS codes and sound engineering practice without hampering the progress of work. Such drawings shall be used in the work only after approval of the Engineer in charge. All necessary help and cooperation shall be provided by the Contractor for incorporating any changes in such drawings, if any, as suggested by the Engineer in charge. Nothing extra shall be payable on any account.

4. The structural designing shall be carried out considering the safe bearing capacity of soil. In case the nature of soil is found such which need some additional measures/modifications in structural design & drawing due to less bearing capacity of soil or due to any other reason whatsoever, the work shall be executed accordingly by the Contractor as per modified design & drawing without any extra cost. Such changes if any, shall be done as per relevant IS Code provisions and sound engineering practice as approved by Engineer-in-charge. Nothing extra shall be payable on any account.

5. The designs and execution of work shall be in accordance with the provisions of the following I.S. Codes, incorporating subsequent revisions, if any.
   (i) I.S. 456-2000
   (ii) I.S. 875
   (iii) I.S. 1893 (Part-I) 1984 with revisions
   (iv) I.S. 3370 (Part-I & II) with revisions (v) I.S. 2309

   Where I.S. Codes are not applicable the sound Engineering practices shall apply. The decision of Engineer in charge in this regard shall be final and binding on the Contractor.

6. To make the tanks water tight against seepage and leakage, water proofing treatment of approved quality shall be mixed with concrete and plaster during mixing as per the manufactures specifications.

7. After completion of the construction work, the RCC Terrace Tank and pipe lines shall be fully disinfected before commissioning. All expenditure in this regard shall be borne by the Contractor.

8. In case of any dispute on interpretations of any provision of the Indian Standard above, the decision of the Engineer in charge shall be final and

binding on the Contractor and not open to the arbitration.

9. The Engineer in charge or his representative will carry out the tests as and when considered necessary for quality of work done and material used / to be used in the work and the Contractor shall have to provide every facility in this connection at his own cost. The Contractor shall also provide C.I. moulds for casting concrete cubes and sets of sieves for fine and coarse aggregate.

10. All the centering and shuttering shall be of steel only, good in line & level, shape & size and should be free from any undulations etc. In overall, the quality of centering and shuttering should be such that after removal of forms, the exposed concrete surface gives a uniform appearance true to lines, levels and curvature free from any pitting etc.

11. Nothing extra shall be paid for centering and shuttering required for RCC slabs, beams, walls, columns, domes, shafts, staircase, bracings, all coffers etc. curved in plan and / or in elevation and providing holes, slits, coffers etc. wherever required.

12. After physical completion of work, the Contractor shall have to fill the tanks with water to show that it is completely watertight. The tanks shall be kept filled for a minimum period of three days (or as desired by the Engineer in charge) and no leakage, seepage or dampness shall be there in the tank. Nothing extra shall be paid for arranging the water and for filling it in the tanks for testing of making other arrangement.

13. If any leakage, seepage or dampness is observed during testing, necessary rectification shall have to be done by the Contractor at his own cost and the tanks shall be re-tested in the manner stated above. Nothing extra shall be paid for arranging the water and for filling it in the tanks for re-testing.

14. The Contractor shall guarantee the safety and water tightness of the structure and in the event of the tank developing leakage or any other defects on the completion and filling up the same shall be rectified by the Contractor without any other cost.

15. In the event of the tank not conforming to the above requirements and if the Contractor fails to rectify the defects to the satisfaction of the Engineer in charge. The Contractor shall not be eligible for any payment under the contract and all sums which might have been paid by way of work done shall be recovered from the dues of the Contractor either under this contract or any other contract with the Govt. In the event of the amount available with the Govt. does not cover the full amount due from the Contractor or if no amount is available with the Govt. against the Contractor, the Contractor shall on demand from the Engineer in charge remit the required amount within ten days.

16. The Contractor must take all precautions to avoid all accidents by exhibiting day and night necessary caution boards red flag, red lights and providing barriers. He shall be responsible for all damages and accidents due to negligence on his part.

17. The Contractor shall maintain in good conditions all work during execution till completion of the entire work allotted to him.

18. Any damage done by the Contractor to any existing work during the course of execution of the work tendered for, shall be made good by him at his own cost.

19. The sand charcoal filling alround the copper plate of lighting conduction shall be done as per CPWD specifications for electrical works.

20. RCC Terrace Tank should be designed so that no adverse effects develop below the foundation, when tank is constructed upto top (without top dome) and is empty and wind blows with design speed, re-distribution of stresses will not be allowed.

21. No reduction in wind pressure prevailing in the area as per IS 875 shall be allowed for design of RCC components including RCC columns and for stability calculations.

22. Continuity effect of various structural components shall be required to be taken into account in design.

23. Only Elastic theory of design shall be used for design of RCC structures on no crack basis.

24. Wherever any reference of any IS Code / National Building Code / Any other published documents related to engineering has been made, the provisions contained thereof as per their latest versions shall be considered.

25. The cost of Raising head from ground, Delivery pipe with sluicevalve up to ground level and chamber, Scour pipe with sluice valve and chamber, over flow pipe upto ground, ladder etc. shall be included in this job and nothing extra shall be on this account.

26. Projected slab with railing shall be provided at bottom and of top tank for maintenance purpose.

27. The rates shall include all the operations mentioned above andalso not mentioned but required for making the RCC Terrace Tanks functional. Nothing extra shall be paid on this account.

Guarantee Bond for RCC Terrace Tank: -

Five years Guarantee bond in prescribed proforma **given in the Bid document** shall be submitted by the Contractor which shall also be signed by both the specialized agency and the Contractor to meet their liability / liabilities under the guarantee bond. However, the sole responsibility about efficiency of water proofing treatment shall rest with the building Contractor. **10% (Ten per cent) of the cost of water-proofing work shall be retained as Security Deposit and the amount so deducted would be released after 5 (Five) years from the date of completion of the entire work under the agreement, if the performance of the treatment is foundsatisfactory**. If any defect is noticed during the guarantee period, the Contractor shall rectify it within 15 days of receipt of intimation of defects in the work. If the defects pointed out are not attended to within the specified period, the same will be got done from another agency at the risk and cost of Contractor. However, this security deposit can be released in full, if bank Guarantee of equivalent amount for Full **05 (Five) years** is produced and deposited with the department.

Detailed Specification for RCC Terrace Tank:

(a) **General:** The tentative location of RCC Terrace Tank has been shown in the layout plan enclosed in Bid Document. The scope of work includes, planning, designing, construction and commissioning including all necessary connections, fitting & fixtures of RCC Terrace Tank.

(b) **Structural System**: The structure consists of conventional RCC cast-in-situ beam-column-slab-wall system of construction. The structure shall be Earthquake resistant RCC Cast in situ structure, which shall be constructed with M 30 or more grade of Design Mix cement concrete and Fe 500D Reinforcement. The Design Mix for concrete shall adopt use of GGBS / fly ash (The Physical & Chemical properties of GGBS shall confirm to IS: 12089-1987 and that of fly ash shall confirm to IS: 3812-2003. Uniform blending with cement to be ensured in accordance with clause 5.2 & 5.2.1 of IS: 456-2000) of minimum 30% by weight as part replacement of OPC and the Design Mix is to be got approved by CPWD before actual construction. The agency is permitted to use RMC in place of Design Mix concrete for RCC in both foundation and superstructure but nothing extra is payable on this account.

(c) **RCC Walls, Beams & Slabs**: RCC in walls beams and slabs shall be as per the approved structural drawings with design mixed concrete/ RMC mixed with permissible admixtures, centering, shuttering & reinforcement. The detailed dimensions & mix for structural elements to be adopted shall be as per provisions of IS: 456, IS:1642, IS: 1893, IS: 3792, IS: 6073, IS: 13920, IS: 11447, IS: 15916, IS: 15917 and as per approved structural design. RCC leaner than M-30 shall not be used.

(d) **Centering and Shuttering**: The Centering and Shuttering shall be with M.S. material unless and otherwise specified to give an even finish of concrete surface. However, rubber coated marine-ply shuttering in

exceptional cases as per site requirement may bepermitted to be used on specific request from Contractor to beapproved by the Engineer-in-charge. The Contractor shall provide centering and shuttering as per approved design and drawing all complete and Nothing extra shall be payable on account of additional lift involved in execution.

(e) **Finishing:**

I. The bottom and the side walls of the sump shall be Ceramic Tile Flooring, Dado and wall lining, in general, shall be done as per CPWD Specifications, 2019 Volume I & Volume II with upto date correction slips.

II. The tiles shall be of approved make and shall generally conform to Table 12 of IS:15622. The Vitrified tiles of specified sizes shall be used and sample of tiles shall be got approved from the Engineer-in-charge. The Mandatory tests for vitrified tiles shall be got done as per CPWD Specifications, 2019 Volume-I & Volume-II with upto date correction slips as on last date of submission of Bid document / relevant BIS Code.

III. The vitrified/ceramic tiles shall be as specified in the drawing. The tiles shall be of specified colours as shown in the drawings or as approved by Engineer-in-charge and will be laid in pattern as per architectural drawings. Nothing extra shall be paid for laying tiles in specific pattern. The tiles shall be first quality of approved make.

(f) **Water Supply Pipes:** The Contractor shall make all necessary connections of Inlet, Outlet, Overflow pipes as per CPWD specifications with GI/CI pipes as per the schedule of Quantities and as per directions of the Engineer-in-charge.

(g) **Water Proofing Treatment:** The Water Proofing Treatment shall be done as per methodology and specifications as mentioned in Water Proofing Sub-Head provided in the Bid Document.

19 HORTICULTURE

1.0 General :

1.1 Scope : Contractor to furnish all materials labor and related items necessary to complete the work indicated on drawing and specified herein and also to make provision of storage, security of material on site

2.0 Materials :

2.1 Topsoil : (Poyta earth) pH range 6.5 to 7.5 Topsoil or good earth shall be a friable loam, typical of cultivated topsoil of the locality containing at least 2% of decayed organic mater (humus). It shall be taken from a well-

drained arable site. It shall be free of subsoil, stones, earth clods, sticks, roots or other objectionable extraneous matter or debris. It shall contain no toxic material. No top soil shall be delivered in wet condition. Top soil available on Site may be used on approval of the Landscape Architect. For this the Contractor shall be paid only the Local carting Charges Prevalent on Site/as agreed by the Client.

The Contractor to provide soil test report from approved laboratory before supplying any soil on site

3.0 Earthwork:

Rough Grading:
Rough Grading of all areas within the project, including cut and fill sections and adjacent transition areas, shall be reasonably smooth, compacted and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable except as otherwise specified. All ditches, swales, and gutters, shall be finished to drain readily. Unless otherwise indicated or drawings, the sub-grade shall be evenly sloped to provide drainage away from the building walls in all directions at a grade of not less than 1 in 50 provide rounding at top and bottom of banks and at other breaks in grade.

3.1Backfill & Fill:
A. General:
Place soil material/murrum acceptable to Landscape Architect, in layers to required sub-grade elevations, for each classification listed below.

1. Under grassed areas, use satisfactory excavated or borrows material.

2. Backfill and fill materials are to be placed to layers not more than 20 cm in loose depth. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum density for each area classification. Do not place backfill or fill material on surfaces that are muddy.

3.2 Lawn or Unpaved Areas:
Compact top 15 cm of sub-grade and each layer of backfill or fill material at 90% maximum density.

3.3 Finish Grading:
A. If finished grades shown by spot elevations conflict with those shown by contours, spot elevations shall be used. Unless indicated, outside of buildings shall be given uniform slopes between points for which finished grades are shown or between such points and existing established grades, except vertical curves or rounding shall be provided at abrupt changes in slope. Do all grading require bringing entire project area to underside of respective surfacing or paving base as determined by the finished grade?

B. The contractor is responsible for bringing down all the grades to the finished contours and elevations shown.

C. Tolerance for finish grades shall be (+ or -) 5 cm in large planting areas but at junctions of soft & hard areas soil shall be 2-3 cm uniformly below paving level.

D. All grading and landscaping under this contract shall be done to provide adequate drainage and to preclude the pounding of water.

E. The Contractor shall uniformly distribute the top soil to the required depth over the entire site area to be grassed. Where top soil is spread directly over rock or gravel surfaces depth of the top soil shall be a minimum 20 cms.

4.0 Grassing and Flower beds:

4.1 Preparation:
Area to be grassed shall be prepared to a minimum depth of 200 mm on ground and / or to available depth on slab with good earth mixed with neemcake 20 0 gms/sqm and approved insecticide powder 100 gms/sqm and coco pit 1 kg/sqm & fertilizer 125 gm/sqm.

During period prior to planting the ground shall be maintained free from weeds. Grading and final leveling of the lawn shall be completed at least two weeks prior to the actual sowing, Regular watering shall be continued until sowing by dividing the lawn area into portions of approx. 5 mts square by constructing small bunds to retain water. These 'bunds' shall be leveled just prior to sowing of grass plants. At the time of actual planting of grass, it shall be ensured that the soil has completely settled.

