Construction of North East Regional Office of National Highways & Infrastructure Development Corporation Ltd. at Guwahati, Assam on EPC mode.

Technical Schedules

BUILDING INFRASTRUCTURE - BUILDING THE NATION

NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LTD.

(NHIDCL)

April 2021

SCHEDULES

Schedule-A

(See Clause 2.1 and 8.1)

Site of the Project

A plot of land was bought by NHIDCL, measuring 3 Bighas approx. covered by Dag No. 305 (pt) of village Numalijalah under Sila Sinduri Ghopa Mouza of North Guwahati Revenue Circle for construction of the "North East Regional Office" of NHIDCL. The brief details of the plot are as follows:-

State/UT	Location	Mouza, Revenue Circle	Size of the plot	Area of the plot
Assam	Dag No. 305 (pt) of village Numalijalah	Sila Sinduri Ghopa Mouza of North Guwahati Revenue Circle	59.26 m X 66.91 m	3965.09 sqm

Note:-

(a) The Bidder, at the Bidder's own responsibility and risk, is encouraged to visit, examine and familiarize himself with the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

(b) Contractor has to obtain all kind of permits, and all kinds of Permissions from Concerned Authorities related with the execution of work and mandatory reuirements etc. Necessary assistance in this regard will be provided by the Engineer-in-Charge of NHIDCL at the request of the Contractor