4.2 Sowing the grass roots. / laying lawn carpet
Grass roots (Cynodon dactylon, American Blue, Paspalum, Taiwan or local genus approved by the landscape architect) shall be approved beforehand. The grass roots stock received at site shall be manually cleared of all weeds and water sprayed over the same after keeping the stock in a place protected from sun and dry winds. Grass stock received at site may be stored for a maximum of three days. In case grassing for some areas is scheduled for a later date fresh stock of grass roots shall be ordered and obtained.

Korean Lawn carpets shall be of size 0.6m x 0.3 m neatly cut & of uniform thickness. Carpets shall have min. thickness of 50 mm with uniform lawn growth & color, free of weeds, pest etc

Carpets shall be laid on evenly prepared firm surface, joints filled with mixture of garden soil & manure, rolled over at appropriate time to form uniform carpet of grass.

4.3 Execution
Small roots shall be dibbled about 5.0cms apart into the prepared grounds. Grass areas will only be accepted as reaching practical completion when germination has proved satisfactory and all weeds have been removed. It is necessary to get a sample area admeasuring min .5 sqm approved in all respects two weeks prior to plantation of main area.

4.4 Maintenance
As soon as the grass is approximately 3cm high it shall be rolled with a light wooden roller - in fine, dry weather and when it has grown to 5 to 8cms above

the ground, weeds must be removed and regular cutting and rolling must be begin. A top-dressing of Fertilizer shall be applied when the grass is Sufficiently secure in the ground to bear the mowing machine, the blades must be raised an inch above the normal level for the first two or three cuttings. That is to say, the grass should be cut so that it is from 4 to 5 cms in length, instead of the 3 cm necessary for mature grass.

In the absence of rain, in the Monsoon the lawn shall be watered with sprinklers every, three days soaking the soil through to a depth of at least 20cms.Damage, failure or dying back of grass due to neglect of watering especially for seeding out of normal season shall be the responsibility of the contractor. Any shrinkage below the specified levels &/or mixing of species during the contract of defects liability period shall be rectified at the contractors expense. The contractor is to exercise care in the use of rotary cultivator and moving machines to reduce to a minimum the hazards of flying stones and brickbats. All rotary mowing machines are to be fitted with safety guards.

4.5 Rolling:
Lawn mower with roller shall be used periodically, taking care that the lawn is not too wet and sodden.

4.6 Edgings:
These shall be kept neat and must be cut regularly with the edging shears, and edging shall be done with Golden Duranta, maroon Duranta or as per the directions of Engineer In Charge.

4.7 Watering:
Water shall be applied at least once in three days during dry weather. Watering whenever done should be through and should wet the soil at least up to a depth of 20cms.

4.8 Weeding: Prior to regular mowing the contractor shall carefully remove rank and unsightly weeds.

5.0 Planter Boxes with Plants:
The Planter boxes shall be constructed with CC Block masonry with Granite Cladding and filled with soil as mentioned above and planted with approved plants as per the directions of Engineer In Charge

20 Children Play Area (KOOCHIE or Equivalent Make).

1.0 SCOPE

Providing & fixing Play equipment of approved make as per specification, including excavation of pit with and providing Plain Cement Concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) for foundation of size 600x600x300 mm for embedding the posts. The posts of the unit shall be provided with 10 mm thick mild steel base plate and 150 mm anchor GI fasteners, as per manufacturer's specification. The units shall be protected against damage upto handing over of entire project complete as directed by Engineer In Charge.

2.0 GENERAL

Play equipments shall have following standards:

All posts shall be of galvanised 100mm nominal bore mild steel pipes with wall thickness 4.5mm, all fasteners shall be in galvanised steel with 'Flow-Coat' system, all parts shall be high grade LLDPE plastic with UV stabilized colour and antistatic compound additives, rotationally moulded plastic components to be with anti-ultra violet radiation consistent, all polythylene components to be of 'Ultra high molecular weight material. The galvanisation thickness for all mild steel pipes ,flats, sheets of all units shall be 80 microns. The powder coating thickness to the galvanised steel sections, aluminium alloy sections, wherever specified shall be minimum 50 microns.

3.0 EPDM Flooring

Providing & Laying Outdoor floor safe Insitu 30 mm thick precoated EPDM (Ethylene Propylene Diene Monomer) granules rubber tile flooring for children's play area. The 20mm thick cushioning layer shall be with 20% polyurethene colour adhesive for base and 10mm thick top layer shall be of EPDM of Grey colour 27%, Terracota red colour 57% and Yellow colour 16% with 33% polyurethene colour adhesive as per required pattern.The rate includes the cost of above materials , primer coat between base surface & base layer & giving slopes as specified, cutting, dressing, edge cleaning and washing and protecting the surface upto handing over of site etc. complete as directed by EIC.

3.1 FREE STANDING GLIDE SLIDE

3.1.1 Slide Guardrail – Free standing

Shall be an all welded assembly fabricated of 1.315 inch outside diameter, 14 gauge galvanized steel tubing and 1.029 inch outside diameter, 14 gauge galvanized steel tubing. Finished with a baked on polyester powder coating.

3.1.2 Connector / Adaptor

Shall be cast of high strength Almag 35 (535.0-F) aluminum alloy. Finished with a 420 micro finish and a baked on polyester powder coating.

3.1.3 Barrier Gate – Round Tube – Upper

Shall be fabricated of 1.315 inch outside diameter, 14 gauge galvanized steel tubing and 7 gauge hot rolled, pickled and oiled flat steel. All tube to tube weld connections shall be coped before welding to provide a clean look and the strongest joint possible. Flattened or partially flattened tube weld connections are not acceptable. Finished with a baked on polyester powder coating.

3.1.4 Tie Rod

Shall be fabricated of 1.315 inch outside diameter, 14 gauge galvanized steel tubing. Shall have factory intsalled crimped threaded inserts at each end. Finished with a baked on polyester powder coating.

3.1.5 Gasket

Shall be mounted between slide and deck. Shall be made from 0.375 inch thick neoprene. Shall have an approximate density of 11-13 Pounds/Cft. Shall have a minimum tensile strength of 70 p.s.i. Shall have a maximum water absorption of 5% by weight.

3.1.6 Exit Support Post

Shall be an all welded assembly fabricated of 3.5 inch outside diameter, 13 gauge galvanized steel tubing and 11 gauge zinc plated hot rolled flat steel. (See Tubing) Finished with a baked on polyester powder coating. ASTM Specifications: A-36

3.1.7 Stair / Ladder Handrail

Shall be an all welded assembly fabricated of 1.029 inch outside diameter, 14 gauge galvanized steel tubing and 1.315 inch outside diameter, 14 gauge galvanized steel tubing. Shall be finished with a baked on polyester powder coating.

3.1.8 Stair Ladder Footing Leg

Shall be fabricated of 1.029 inch outside diameter, 14 gauge galvanized steel tubing. (See Tubing.) Finished with a polyester powder coating.

3.1.9 Spacer / Connector

Cast of regular 319 (319.0-F) aluminum. Ultimate tensile strength shall be 27 ksi. Yield strength shall be 18 ksi. Finished with a 420 micro finish and a baked on polyester powder coating. ASTM Specifications: B- 26. Federal Specifications: QQ-A-601.

3.1.10 Glide Slide

Shall be rotationally molded from Exxon CP-812 polyethylene. Dry-blended or molded-in color resins are not acceptable.

3.1.11 Glide Slide Canopy

Shall be rotationally molded from Exxon CP-812 polyethylene. Dry-blended or molded-in color resins are not acceptable. Shall have molded in threaded inserts, and 1.315 inch outside diameter, 14 gauge galvanized steel tubing color matched to the plastic. Tubing shall be finished with a baked on polyester powder coating.

3.1.12 Coated Perforated Ladder

Shall be an all welded assembly fabricated of 11 gauge hot rolled, pickled and oiled flat steel and 14 gauge hot rolled, pickled, and oiled flat steel. Ladder treads and risers shall be die-formed from a single sheet of 14 gauge hot rolled, pickled, and oiled flat steel. Ladder shall be reinforced with stringers fabricated of 11 gauge hot rolled, pickled, and oiled flat steel. Ladder treads shall have .34 inch (9mm) perforated holes. Entire weldment shall have a protective coating.

3.1.13 Coated Deck / Platform

Shall be an all welded assembly fabricated of 12 gauge hot rolled, pickled and oiled flat steel. Deck surface and sides shall be die formed from a single sheet of 12 gauge hot rolled, pickled and oiled flat steel. Deck surface shall have .34 inch (9mm) diameter perforated holes. Entire weldment shall have a protective coating.

3.1.14 Support Post with End Cap

Shall be fabricated of 3.5 inch Outside diameter, 13 gauge galvanized steel tubing. (See Tubing) Shall have a factory installed 319 type aluminum alloy end cap secured with drive rivets. Finished with a baked on polyester powder coating.

3.1.15 Steel Tubing – 1.029 inch OD, 14 guaze

Tensile strength shall be 55,000 psi. Yield strength shall be 50,000 psi.

3.1.16 Steel Tubing – 1.315 inch OD, 14 guaze

Tensile strength shall be 75,000 psi. Yield strength shall be 60,000 psi.

3.1.17 Steel Tubing – 3.5 inch OD, 14 guaze

Tensile strength shall be 55,000 psi. Yield strength shall be 50,000 psi.

3.2 **GEODOME CLIMBER**

3.2.1 Rung

Shall be fabricated of 1.029 inch outside diameter, 14 gauge galvanized steel tubing with crimped-in threaded inserts. Finished with a baked-on polyester powder coating.

3.2.2 Anchor Strap

Shall be fabricated from one piece of .125 inch hot rolled flat steel. Shall be zinc plated before finish is applied. Finished with a baked on polyester powder coating or PrismCoat.

3.2.3 Steel Tubing – 1.029 inch OD, 14 ga.

Tensile strength shall be 55,000 psi. Yield strength shall be 50,000 psi.

1.3 **STANDARD SWING**

3.3.1 Swing Top Rail / Leg

Shall be 2.375 inch outside diameter, 10 gauge galvanized steel tubing. Tubing shall have a zinc-rich paint interior coating. Finished with a baked on polyester powder coating or PrismCoat. ASTM Specifications: A-315, A-500, and A-513. Support posts shall carry a factory-applied marker to indicate the level of protective surfacing material to be maintained.

3.3.2 End Yoke

An all-welded assembly fabricated of 2.875 inch outside diameter, 8 gauge galvanized steel tubing. Finished with a baked on polyester powder coating or PrismCoat.

3.3.3 Swing Clevis

Shall be manufactured of superior grade cast ductile iron and zinc plated for optimal surface protection. Shall have an integrated bronze bearing pressed in after powdercoating. Shall be finished with a baked on polyester powder coat.

3.3.4 Swing Hanger / Band

Shall be manufactured of superior grade cast ductile iron and galvanized. The swing hanger and band together shall have an ultimate tensile load of 5000 lbs. Shall be finished with a baked on polyester powder coat.

3.3.5 Surfacing Warning Label

Shall be a pressure sensitive adhesive white vinyl label laminated with clear mylar for weather resistance. Shall contain the following text: Warning! Installation over a hard surface such as concrete, asphalt, or packed earth may result in serious injury or death from falls. Shall be tamper resistant to deter removal.

3.3.6 Steel Tubing – 2.375 inch OD, 10 guage

Tensile strength shall be 75,000 psi. Yield strength shall be 60,000 psi.

3.3.7 Steel Tubing – 2.875 inch OD, 8 guage.

Minimum yield strength shall be 50,000 psi. with a maximum tensile strength at least 13% higher. Material ASTM Designation: A1011/A 1011/M Ola Commercial Steel CS Type B Mn content 0.6% max. Carbon Content (0.07 to 0.11) % vs. (0.02 to 0.15) % per ASTM Specs.

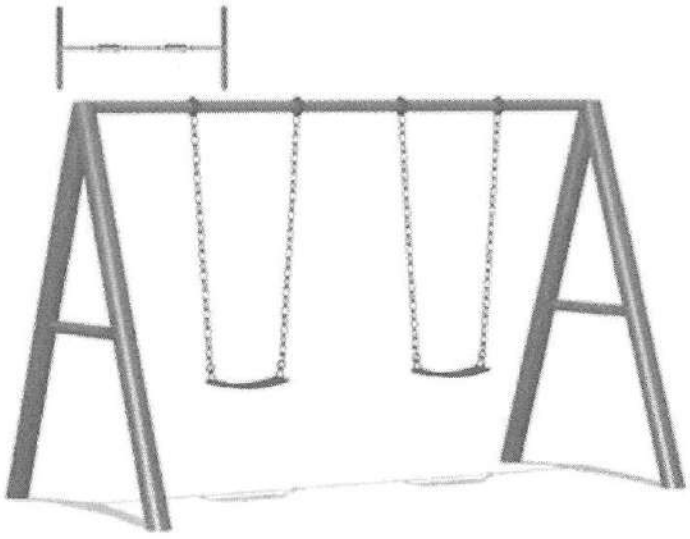
3.4 BELT SEAT W/SILVER SHIELD CHAIN FOR 8ft TOP RAIL

3.4.1 Chain 4/0 Silver Shield

ASTM B695 Type 1- Class 40 A - 1.7 mil coating of zinc equal in corrosion protection to a hot dip galvanized zinc finish. Meets ASTM spec B454, Military spec Mil-C-81562A for mechanical zinc coating required by SATM A-153, Class D.

3.4.2 Swing Seat – Belt

Shall be fabricated from 0.5 inch (13 mm) thick ethylene propylene diene monomer with a T-301 full hard .020 inch (.51 mm) carbon steel insert. A triangular galvanized steel bracket and plate shall be secured to seat with galvanized rivets for chain attachments. Seat shall be slash-proof.



FIERO A-SWING

3.5 **SEAT SEE-SAW W/ FIXED FULCRUM**

3.5.1 Seesaw support Rail / Leg / Beam

Shall be 2.375 inch outside diameter, 12 gauge galvanized steel tubing. Tubing shall have a zinc-rich paint interior coating. Surface mount post shall have a predrilled 3/8 inch x 10 inch square hot rolled steel base plate. (See Tubing) Finished with a baked on polyester powder coating or PrismCoat.

3.5.2 Elbow

Shall be cast of high strength Almag 35 (535.0-F) aluminum alloy. (See Cast Almag Clamps) Finished with a 420 micro finish and a baked on polyester powder coating or PrismCoat.

3.5.3 Seesaw Fulcrum

Shall be an all welded assembly of 0.25 inch galvanized hot rolled flat steel plate, 1.5 inch x 1.5 inch steel x 0.125 inch angle, and 2.875 inch outside diameter, 8 gauge galvanized steel tubing. Finished with a baked on polyester powder coating or PrismCoat.

3.5.4 Seesaw Fulcrum Retainer

Shall be fabricated of 2.875 inch outside diameter, 8 gauge galvanized steel tubing with a welded 1/2 inch -20 UNC threaded insert. Finished with a baked on polyester powder coating or PrismCoat.

3.5.5 Seesaw Seat

Shall be fabricated of Tenzalloy 713.0-T5 aluminum alloy. ASTM Specifications: B-26. Federal Specifications: QQ-A-601. Tensile strength is 27 ksi. Yield strength is 18 ksi. Finished with a baked on polyester powder coating or PrismCoat.

3.5.6 Handle

Shall be fabricated of 319.0-F aluminum alloy. ASTM Specifications: B-26. Federal Specifications: QQ-A-601. Tensile strength is 35 ksi. Yield strength is 25 ksi. Finished with a baked on polyester powder coating or PrismCoat.

3.5.7 Pipe Cap

Cast of regular 319 (319.0-F) aluminum. Ultimate tensile strength shall be 27 ksi. Yield strength shall be 18 ksi. Finished with a 420 micro finish and a baked on powder coating. (See PrismCoat / Polyester Powder Coat Finish) ASTM Specifications: B-26. Federal Specifications: QQ-A-601.

3.5.8 Tire Mounting Plate

Shall be fabricated of .188 inch hot rolled flat steel and zinc plated. Finished with a baked on polyester powder coating or PrismCoat.

3.5.9 Tire

Shall be a 205/75 D15 tire. Shall be a rubber tire with nylon belts.

3.5.10 Surfacing Warning Label

Shall be a pressure sensitive adhesive white vinyl label laminated with clear mylar for weather resistance. Shall contain the following text: Warning! Installation over a hard surface such as concrete, asphalt, or packed earth may result in serious injury or death from falls. Shall be tamper resistant to deter removal.

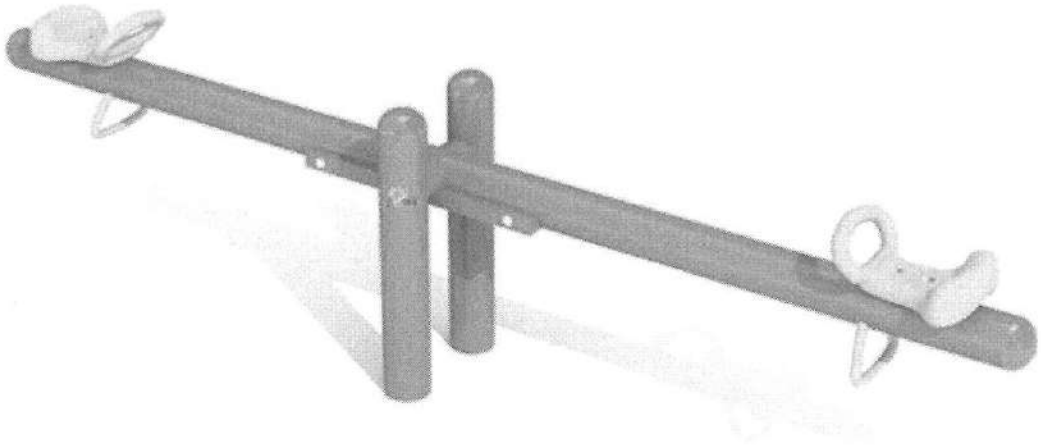
3.5.11 Steel Tubing – 2.375 inch OD, 10 ga.

Tensile strength shall be 75,000 psi. Yield strength shall be 60,000 psi.

3.5.12 Steel Tubing – 2.875 inch OD, 8 ga.

Minimum yield strength shall be 50,000 psi. with a maximum tensile strength at least 13% higher. Material ASTM Designation: A1011/A 1011/M Ola Commerical Steel CS

Type B Mn content 0.6% max. Carbon Content (0.07 to 0.11) % vs. (0.02 to 0.15) % per ASTM Specs.



3.6 **STANDARD BASKETBALL POST W/ PAINTED ALUM FAN BACK BOARD**

3.6.1 Basketball Post

Shall be an all welded assembly fabricated of 3.5 inch Outside diameter, 8 gauge galvanized steel tubing and 0.188 inch hot rolled, pickled and oiled flat steel plate. Finished with a baked on polyester powder coating or PrismCoat.

3.6.2 Basketball Fan Backboard

Shall be fabricated of 319.0-F aluminum alloy. ASTM Specifications: B-26. Federal Specifications: QQ-A-601. Tensile strength is 35 ksi. Yield strength is 25 ksi. Shall have a nominal panel thickness of 0.188 inch (5 mm). Shall have molded in reinforcing ribs and flange. Finished with a baked on polyester powder coating or PrismCoat.

3.6.3 Support Plate

Shall be fabricated of 0.25 inch (6 mm) hot rolled flat bar steel. Finished with a baked on polyester powder coating or PrismCoat.

3.6.4 Steel Tubing – 3.5 inch OD, 8 guage

Tensile strength shall be 48,000 psi. Yield strength shall be 45,000 psi.

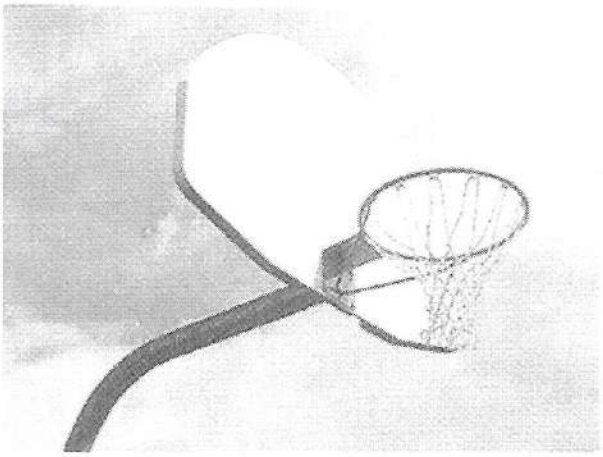
3.6.5 HEAVY DUTY BASKET BALL GOAL W/ CHAIN NET

3.6.5.1 Basketball Goal

Shall be fabricated of 0.313 inch outside diameter cold rolled steel rod and hot rolled steel plate. Finished with a baked on polyester powder coating or PrismCoat.

3.6.5.2 Net - Chain

Shall be constructed of chain.



3.7 MULTIPLAY EQUIPMENT KPS 302 D

3.7.1 Poles - 10nos.

Shall be of galvanised 100 mm dia. Nominal bore pipe of wall thickness 4.50 mm, made from mild steel then powder coated to perfection . Finished with a baked on polyester powder coating .

3.7.2 Top rail for swing – 1 no.

Shall be galvanised steel & powder coated for color protection with a baked on polyester powder coating.

3.7.3 Curved bridge, Robot Bridge and S Slide

Shall be rotationally molded from Exxon CP-812 polyethylene. Dry-blended or molded-in color resins are not acceptable.

3.7.4 Monkey Bar

Shall be fabricated with 14 guage galvanized steel tubing of 1.315 inch diameter. Shall have factory installed crimped threaded inserts at each end. Finished with a baked on polyester powder coating.

3.7.5 Stair / Ladder Handrail

Shall be an all welded assembly fabricated of 1.029 inch outside diameter, 14 guage galvanized steel tubing and 1.315 inch outside diameter, 14 gauge galvanized steel tubing. Shall be finished with a baked on polyester powder coating.

3.7.6 Stair Ladder Footing Leg

Shall be fabricated of 1.029 inch outside diameter, 14 guage galvanized steel tubing. (See Tubing) Finished with a polyester powder coating.

3.7.7 Spacer / Connector

Cast of regular 319 (319.0-F) aluminum. Ultimate tensile strength shall be 27 ksi. Yield strength shall be 18 ksi. Finished with a 420 micro finish and a baked on polyester powder coating. ASTM Specifications: B- 26. Federal Specifications: QQ-A-601.

3.7.8 Glide Slide

Shall be rotationally molded from Exxon CP-812 polyethylene. Dry-blended or molded-in color resins are not acceptable.

3.7.9 Coated Deck / Platform

Shall be an all welded assembly fabricated of 12 guage hot rolled, pickled and oiled flat steel. Deck surface and sides shall be die formed from a single sheet of 12 gauge hot rolled, pickled and oiled flat steel. Deck surface shall have .34 in. (9mm) diameter perforated holes. Entire weldment shall have a protective coating.

3.7.10 Support Post with End Cap

Shall be fabricated of 3.5 inch Outside diameter, 13 guage galvanized steel tubing. (See Tubing) Shall have a factory installed 319 type aluminum alloy end cap secured with drive rivets. Finished with a baked on polyester powder coating.

3.7.11 Steel Tubing – 1.029 inch OD, 14 guage.

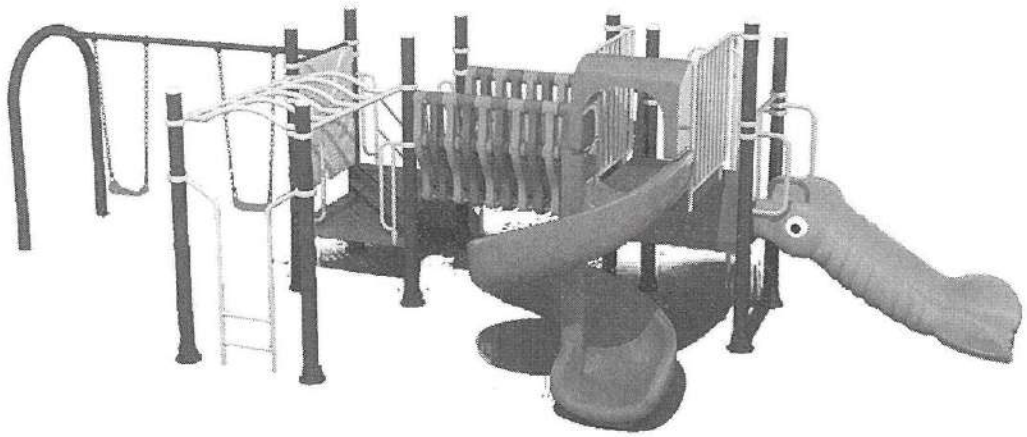
Tensile strength shall be 55,000 psi. Yield strength shall be 50,000 psi.

3.7.12 Steel Tubing – 1.315 inch OD, 14 guage.

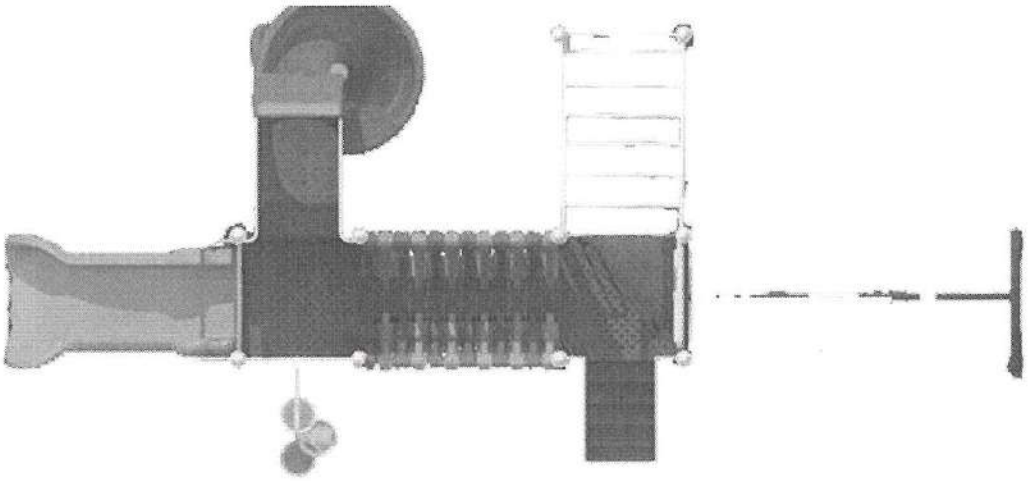
Tensile strength shall be 75,000 psi. Yield strength shall be 60,000 psi.

3.7.13 Steel Tubing – 3.5 inch OD, 14 guage.

Tensile strength shall be 55,000 psi. Yield strength shall be 50,000 psi.



ELEVATION



PLAN

LIST OF APPROVED MAKES

This section gives list of approved makes for few items. The contractor shall obtain approval of makes of all materials at time of submission of detailed design. The contractor shall submit the samples of all the materials before procurement.

1. CIVIL Works

Material / Item	Approved Make
CIVIL WORKS	
AAC Blocks	Xtralite from Ultratech, Aerocon from HIL, ECOREX, BILTECH
AAC block joining mortar	Fixoblock xtralite from Ultratech, Smartfix from Aerocon, MYK Laticrete, Ardex Endura
Acoustic Insulation (Mineral Wool)	Lloyd, Ecophone from Saint Gobain, U.P. Twiga Ltd, Rockwool India, Anuton, Knauf, Siderise
Acoustic Wooden Door	Pacific, Navair, Tesco
Acoustic Seal	Lorient, Raven, Dorma, Kelargo, Reddiplex
Acoustical Ceiling / Wall Panelling	Anutone, Ecophon - Saint Gobain, USG Boral, Armstrong,
Access panel in False ceiling	Saint Gobain, USG Boral, Knauf Denoline
Adhesive For Wood Work	Ardex Endura, Laticrete, Pidilite,
Air transfer grills	Trox, Ruskin Titus, Systemair India
Aluminium Accessories	Classic/ Argen/ Oxford/ Nulite/ Crown/ EBCO
Aluminium composite panel	Alucobond, Alstone, Alubond, Eurobond, Aludecor, Alstrong
Aluminium Sections	Hindalco, Jindal, Bhoruka, Indalco
Aluminium System Windows	Kaluco, Technal, Domal, ALCOI, Eternia from Hindalco, Alumak,
Aluminium Systems Glazing/ Curtain wall (Façade system)	Schuco, Reyners, Kawneer, Bhoruka
Aluminium D/W hardware	Alualpha, Lavaal, Giesse, Cotswold, Securistyle,
Aluminium Louvers	Hunter Douglas, Armstrong, Luxalon
Anchor Fastner, Rebar, Chemcial/ Mechanical fastner, Core - cutting, Dry stone cladding clamp, Expandable fastners	Hilti, Fischer
Anti-Termite Pesticides - (Chloropyriphos)	DE - Nocil, Bayer, Biflex-TC from FMC, Hilban from HIL
Automatic Slidding doors/ Revolving Doors	Dorma, Geze, Hafele
Acoustical Ceiling / Wall Panelling	Anutone, Ecophon - Saint Gobain, USG Boral, Armstrong, Knauf Denoline
Acoustic Wall Panel	Armstrong, Ecophon, Anutone
Access panel in False ceiling	Saint Gobain, USG Boral, Knauf Denoline, Anutone
Adhesive For Wood Work	Ardex Endura, Laticrete, Pidilite,
Aluminium Sections	Hindalco, Jindal, Bhoruka, Indalco, Global
Aluminium System Windows	Kaluco, Technal, Domal, ALCOI, Eternia from Hindalco, Alumak,
Aluminium Systems Glazing/ Curtain wall (Façade system)	Schuco, Reyners, Bhoruka or approved equivalent
Auditorium Chairs	KI Seating, Acoustika
Acoustical Doors	Signum, Hillpoint, Stairway Studio.
Backer Road	Supreme, Fosroc

Material / Item	Approved Make
Calcium Silicate Board	Hilux, Aerolite, Pamtech, Promatech
Cement OPC/ PPC	Ultratech, ACC, Lafarge, Bharathi, Zuari.
Cement - White	Birla, JK
Cement Fiber Board	Everest, NCL Industries (Bison Panel), Shera Board, Visaka Industries (V- Next), Century (Zykron),
Chemical Admixtures & Additives	BASF, Pidilite, Sika, Fosroc, Ecmas, Sunanda Chemicals, Mapei, Hycrete, Bal-Endura, MC Bauchemie, MYK Schomburg,
Children Play Area	Koochie or Eqivallent
Commercial ply & Board	Greenply, Archidply, Century, Duroply, Uniply, Kitply, National
Crystalline Integral Waterproofing	Kryton, Penetron, Pidilite, BASF, Fosroc, Sika, Xypex
Ceramic Fritting on Glass	Art & Glass, GSC Glass, Ashai
Cement Concrete Jali	Amusement Concrete Jali, Birla or approved equivalent
Concrete Cover Blocks	Astra, Ramtec or approved equivalent. For exposed concrete only pointed type shall be approved
Ceramic Tiles	Kajaria, RAK, Restile, Somany, Jhonson, Asian
Ceramic Tiles	Kajaria, RAK, Restile, Jhonson, Asian
Compact laminated sheet	Greenlam, Marino
Cement Concrete Jali	Amusement Concrete Jal, Birla or approved equivalent
Concrete Cover Blocks	Astra, Ramtec or approved equivalent. For exposed concrete only pointed type shall be approved
Ceiling Wall Panel	Armstrong, Ecophon, Anutone
Colour Coated Galvalume Standing Seam Roofing	Agrima Roof & Façade systems, Maxroof , Optima India
Door Closer	Dorma (XLC), Hafele, Yale, Geze
Door Locks, Access Control Lock	Dorma (XLC), Geze, Kich, Hafele, Assa Abloy (Yale)
Door Hardware (other than Floor spring, Closer, Locks)	Dorma (XLC), Kich, Hafele, Assa Abloy (Yale),
Door Seal – Wool pile Weather Strip	Reddiplex, Osaka rubber, Enviro Sealz, Anand
Double Side Tape, Decorative Tape	3M
Door Hardware (other than Floor spring, Closer, Locks)	Dorma (XLC), Kich, Hafele, Assa Abloy (Yale), Dorset,
EPDM Gaskets	Anand, Osaka Rubber, Roop, Bohra, Hanu, Maharashtra polymer
Epoxy Grout/ Cementitious Grout for Flooring	Ardexl Endura, MYK Latricrete, Kerakoll, Pidilite
External Paving Tiles (Cement based)	Pavit, Basant baton, Vyara, Ultra, Eurocon, Super
Expansion Joint System	3R, Kantaflex, sandfield, Deevin, Vexcolt
Expansion Filler board - Premoulded compressible	Supreme (Capcell HD100), Shalitex -STP
Fabric (Acoustic and fire rated)	Atmosphere, Palette, D'décor Fabric,Response fabric
Fire Doors	Shakti Horman, Pacific, Navier, iCLEAN - IHMS,

Material / Item	Approved Make
Fire Rated Hardware	Dorma, Hafele, Geze, Horman, Assa Abloy (Yale)
Fire Seal, Fire smoke Seal	3M, Hilti, Dorma, Sealz, Lorient, Kelargo, Raven
Fire rated Glass	Vetrotech Saint-Gobain, Pyroguard, Glaverbel, Schott - Pyran, Pyroswiss
Fire rated Glass fixing gasket, tape	Karfani, 3M
Floor Springs	Dorma (XLC), GEZE, Haffle, Assa Abloy (Yale)
Floor hardening compound	JBA, Ardex endura, Fosroc, Basf, Sika, Sunanda chemicals
Flush Door Shutter (Factory pressed laminated)	Century, Greenply, Duroply, Kitply, Uniply, Anchor
Furniture Hardware	Hettich, Hafele
Fabric (Acoustic and fire rated)	Atmosphere, Palette, D'décor Fabric, Response fabric
Fly ash for SCC : Manuguru	HWP and for other work : NTPC Ramagundam
Floor Drain	Neer, ACO, GMGR
GRC JALI	Birla GRC, MS Engineers, Ionex engineering co
Glass, Tinted Glass, High Performance Glass, Reflective Glass	Saint Gobain, Asahi, Pilkington
Glass Processing	FG, Fuso, Asahi,
Glass, Tinted Glass, High Performance Glass, Reflective Glass	Saint Gobain, Modiguard (Gujarat Guardian), Pilkington, Asahi
Glass Processing	FG, Fuso, Asahi, Saint Gobain
Glass Doors (Motorised systems / sliding system)	DORMA, Haffle,
Glass Doors (Motorised sytems/sliding system)	DORMA, Haffle
Glass Fibre Acoustical Tiles	ECOPHON, Armstrong, Anutone, AMF
Glass mosaic tiles	Italia, Bissazza, Scisis, Palidio
Grab Bars and Disabled Hardware	Cera, Jaquar, Hindware, Dorma
Gypsum plaster	Stain Gobain, Perma board or approved equivalent,
Grab Bars and Disabled Hardware	Cera, Jaquar, Hindware, Dorma
Gypsum ceiling board	Saint Gobain, Knauf, USG Boral
Gypsum plaster	Stain Gobain, Perma board approved equivalent
Glass	Saint Gobain, Modifloat, Pilkington
GI channels	Gypsteel, Anutone, Hillpoint Diamond Frames.
Honey Comb Panels	Sarey approved equivalent
Honey Comb Panels	Honeycomb India Pvt Ltd, Sarey or approved equivalent
Heavy duty Vitrified Tile 16mm	Somany , Johnson , Nitco
Laminates	Marino, Century, Greenlam, Formica, Sunmica,
Laminated Shuttering Ply	Green Ply , Century Ply, Archidply
Laminated wooden slats	Hillpoint, Anutone, Topakustik Tranquil
Masking Tapes	3M, Sun Control, Wonder Polymer. Essentra
Metal Ceilings	Luxalon, Armstrong, Hunter Douglas, Saint Gobain
Metal Doors (Non Fire rated)	Shakti Horman, Naviar, Ahlada, Metaflex, Pacific

Material / Item	Approved Make
Mineral Fibre Grid Ceilings	Armstrong, Saint Gobain (Ecophon), Anutone, USG Boral, Knauf, AMF
Mirrors	Saint Gobain, Modi Guard (Gujarat Guardian), Asahi, HNG, Pilkington
Modular Toilet Cubical - Compact laminate	Merino, Greenlam, Stylam
Metal Ceilings	Luxalon, Armstrong, Saint Gobain, Hunter Douglas, Dexune, USG Boral
Mineral Fibre Grid Ceilings	Armstrong, Saint Gobain (Ecophon), Anutone, USG Boral, Knauf, AMF, Dexune
MS Expanded metel mesh (Powder Coated)	Tata, Asian Streck Metal
Non shrink cementious precision (anchoring) grout	Fosroc, Sika, Ardex Endura, BASF
Patch Fitting	Dorma (XLC), Haffle, Geze, Hettich
PAINT - Cement Based	ICI Dulux, Berger Paints, Asian, Nerolac
Paint - Acrylic, Synthetic Enamel, Acrylic emulsion- interior and exterior	Asian Paints, Akzo Nobel (Dulux), Berger, Nerolac, Jotun
Polished Concrete Flooring	JBA, Impact flooring approved equivalent
Paint - Texture Paints (Interior, Exterior)	Asian, Jotun, ICI Dulux, Berger, Nippon
Paint - Anti microbial paint	Asian, Berger, Jotun
Paint - Fire Retardant paint	Jotun, Akzo Nobel, Viper-Nullifire, Asian
Paint - High Albedo paint/ Solar reflective paint	BASF, Jotun, Sika, Fosroc, Pidilite, Ecmas
Paint - Oil Bound Distemper & Dry Distemper	Asian Paints, AkzoNobel (ICI Dulux), Berger
Paint - PU paint, epoxy paint and	Asian, Nippon, ICI, Berger, Jotun, Nippon
Parapet Drain	Neer, Chilly,Camry
Polycarbonate Sheets & Panel system	Tuflite, Gallina India, Dan Pal (Dpi daylighting)
Polish for wooden work	MRF, Asian
Polysulphide Sealant	Fosroc, Dow corning, Sika, MC-bauchemie
Polyurethane Concrete Flooring, Epoxy flooring, Self Levelling compound	BASF, Fosroc, Ardex Endura, MYK Schomburg, Sika,
Polyurethane overdeck insulation foam	BASF, Pidilite, Ecmas, Lloyd Insulations
Polyster Powder coating/ PVDF	Jotun, Akzo nobel (Interpon), Valspar, Asian PPG
Precast panels for Façade	Fuji -Silvertech, Elematic, Preca
Precast concrete tiles, Interlocking Paving, Brick paver, Grass/ Grid	Vyara, Basant betons, Super Decorative floorings, Ultra Tiles, Unistone, Nimco
Pre cast Concrete Landscape elements, gratings, kerb, Drain cover	Vyara, Basant betons, Super decorative floorings, KK Manholes & Gratings, Nimco
Precoated Galvanised Sheets	Tata-Blue scope, Jindal, Everest, Interarch
PT strands	DP Wires, Tata, Usha Martin
PVB/ SGP Laminate Film, Sentry film	Dupont, Saflex, Eastman , Saint Gobain, XDS

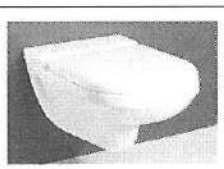
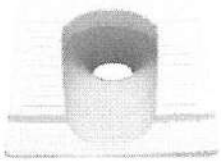
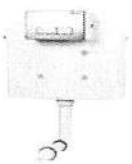
Material / Item	Approved Make
PVC continuous fillet for periphery Packing of Glazings/ Curtain Wall	Roop, Anand, Forex Plastic or approved equivalent
PVC trims	Sanjay Polymer, Tubes & Tubings
Patch Fitting	Dorma (XLC), Haffle, Geze, Hettich, Kinlong
PAINT - Cement Based	ICI Dulux, Berger Paints, Asian, Nerolac
Paint - Texture Paints (Interior, Exterior)	Asian, Jotun, ICI Dulux, Berger, Nippon
Paint - Oil Bound Distemper & Dry Distemper	Asian Paints, AkzoNobel (ICI Dulux), Berger,
Polycarbonate Sheets & Panel system	Tuflite, Gallina India, Dan Pal (Dpi daylighting),
Polysulphide Sealant	Fosroc, Dow corning, Sika, MC-bauchemie
Polyurethane Concrete Flooring, Epoxy flooring, Self Levelling compound	BASF, Fosroc, Ardex Endura, MYK Schomburg, Sika,
Precast concrete tiles, Interlocking Paving, Brick paver, Grass/ Grid Pavers	Vyara, Basant betons, Super Decorative floorings, Ultra Tiles, Unistone, Nimco
Pre cast Concrete Landscape elements, gratings, kerb, Drain cover	Vyara, Basant betons, Super Decorative floorings, KK Manholes & Gratings, Nimco
Plain gypsum plaster board	Gyproc, USG Boral, Knauf Gypsum.
Perforated gypsum plaster board	Gyproc, Knauf Danoline, Anutone
Perforated veneered wooden panels	Hillpoint , Anutone , Topakustik
Polyester wool	Anutone, Hillpoint, Prominent Insulations
Reinforcement Steel: Main Producers	SAIL, TATA (TISCO), RINL, JINDAL
Rock wool Insulation	UP Twiga, Rockwool India, Lloyd, Ecophone, Knauf,
Retro Plate System (Concrete Floor Precessing)	JBA, Impact flooring or approved equivalent
Reinforcement Steel	SAIL, TATA (TISCO), RINL, JINDAL
Signage vinyl sticker	Claude Neon, Prolite 3M
Silicon Gaskets	Sree Gaurav, Roop
Silicone Sealant	Wacker, Dow Corning, GE momentive, MC-bauchemie, Pidilite
Spider Fittings/ WCP profiles	Dorma, Hefele, Hettich, Dline, Geze
Stainless Steel	SAIL, Jindal, Salem steel
Stainless Steel Bolts, Washers and Nuts, Pressure plates, screws	Kundan, Puja, Atu, GKW, knettlefoldl
Stainless Steel Friction Stay	Giesse, Securistyle, Cotswold, Hefele
Structural Silicon sealant, Weather Silicone	Dow Corning, Momentive (GE)
Structure Steel & Hallow Section Producers only	SAIL, TATA (TISCO), RINL, Jindal steel & Power (JSPL) or approved equivalent for non-structural work
Suspended ceiling system	Armstrong, Saint Gobain, USG Boral, Knauf, Anuton
Swimming pool tile (FINA approved)	Johnson Endura or approved equivalent
Stainless Steel	SAIL, Jindal, Salem steel
Soft fibre tile with T grids	Anutone, Hillpoint, AMF, Armstrong, Ecophon
Tandur stone	Bhikshu Granimart LLP, Arihant Marbles, Natural Marble, Patel granite and marbles
Tensile Fabric Roofing	Ferrari, Saint Gobain, Melher
Tactile Guiding & Warning flooring	Johnson, Pelican ceramics, Maiara technologies

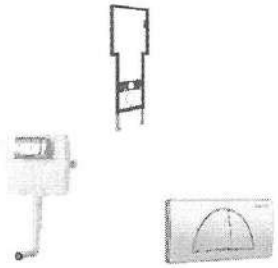
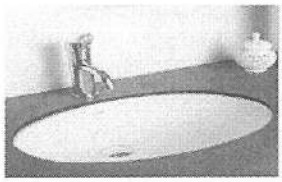
Material / Item	Approved Make
Tensile Fabric Roofing	Ferrari, Saint Gobain, Mehler,
Tiles/ Stone Adhesive	Pidilite, MYK- Latricrete, Ardex Endura, KeraKoll, Ultratech
Veneer - Natural	GreenLam, Century, Kitply
Vitrified Tiles	Kajaria, RAK, Restile, Somany, Jhonson, Asian or approved equivalent
Veneered plywood	Hillpoint, Greenply, Anchorply
Veneered wooden slats	Hillpoint , Anutone, Topakustik Tranquil
White cement based putty	Birla, JK
Water Proofing compound	Fosroc, Sika, BASF,
Water proofing membrane/ coating (PU/ Elastomeric cementitious coating)	SIKA, BASF, Fosroc, Pidilite, Sunanda Chemicals, MYK Schomburg
Water Stops - Hydrophilic Swellable rubber strip	Sika, BASF, Fosroc, Hydrotile, Penetron
Wood Wool board	Anutone, Armstrong, AMF, Himalaya Acoustic
Wooden Ceilings/ Wall panelling	Anutone, Armstrong
Wooden flooring - Engineered	Armstrong, Pergo, Mikasa, Junkers, Haro, Tarkett,
Wool Pile with Silent Film	Schlegel or approved equivalent
White cement based putty	Birla, JK,
Water Proofing compound	Fosroc, Sika, BASF,
Water proofing membrane/ coating (Poly urethane/ Poly Urea/ Elastomeric cementitious coating)	SIKA, BASF, Fosroc, Pidilite, Sunanda Chemicals, MYK Schomburg
Water Stops - Hydrophilic Swellable rubber strip	Sika, BASF, Fosroc, Hydrotile, Penetron
Wired Glass	From Locally approved glass manufacturer
KITCHEN EQUIPMENTS	
Paper Roll Holder (Wall Mounted Stand)	KIMBERLY CLARKE, EURONICS INDUSTRIES
Soap Dispenser	KIMBERLY CLARKE, EURONICS INDUSTRIES
Sink Cock	Jaquare, Hindware, Cera
Weighing Scale (Floor Model)	ACZET PRIVATE LIMITED, WENSAR SCALES, PFB
WALK IN CHILLER	CELFROST, BLUE STAR
Sink Unit	Nirali, Jayna, Hindware, Dimond or CUSTOM FABRICATED
PLUMBING WORKS	
Sanitary Ware, CP Fittings & Washroom Accessories	
Vitreous China Sanitary ware	
European Water Closet (Type 1/ 2)	Hindware / TOTO / Kohler / Parry ware / Cera
European Water Closet (Type 3)	Cera / TOTO / Kohler
Indian Water Closet (Orissa Pan)	Cera / TOTO / Kohler
Concealed Cisterns	
Concealed Cistern – Type 1	Hindware / TOTO / Kohler
Concealed Cistern – Type 2	Cera / TOTO / Kohler
Wash Basin	

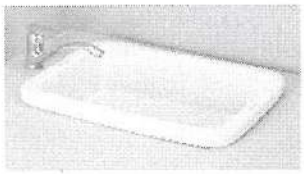
Material / Item	Approved Make
Under Counter White Vitreous China Wash Basin – Type 1	Hindware / TOTO / Kohler
Under Counter White Vitreous China Wash Basin – Type 2	Cera / TOTO / Kohler
Laboratory Sink	
White Vitreous China Laboratory	Cera / TOTO / Kohler
Divyang Toilet Set	
Divyang Toilet Set – Type 1	Hindware / TOTO / Kohler
Divyang Toilet Set – Type 2	Cera / TOTO / Kohler
White Enamelled Acrylic Bath Tub	Hindware – Tiffany / TOTO / Kohler
Urinals	
White Vitreous China Urinal – Type	Hindware / TOTO / Kohler
White Vitreous China Urinal – Type	Cera / TOTO / Kohler
Ceramic Soap Dish	
White Vitreous China Recessed Type Ceramic Soap Dish	Cera / Parryware
C.P. Brass Faucets & Fittings	
C.P. Brass Faucets	Jaquar / Hindware / Kohler
C.P. Brass Fittings	Jaquar / Hindware / Kohler
Wash room accessories	Jaquar / Euronics / Kohler
Stainless Steel Ware, Fittings & Accessories	
Stainless Steel Sink	Nirali / Neelkanth / Futura
Stainless Steel Shower Seat	Euronics / Jaquar
Emergency Eye Wash & Shower	Udyogi / Vijay / Prajesh Impex
S.S. Floor Drain Grating Cover	Chilly / Neer / Futura/Camary
Internal Drainage Pipes & Fittings	
UPVC SWR Pipes & Fittings	Astral / Supreme / Ashirvad
(Ring Fit & Self Fit)	
P.P. Pipes & Fittings	Astral Silencio / Huliot / Poloplast / Rehau
Brass Floor Clean Out	Chilly / Camry / Neer
Air Admittance Valve	Ashirvad / Astral / Supreme
G.I. Perforated Strip	NECO / Kapilansh / Saint Gobain
G.I. Rubber Coated U-Clamps	Ashirvad / Astral / Supreme
G.I. Rubber Coated O-Clamps	Astral / Chilly / Intellotech
G.I. Threaded Rods	Hitech / Tata
C.I. Parapet Drain	Neer/GMGR/ACO
Water Supply Pipes & Fittings	
CPVC Water Supply Pipes	Astral / Supreme / Ashirvad
G.I. Pipes	Tata / Zenith / Jindal
HDPE Pipes	Jain Irrigation / Supreme / Oriplast / Nagarjuna
D.I. Pipes	Neco / Welspun
Pipe Insulation	Armaflex / Thermaflex
CPVC Ball Valve	Ashirvad / Astral / Supreme
Pressure Reducing Valves	Zoloto / Sant / Varie
Gun Metal Ball Valve	Zoloto / Sant / Leader

Material / Item	Approved Make
Gun Metal Wheel Operated Sluice Valve	Zoloto / Sant/ Leader
Gun Metal Gate Valve	Zoloto / Sant/ Leader
Gun Metal Butterfly Valve	Zoloto / Sant / Leader
Gun Metal Non-Return Valve	Zoloto / Sant/ Leader
Electrically Operated Actuator Valves	Zoloto / Sant / Equivalent
Cast Iron Y Strainer	Zoloto / Sant/ Leader
Electronic Water Meter	Krohne / Dwyer
Air Release Valve	Zoloto / Sant/ Leader
Pressure Gauge	Zoloto / Sant / Equivalent
Water Level Sensor / Indicator	Honeywell / Wika / Seimens
Pipe Clamps and Support	Intellotech / Fischer / Hitech / Hilti
Water Tank Air Vent with Mosquito Net	

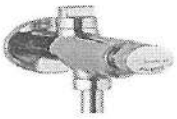
LIST OF SANITARY WARES & CP FITTINGS

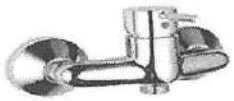
1	Providing and Fixing vitreous china extended wall mount water closet (EWC) as per IS: 2556 (Part 2) of minimum size 600 x 360 x 400mm (P Type) including heavy duty seat and cover as per IS: 2548 of approved make and quality, and as approved by Engineer in Charge, including all necessary fittings and accessories, complete. (II) **Type 2**	Hindware	Crystal - 20047	
2	Providing and Fixing vitreous china wall mount water closet (EWC) as per IS: 2556 (Part 2) of minumum size 500 x 360 x 350 mm (P Type) including heavy duty seat and cover as per IS: 2548 of approved make and quality, and as approved by Engineer in Charge, and including all fittings and accessories, complete. (III) **Type 3**	CERA	CARAT	
3	Providing and fixing white vitrious China water closet squatting pan (Indian type W.C. pan) of minimum size 580 x440 mm of approved make and quality with integral foot rests setting in cement concrete 1:2:4 mix (1 cement: 2 coarse sand : 4 stone agrregate 20 mm nominal size), including providing and fixing of 100 mm ceramic deep seal/ sand cast Iron P or S trap, with all necessary fittings & accessories & associated civil work with cutting and making good the wall & floors wherever required and as approved by Engineer in Charge.	CERA	CALINA S3010102 580 x 440	
4	Providing, fixing, testing & commissioning of Concealed cistern with dual flush 3/6 ltr with wall flush plate of approved make including angle valve and push fit flexible hose complete	Hindware	Concealo 80	

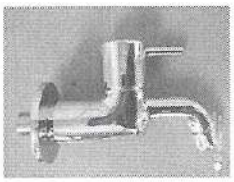
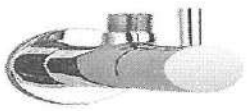
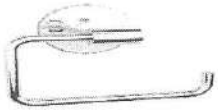
	including cutting and making good the walls where required complete as directed by Engineer in Charge. (I) **Type 1**			
5	Providing, fixing, testing & commissioning of Concealed cistern with dual flush 3/6 ltr with frame with wall flush plate of approved make including angle valve and push fit flexible hose complete including cutting and making good the walls where required complete as directed by Engineer in Charge. (II) **Type 2**	CERA	Chevron B11101 Frame B1130101 Flush Plate SHINE B1120102	
6	Providing and Fixing Vitreous China Under Counter Wash Basin as per IS: 2556 (Part 4) of minimum size 560 x 450mm, in white colour of approved make and quality. All junctions shall be sealed with silicon sealant. Rate shall include CI bracket,32 mm dia CP brass waste coupling, 32 mm dia CP cast brass bottle trap, union & extension piece of required length and CP wall flange complete including cutting & making good the walls where required and as directed by the Engineer in Charge. (I) Type 1	Hindware	Zen-10049	
7	Providing and Fixing Vitreous China Basin as per IS: 2556 (Part 4) of minimum size 640 x 450mm, in white colour of approved make and quality. All junctions shall be sealed with silicon sealant. Rate shall include CI bracket, 32 mm dia CP brass waste coupling, 32 mm dia CP cast brass bottle trap, union & extension piece of required length and CP wall flange complete including cutting & making good the walls where required and as directed by the Engineer in Charge. (I) Type 2.	CERA	Concord (without half pedestal)	

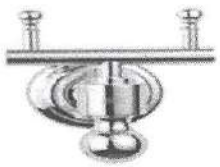
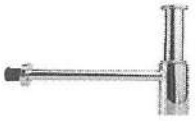
8	Providing and fixing wash basin with C.I. brackets, 15mm C.P. brass pillar taps, 32mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever required: White Vitreous China Wash Basin size 630x450 mm with a single 15mm C.P. brass pillar tap as directed by the Engineer in Charge	CERA	S2040104 (CORNET)	
9	Providing and fixing white vitreous china pedestal for wash basin (approved make) completely recessed at the back for the reception of pipes and fittings.	CERA	S2090101	
10	Providing and fixing white vitreous china laboratory sink of size 600x450x200 mm with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good the wall wherever required as directed by Engineer Engineer in Chagre.	CERA	S6010102 (CATER)	

11	Providing & fixing Divyang toilet set with European Closet (P Trap) & wall mount wash basin & all divyang requirements with dual flush tank, seat & lead (heavy duty) including C.I. Brackets, C.P. brass hinges, M.S. / C.I. painted brackets, 32mm CP waste Coupling, 32mm size CP bottle trap, CP brass Spatula Faucet, etc. all Internal fittings complete with one no Hinged rail, 4 numbers of S.S grab rails etc. rubber buffers, C.P nuts, bolts etc making holes in walls & floors, & finishing for ready to use.The rate includes all necessary connection charges as per product detail to the satisfaction and as directed by the Engineer. (I) Type 1. All materials specified above shall form part of the Divyang toilet set and shall be from Divyang range of approved make.	Hindware	Matrix – 70002	
12	Providing & fixing Divyang toilet set with European Closet (P Trap) & wall mount wash basin & all divyang requirements with dual flush tank, seat & lead (heavy duty) including C.I. Brackets, C.P. brass hinges, M.S. / C.I. painted brackets, 32mm CP waste Coupling, 32mm size CP bottle trap, CP brass Spatula Faucet, etc. all Internal fittings complete with one no Hinged rail, 4 numbers of S.S grab rails etc. rubber buffers, C.P nuts, bolts etc making holes in walls & floors, & finishing for ready to use.The rate includes all necessary connection charges as per product detail to the satisfaction and as directed by the Engineer. (II) Type 2.All materials specified above shall form part of the Divyang toilet set and shall be from Divyang range of approved make.	CERA	CRUSE SET	

13	Providing and fixing white vitreous china urinal of minimum size 280 x 345 x 690 mm, including CP Pressmatic Flush Valve, 15mm dia SS connection pipe, CP brass waste grating, CP Bottle trap with extension piece, wall flanges complete with all fittings & accessories complete including cutting and making good the walls where required as per specifications and directions of Engineer in Chagre. (I) **Type 1**	Hindware	Rhine-96008	
14	Providing and fixing white vitreous china urinal of minimum size 265 x 335 x 695 mm, including CP Pressmatic Flush Valve, 15mm dia SS connection pipe, CP brass waste with dome type grating, CP Bottle trap with extension piece, wall flanges complete with all fittings & accessories complete including cutting and making good the walls where required as per specifications and directions of Engineer in Chagre. (II) **Type 2**	CERA	CARAVAN S 4020105	
15	Pressmatic flush valve	Jaquar	PRS-077G	
16	Providing and fixing recessed type ceramic soap dish (Size - 150 X 150 mm), including chasing in the wall, setting the soap dish in white cement in the location and at levels as directed by the Engineer in Chagre.	CERA	S9010108	
17	Providing and Fixing 15 mm dia. CP brass two way bib cock with wall flange and ceramic disc cartridge complete, making all necessary connections etc. All complete as per directions of the Engineer in Chagre.	Jaquar	FLR-5041NG	

18	CP Brass Single lever telephonic wall mixer	Jaquar	Jaquar– Model- Florentine - No.- FLR-5149	
19	Providing and Fixing in position CP brass Pressmatic Pillar cock including 450mm long braided hose of approved make and quality, and as approved and directed by the Engineer in Chagre, including all necessary materials required for fixing.	Jaquar	PRS-031G	
20	Providing and Fixing in position CP brass Sink cock quarter turn, with extended swinging spout (table mounted) including 450mm long braided hose of approved make and quality, and as approved and directed by the Engineer in Chagre, including all necessary materials required for fixing.	Jaquar	FLR-5357 ND	
21	Providing and fixing of 15 mm dia CP Brass Sink cock with Swinging casted spout (wall mounted model) with ceramic disc cartridge of approved make and quality, conforming to IS standards, including the flange & extention nipples and all materials required for fixing etc.all Complete and as approved and directed by Engineer.	Jaquar	FLR-5347NGE	
22	Providing & fixing C.P. Bath Spout with washer conforming to Manufacturers Standards. Work to be completed as per of approved Quality and as directed by the Engineer.	Jaquar	FLR-SPJ-CHR-5429G	

23	Providing and fixing C.P. Brass Over Head Shower rose with 15 or 20mm inlet of approved make and quality, and as approved by the Engineer. I) Type 1	Jaquar	OHS-CHR-35495GA	
24	Providing and fixing C.P. brass Shower arm for overhead shower of approved make and quality, and as approved by the Engineer, and conforming to Manufacturers Standards. I) Type 1	Jaquar	SHA-CHR-479L600	
25	Providing and Fixing 15mm C.P brass bib cock complete, including cutting and making good the walls wherever required.15mm nominal bore (Short Body)	Jaquar	FLR-5047NGE	
26	Providing and fixing of 15mm nominal bore CP Brass Angle valve confirming to IS: 8931, for wash basins, water coolers, geyser points, etc of approved quality and as approved by and directed by the Engineer. 15mm nominal bore	Jaquar	FLR-CHR-5053N	
27	Providing and fixing ABS Chrome plated Brass Hand Shower (Health Faucet) of approved make and quality and as approved by Engineer - In - Charge, including 8 mm dia, 1 to 1.5 Meter long Flexible tube & wall hook including cutting and making good the walls wherever required complete as per directions of the Engineer.	Jaquar	ALD-573GA	
28	Providing and fixing CP toilet paper holder.	Jaquar	ACN - CHR - 1151N	

29	Providing and fixing S.S. Double coat hook of approved make, fixed to PVC cleats with C.P. brass screws etc.all complete as per directions of the Engineer.	Jaquar	Queens AQN-7761	
30	Providing and Fixing SS Towel Ring of approved make and quality, and as approved by the Engineer, including all necessary materials required for fixing. All complete as per directions of the Engineer.	Jaquar	AQN-7721	
31	Providing and fixing S.S. towel rail of size 600mm long of approved make and quality, and as approved by the Engineer, fixed with wooden cleats with CP brass Screws etc all complete as per directions of the Engineer.	Jaquar	ACN-1181FN	
32	Providing and Fixing Chrome plated brass Liquid Soap Dispenser of approved make and quality, and as approved by the Engineer, including all necessary materials required for fixing. All complete as per directions of the Engineer in Charge.	Jaquar	CAN-1137N	
	ANCILLARY ITEMS			
1	32 mm dia CP brass waste coupling for wash basin	Jaquar	ALD-CHR-705	
2	32 mm dia CP brass bottle trap for wash basins	Jaquar	ALD-CHR-769L300X190	
3	CP Pressmatic Flush Valve for urinal	Jaquar	PRS-CHR-077G	

LIST OF PLANT AND EQUIPMENTS

REQUIREMENTS OF PLANT AND EQUIPMENT AT SITE & FACTORY

Sl. No.	Equipment	Numbers
1.	Concrete batching plant of minimum capacity 30 cum per Hour or 60 cum per Hour at Factory	1
2.	Concrete batching plant of minimum capacity 18 cum per Hour at site	1
3	Boom Placer	1
3	Transmit Mixers either 6 or 7 cum	2
2.	Top Slewing Tower Carnes with Maximum Capacity of 16 Ton or as per the Maximum Tip capacity required to erect the gable end panels and as per Directions of Engineer In-charge	8
3.	Double Girder Gantry Cranes of 10 Ton Capacity or as per the actual site requirement as per the directions of Engineer In-charge	3
4.	Double Girder EOT Cranes of 10 Ton Capacity or as per the actual site requirement as per the directions of Engineer In-charge	3
5.	Excavator cum loader (JCB 3D model or equivalent).	3
6.	DG set of minimum capacity 62.5 KVA.	3
7.	Pan Mixer for Grout Preparation	10
8.	Needle Vibrators.	5
9.	Screed leveler.	3
10.	Plate Vibrator	3
11.	Dumper/Tipper	3
12.	Reinforcement cutting machine.	3
13.	Power driven earth rammer (Soil compactor).	3
14.	Total station.	9
15.	Auto Level	9
16.	Water tanker (Minimum capacity of 5000 liters)	2
17.	Welding machine 400 Ampere	3

18.	Screener for coarse sand and fine sand	4
19.	Centrifugal mono block water pump minimum capacity2 HP	9
20.	Road roller 8 to 10 tonnes	1
21.	Vibratory roller	1
22.	Drilling machine	5 Nos.
23.	Shuttering with necessary props	As per requirement
24.	Double steel scaffolding and staging materials	As per requirement
25.	Air compressor	3 Nos.
26.	Floor grinding/polishing machines	9 Nos.
27.	Granite cutting machine	9 Nos.
28.	Ceramic tile cutting machine	10 Nos.
29.	Granite polishing machine	9 Nos.
30.	Mobile crane	As per requirement
31.	Lap Top Computers (All in one)	6 Nos.
32.	Vacuum dewatering machine for concrete	3 Nos
33.	Vehicles with driver for movement of engineersfrom one building to other for supervision, coordination with various agencies and delivery of samples for Third Party Labs	4 seater Executive Vehicle – 3 numbers
34.	Smart Phones (with Data Pack) for communication andinstant photos	As per Actual Requirement
35.	Good quality Camera for taking photographs and video recording of major activities for record purpose and for quality assurance.	2 Nos.
36.	Any other machinery required for completion of the work as per decision of Engineer-in-charge.	As per Actual Requirement

Note: 1. The above list is only indicative and not exhaustive. The Bidder may berequired to deploy more T&P as per requirement of work.

2. All the above plants & equipments are to be deployed as and whenrequired or directed by Engineer-in-Charge.

LIST OF ESTABLISHING SITE/ PRECAST CASTING YARD LABORATORY (FACTORY) AND TESTING OF MATERIALS

Equipment for conducting necessary tests (as per CPWD Specifications 2019 Volume-I) shall be provided and installed at site / at precast fabrication yard in the well-furnished field laboratory by the agency at his own cost. The following laboratory equipment should be in general o r as and when required be set up at site laboratory: -

Sl. No.	Equipment	Numbers
1.	100MT compression testing machine, electrical-cum- manually operated)	1
2.	Slump cone, steel plate, tamping rod, steel scale, scoop	5
3.	Vicat Apparatus with Desk pot	1
4.	Megger & earth resistance tester	1
5.	Pumps and pressure gauges for hydraulic testing of pressure	2
6.	Weighing scale platform type 100 Kg	2
7.	Graduated glass measuring cylinder of various capacity	As per requirement
8.	Sets of sieves of 450mm internal dia for coarse aggregate [100mm, 80mm, 40mm, 2mm, 12.5mm]	3 sets
9.	Sets of sieves of 200mm internal dia for fine aggregate [4.75mm; 2.36mm; 1.18mm; 600microns; 300 microns & 150 micron, with lid and pan]	3 sets
10.	Sieve Brushes and sieve shaker capable of 200mm and 300mm dia sieves, manually operated with timing switch assembly	1
11.	Cube moulds size 150mmx150mmx150mm	50
12.	Ultrasonic Test Equipment (For concrete)	1
13.	Hot air oven temp. Range 50°C to 300°C-sensitivity 1 degree	1
14.	Electronic balance 600gx0.1g., 10kg and 50 kg	1each
15.	Physical balance weight up to 5 kg	1
16.	Digital thermometer up to 150oc	2
17.	Measuring jars 100ml, 20ml, 500ml	5 Nos each
18.	Gauging trowels 100mm & 20mm with wooden	3
19.	Spatula 100mm & 20mm with long blade wooden	3
20.	Vernier calipers 12" & 6" size	2 each
21.	Digital PH meter least count 0.01mm	2 each
22.	Digital Micrometer least count. 0.01mm	1 each
23.	Digital paint thickness meter for steel 500 microns	1
24.	GI tray 600x450x50mm, 450x300x40mm,	3 Nos each
25.	Electric Motor mixer 0.25 cum capacity	1
26.	Rebound hammer test digital rebound hammer	2
27.	Screw gauge 0.1mm-10mm, least count 0.05	2
28.	Water testing kit	1
29.	Motorized sieve shaker	1
30.	Pruning Rods 2 Kg weight length 40 cm and ramming face 25 mm2	1
31.	Extra Bottom plates for 15 cm cube mould	10

32.	Dial type spring balance preferable with zero correction knob capacity 100 kgs. Reading to ½ kg.	1
33.	Iron Weight of 5 kg, 2 kg, 1 kg, 500 gm, 20 gm, 100 gm	1 set
34.	Brass Weight of 50 gm, 2 gm, 10 gm, 5 gm, 2 gm, 1 gm	As per requirement
35.	Measuring cylinder TPX or Poly propylene capacity 100 ml, 500 ml, 250 ml, 100 ml	As per requirement
36.	Pyrex, corning or Borosil beakers with cover capacity 500 ml, 20 ml, 50 ml	As per requirement
37.	Wash Bottles capacity 500 ml	As per
38.	Hammer 1lb& 2lb	1 each
39.	Distance metre (of 100 metre)	5
40.	Hacksaw with 6 blades	5
41.	Measuring tape (5 metre)	10
42.	Shovels & Spade	10
43.	Steel plates 5 mm thick 75x75 cm	As per requirement
44.	Plastic or G.I. Buckets 15 ltr, 10 ltr, 5 ltr	As per requirement
45.	Wheel Barrow	As per requirement
46.	Floor Brushes, hair dusters, scrappers, wire brush, paint brushes, shutter steel plat oil, kerosene with stove etc.	As per requirement
47.	Any other equipment for site tests as outlined in BIS codes and as directed by the Engineer-in-charge.	As per requirement
48.	Concrete Core cutter Machine	1
49	Proctor Compaction and Density Equipment	1
50	Field Density Test Apparatus by Sand Replacement	1
51	Wet Film Thickness Gauge (Elcometer make or equipment)	5

Note: 1. The above list is only indicative and not exhaustive. The Bidder may berequired to deploy more Equipment as per requirement of work.

2. All the above plants & equipment are to be deployed as and when required or directed by Engineer-in-Charge.

LIST OF MANDATORY TESTS

Sub Head: Mortars

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ laboratory test*	*Test procedure*	*Min. quantity of material for carrying out the test*	*Frequency of testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Water	3.1.1	(i) pH Value	Lab	IS 3025	-	Water from each source shall be got tested before the commencement of work and thereafter once in every three months till the completion of the work. Water from municipal source need be tested only once in six months. Number of Tests for each source shall be 3
		(ii) Limits of Acidity	Lab			
		(iii) Limits of Alkalinity	Lab			
		(iv) Percentage of solids	Lab			
		(a) Chlorides	Lab			
		(b) Suspended matter	Lab			
		(c) Sulphates	Lab			
		(d) Inorganic solids	Lab			
		(e) Organic solids				
Cement	3.1.2	(a) Physical requirement				
		(i) Fineness	Lab	IS 4031 (Part II)	Each lot	Every 50 tonnes or part thereof. Each brand of cement brought to site shall be tested as per this frequency.
		(ii) Soundness	Lab	IS 4031 (Part III)		
		(iii) Setting time (Initial & Final)	Lab	IS 4031 (Part V)		
		(iv) Compressive Strength	Lab	IS 4031 (Part VI)		
		(v) Consistency of standard cement paste	Lab	IS 4031 (Part **IV)-1988 (Reaffirm 2014)**		
Sand	3.1.3.1	Organic impurities	Field	Appendix 'A' under Chapter 3 of CPWD Specification 2019-Vol I	20 cum	Every 20 cum or part thereof or more frequently as decided by Engineer-in-Charge.

	3.1.3.2	Silt Content	Field	Appendix C under Chapter 3 of CPWD Specification 2019- Vol I	20 cum	-do-
	3.1.3.4	Particle size distribution	Field or Laboratory as decided by the Engineer-in-charge	Appendix B under Chapter 3 of CPWD Specification 2019- Vol I	40 cum	40 cum or part thereof

1	*2*	*3*	*4*	*5*	*6*	*7*
Sand	3.1.3.5	Bulking of Sand	Field	Appendix D under Chapter 3 of CPWD Specification 2019- Vol I	20 cum	Every 20 cum or part thereof or more frequently as decided by Engineer-in-Charge.
Fly Ash	3.1.5 & 3.1.5.1	Total chloride in percent by mass, max.	Lab	IS 12423	10 cum	Every 10 cum or part thereof or more
		Loss of ignition in percent by mass, max.	Lab	IS 1727	10 cum	Frequency as decided by Engineer-in-charge
		Fineness, specific surface in m^2 kg /	Lab/field	Blaine's permeability method	10 cum	-do-
		Compressive strength at 28 days in N/mm^2, Min.	Lab.	-	10 cum	Only in cases when fly ash is used as pozzolana in cement

SUB HEAD : CONCRETE WORK

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ Laboratory*	*Test procedure*	*Min. qty of Material for Carrying out test*	*Frequency of Testing*
1	2	3	4	5	6	7
Stone aggregate	4.1.2.2	(a) Percentage of soft or deleterious material	Field or Laboratory - Test as required	IS 2386-Part II	As required By Engineer in-Charge	For all quantities
	4.1.2.3	Particle size	Field/ Lab	Appendix 'A' Under Chapter 4 of CPWD Specification 2019- Vol I	45 cum	For every 45 cum or part thereof for RCC Work only. For rest of items as decided by Engineer-in Charge
	4.1.2.5	(a) Estimation of organic impurities	Field/ Lab	IS 2386-Part II	10 cum	For every 40 cum or part thereof
		(b) Surface moisture	Field/ Lab	IS 2386	10 cum	-do-
		(c) Determination of 10% fine value	Field/ Lab	IS 2386	10 cum	-do-
		(d) Specific gravity	Field/ Lab	IS 2386	10 cum	-do-
		(e) Bulk density	Field/ Lab	IS 2386	10 cum	-do-
		(f) Aggregate crushing strength	Field/ Lab	IS 2386	10 cum	-do-
		(g) Aggregate impact value	Field/ Lab	IS 2386	10 cum	-do-
Concrete	4.2.2	Slump test	Field	Appendix 'D'under Chapter 4 of CPWD Specification 2019- Vol I	10 cum	15 cum or part thereof

SUB HEAD : RCC WORK

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ laboratory test*	*Test procedure*	*Min, quantity of material for carrying out the test*	*Frequency of testing*
1	2	3	4	5	6	7
Reinforced Cement Concrete (Design Mix)	Coarse Aggregates				50 cum or part thereof & also on each change of source	
	Fine Aggregates				50 cum or part thereof & also on each change of source	
	Cement				50 MT or on each change of source	
	Fresh Concrete	(a) Slump test	Field	Appendix 'D' Chapter 4 of CPWD Specification 2019- Vol I	10 cum	50 cum for R.C.C. work including in all other small location. R.C.C.done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
	Fresh Concrete	(b) Cube Test	Lab	Appendix A Chapter 4 of CPWD Specification 2019- Vol I'	10 cum or part thereof	50 cum or 10 batches of 5-7 cum each for R.C.C. work in all location taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
Reinforced Cement Concrete (Ready Mix)	Coarse Aggregates				50 cum or part thereof & also on each change of source	

	Fine Aggregates				50 cum or part thereof & also on each change of source	
	Cement				50 MT or on each change of source	
	Fresh Concrete	(a) Slump test	Field/Lab	Appendix 'D' of Chapter 4 of CPWD Specification 2019- Vol I'	10 cum	50 cum for R.C.C. work including in all other small location. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineerin-Charge

1	2	3	4	5	6	7	
	Fresh Concrete	(b) Cube Test	Lab	Appendix 'A'	10 cum or part thereof	50 cum or 10 batches of 5-7 cum each for R.C.C. work in all location – taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineerin-Charge	
Steel for Reinforced cement concrete	5.1.3	(A) Physical Test and chemical tests				(a) For consignme nt below 100 tonnes	(b) For consignment over 100 tonnes
						(i) under 10 mm dia, one Sample for each 25 tonnes or part thereof	(i) Under 10 mm dia, one sample For each 40 tonnes or part thereof
						(ii) 10 mm to 16 mm dia one sample for each 35 tonnes or part thereof	(ii) 10 mm to 16 mm, one sample for each 45
						(iii) over 16 mm dia one sample for each 45 tonnes or part thereof	(iii) over 16 mm dia, one sample for each 50 tonnes or part thereof

Mandatory tests on Aggregates at site

Tests	*Nos. of test on each 50 cum of Material or part thereof*
1. Specific gravity	3
2. Bulk density	3
3. Aggregate crushing strength	3
4. Limits of deleterious substances	3
5. Aggregate impact value	3

Following tests shall be conducted at site on each lot of cement delivered: -

Mandatory tests	*Number of test per lot*
1. Consistency of standard cement paste	5
2. Initial and final setting time	5 each
3. Compressive strength test	10

Water sample from each source shall be tested as under: -

Test	*Number of test for each source*
Acidity	3
Alkalinity	3
Presence of solids	3

LIST OF MANDATORY TESTS – Masonry Work

Sl. No.	*Material*	*Clause*	*Test*	*Field/ laboratory Test*	*Test Procedure*	*Minimum Qty. of material for carrying out test*
(i)	Bricks/ Brick Tiles	6.1.3, 6.1.4, 6.1.5	Testing of Bricks/Brick Tiles for dimensions, Compressive strength, Water absorption and efflorescence	Laboratory	Appendix A, B, C & D of Chapter 6	As per Table 6.3 and 6.4
(ii)	Sewer Bricks	6.1.4	Dimensions, Compressive strength, Water absorption And Efflorescence	Laboratory	Appendix A, B, C & D of Chapter 6	As per Table 6.3 and 6.4
(iii)	Burnt clay perforated building bricks	6.1.5	--do--	-- do --	-- do--	-- do--

CLADDING WORK

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ Laboratory Test*	*Test*	*Minimum quantity of material/ work for carrying out the test*	*Frequencyof testing*
Marble	8.3 (Table 8.2)	(i) Moisture Absorption	Laboratory	IS 1124	50 Sq.m.	100 sqm. or part thereof.
		(ii) Hardness Test	-do-	Mho's Scale	-do-	-do-
		(iii) Specific Gravity	-do-	IS 1122	-do-	-do-
Granite		(i) Moisture	-do-	IS 1124	-do-	-do-
		(ii) Specific Gravity	-do-	IS 1122	-do-	-do-

WOOD WORK & P.V.C. WORK

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ Laboratory Test*	*Test Procedure*	*Min, Quantity of Material for carrying out the test*	*Frequency of Testing*
1	2	3	4	5	6	7
Timber	9.1.6	Moisture content	Field (by moisture meter) laboratory test as required by Engineer-in-Charge	Appendix 'C'	1 cum	Every one cum or part thereof.
Flush door	9.7.10	End immersion Test knife test Adhesion Test	Laboratory	IS 2202 Appendix 'F'	26 shutters	As per sampling and testing specified in clause 9.7.11
Mortice Locks	9.15.13	Testing of spring	Laboratory	IS 2209-Appendix 'G'	50 Nos	100 or part thereof.

Testing (Criteria for conformity) for Upvc extruded hollow profiles

The uPVC extruded hollow profiles use in window and doors shall conform to the specification as per

EN 12608 and other standards as mentioned below:

S.No.	Name of the test	Test Method	Specified Parameter
1	Vicat Softening Temperature	EN ISO – 306	Shall not be < 75°C
2	Charpy Impact Strength	EN ISO – 179-2	Shall not be < 20KJ/m²
3	Flexural Modulus Elasticity	EN ISO – 178	Shall not be < 2200 N/mm²
4	Tensile Impact Strength	EN ISO – 8256	Shall not be < 600 KJ/m²
5	Mean Breaking Stress for welded corner		
	(a) For the tensile bending test	EN – 514	Shall not be < 25 N/mm²
	(b) For the compression bending test		Shall not be < 30N/mm²
6	Heat Reversion Test	IS:4985-2000	Shall not be > 2.0 %
7	Surface Spread of flame	BS : 476 - Part 7	Classification 1
8	Ignitability Evaluation	BS : 476 - Part 5	'P' Not easily ignitable
9	Tensile modulus	ASTM D 638	Shall not be < 35 MPa
10	Shear Modulus	ASTM D 732	Shall not be < 220 MPa

11	Tensile Strength	EN ISO 527	Shall not be < 30 MPa

For the determination of the weld ability of profiles, welded corners shall be tested for tests as mentioned above. The sample subjected to weld test shall not be finished by grooving and knifing etc. except for theoutside edge of 90-degree angle, which shall be cleaned to permit the sample to sit fully on to the support.

Minimum percentage of **titanium dioxide** content in uPVC profiles shall not be less than **7.00 percent** and
calcium carbonate content shall not be more than **10.00 percent**.

The uPVC casement / fixed / sliding windows and doors shall be factory fabricated by the approved manufacturerand installation work shall be carried out by them or their authorised vendor duly approved by the Engineer in charge.

STEEL WORK

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ laboratory test*	*Test procedure*	*Min. quantity of material for carrying out the test*	*Frequency of testing*
1	*2*	*3*	*4*	*5*	*6*	*7*
Steel	10.1.1	(a) Tensile strength (b) Bend test	Laboratory	IS 1599	20 tonne	Every 20 tonne or part thereof.
Steel tubular pipes	10.13	(a) Tensile Test (b) Bend Test (c) Flattening Test	Laboratory	IS 1608 IS 2329 IS 2328	Every 8 tonne or part thereof	Every 8 tonne or part thereof

Flooring Work

LIST OF MANDATORY TESTS

Material	*Clause*	*Test*	*Field/ Laboratory Test*	*Test Procedure*	*Min. quantity of material for carrying out the test*	*Frequency of testing*
1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*
		1.				
Terrazzo Tiles	11.10.1 & 11.11.1	2. Transverse strength 3. Water absorption 4. Abrasion test	Laboratory	I S: 1237	5000 Nos. (no testing need be done if total number of tiles of all types of all sizes from all Manufacturers used in a work is less than 5000 Nos)	One test for every 10,000 Nos. or part thereof for each type and size from a single manufacturer. (One test to be done even if the number of terrazo tiles of any type and size from a single manufacturers is less than 5000 Nos. provided the total number of terrazo tiles of all types and sizes from all manufacturers used in a work exceed 5000 Nos
Pressed Ceramic tiles (for floor)	11.4,11.5& 11.16	1. Dimensions and surface quality 2. Physical properties 3. Chemical properties	Laboratory	I S: 13630	3000 Nos.	3000 Nos. or part ereof

Minimum quantity of tiles for carrying out the test and frequency of test shall be as specified in the list of Mandatory Test. The number of tiles selected for each mandatory test shall be as follows"

(a) For conformity to requirements on shape and dimensions,

wearing layer, and general quality - 12 tiles
(b) For wet transverse strength test - 6 tiles
(c) For resistance to wear test - 6 tiles
(d) For water absorption test -

LIST OF MANDATORY TESTS- GSB

Material		Test	*Field/ Laboratory Test*	Test Procedure	Frequency of Testing
Granular Sub Base (GSB)		(i) Gradation	Field	IS:2386 (Part 1)	One test per 400 cu.m.
		(ii) Atterberg limits	Laboratory	IS:2720 (Part 5)	One test per 400 cu.m.
		(iii) Water absorption	Laboratory		One test per 400 cu.m.
		(iv) Density of compacted layer	Laboratory		One test per 1000 cu.m.
		(v) Deleterious constituents	Field	IS:2386 (Part 2)	As required
		(vi) Soundness test	Field	IS:2386 (Part 5)	Same as mentioned under serialNo. 8
		(vii) CBR	Laboratory		As required

LIST OF MANDATORY TESTS- WMM & Concrete Pavement

Material		Test	*Field/ Laboratory Test*	Test Procedure	Frequency of Testing
Wet Mix Macadam		(i) Aggregate Impact Value or Los AngelesAbrasion value	Laboratory	IS:2386 (Part 4)	One tests per 1000 cu.m ofaggregate
		(ii) Grading of aggregate	Field	IS:2386 (Part 1)	One tests per 200 cu.m ofaggregate
		(iii) Combined Flakinessand Elongation Indices	Laboratory	IS:2386 (Part 1)	One tests per 500 cu.m ofaggregate
		(iv) Atterberg limits of portion of aggregate passing 425 micron sieve	Laboratory	IS:2720 (Part 5)	One tests per 200 cu.m ofaggregate
		(v) Density of compacted layer	Field		One set of three tests per 1000sq.m.
		(vi) Water absorption ofaggregate	Laboratory	IS:2386 (Part 3)	Once in a month
		(vii) Deleterious material	Field	IS:2386 (Part 2)	As required, once in a month
Cement concrete pavement under controlled conditions	16.37.19	Coarse aggregate 1. Flakiness Index	Laboratory	IS 2386 (Part 1)	Before approval of the quarry and every sub-sequent change in the source of supply and one test per 100 cum.
		2. Impact Value	-do-	IS 2386 (Part 4)	-do-

		3. Loss Angles abrasion Value	-do-	-do-	-do-
		4. Deleterious material	-do-	IS 2386 (Part 2)	Before approval ofthe quarry and at every subsequent change in the source of supply
		5. Moisture content	-do-	IS 2386 (Part 3)	Regularly as required subject toa minimum of one test per day
		Fine Aggregate			
		1. Silt content	Field	As per CPWD specificatio n Vol. I.	One test per 15 cum.
		2. Gradation of sand	-do-	IS 2386 (Part 2)	-do-
		3. Deleterious material	-do-	IS 2386 (Part 2)	Before approval of the quarry and at every subsequent changein the source of supply
		4. Moisture content	-do-	IS 2386 (Part 3)	Regularly as required subject toa minimum of two tests per day
		5. Mix Aggregate	Field	IS 2386 (Part 1)	One test per 15 cum of concrete
		6. Flextural strength	Laboratory	IS 526	One test consisting of 8 specimen for 30 cum. ofconcrete

Apart from mandatory tests specified above, Tests required for conformance of various materials becoming part of permeant structure shall be carried out as per relevant IS Codes. The Engineer-in-Charge may at his discretion, call for any additional tests that he may consider necessary. Sampling, procedure and computations for such test shall be done in accordance with Relevant IS Codes, ASTM, EN and Standards

GUARANTEE BONDS

ANNEXURE-I

GUARANTEE BOND TO BE EXECUTED BY CONTRACTORS FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER PROOFING WORKS

The Agreement made this ..... day of ..... two thousand and ..... between ..... son of ..... of ..... (hereinafter called the Guarantor of the one part) and the PRESIDENT OF INDIA (hereinafter called Government of the other part).

WHEREAS this agreement is supplementary to a contract (hereinafter called the Contract) dated ..... and made between the GUARANTOR of the one part and the Government of the other part, whereby the Contractor, inter alia, undertook to render the buildings and structures in the said contract recited completely water and leak-proof.

AND WHEREAS GUARANTOR agreed to give a guarantee to the effect that the said structures will remain water and leak-proof for **for 05 (Five) years from date of completion of entire project**.

NOW THE GUARANTOR hereby guarantees that water proofing treatment given by him will render the structures completely leak-proof and the minimum life of such water proofing treatment shall be five years to be reckoned from the date after the maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects or misuse of roof or alteration and for such purpose:

(a) Misuse of roof shall mean any operation which will damage proofing treatment, like chopping of firewood and things of the same nature which might cause damage to the roof;

(b) Alteration shall mean construction of an additional storey or a part of the roof or construction adjoining to existing roof whereby proofing treatment is removed in parts;

(c) The decision of the Engineer-in-Charge with regard to cause of leakage shall be final.

During this period of guarantee the guarantor shall make good all defects and in case of any defect being found, render the building water-proof to the satisfaction of the Engineer-in-Charge at his cost, and shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer-in-Charge calling upon him to rectify the defects, failing which the work shall be got done by the Department by some other contractor at the GUARANTOR'S cost and risk. The decision of the Engineer- in-Charge as to the cost, payable by the Guarantor shall be final and binding.

That if GUARANTOR fails to execute the water proofing or commits breach

thereunder then the GUARANTOR will indemnify the Principal and his successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and/or cost incurred by the Government the decision of the Engineer-in-Charge will be final and binding on the parties.

IN WITNESS WHEREOF these presents have been executed by the Obligor .....and by ..... and for and on behalf of the PRESIDENT OF INDIA on the day, month and year first above written.

Signed, sealed and delivered by OBLIGOR in the presence of

1.

2.

Signed for and on behalf of THE PRESIDENT OF INDIA by ..... in the presence of

1.

ANNEXURE-II

GUARANTEE TO BE EXECUTED BY THE CONTRACTORFOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF SANITARY INSTALLATIONS / WATER SUPPLY / DRAINAGE WORK AND ALUMINIUM WORK/FIRE CHECK DOORS

The agreement made this..... day of.....Two Thousand between

.....S/o .....(hereinafter called the GUARANTOR on the one part) and the PRESIDENT OF INDIA (hereinafter called the Government on the other part)

WHEREAS THIS agreement is supplementary to a contract (Hereinafter called the Contract) dated .....and made between the GUARANTOR ON THE ONE PART AND the Government on the other part, whereby the contractor inter alia, undertook to render the work in the said contract structurally stable, leak proof and sound material, workmanship, anodizing, colouring, sealing etc.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain structurally stable, leak proof and guaranteed against faulty material and workmanship, defective anodizing / Powder coat colouring and finishing for **5 (Five) years from date of completion of entire project.**

NOW THE GUARANTOR hereby guarantee that work executed by him will be free from any leakage, seepage, cracks in pipes and guaranteed against faulty material and workmanship, defective galvanizing for five years to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer-in-Charge with regard to nature and causeof defect shall be final.

During this period of guarantee, the guarantor shall make good all defects and in case of any defect to satisfaction of Engineer-in-Charge at his cost and shall commence the work for such rectification within seven days from the date of issue of the notice from the Engineer-in-Charge calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the guarantor's cost and risk. The decision of the Engineer-in-Charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good all defects or commits breach there under, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR inperformance and observance of this supplementary agreement. As to the amount of loss

and/or damage and or cost incurred by the Government, the decision of the Engineer-in-Charge will be final and binding on both the parties.

Further, (i) the collateral damages caused due to any defective work, shall be borne by the Contractor and (ii) Any incidental works which are to be done for rectification and restoring the same to original condition, shall be borne by the Contractor.

IN WITHNESS WHEREOF these presents have been executed by the obligator.....

..... and.....by
..... for and on behalf of the PRESIDENT OF INDIA on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of :-

1.....2. .....

SIGNED FOR AND ON BEHALF OF THE PRESIDENT OF INDIA BY..... in the presence of :-

1..... 2. .....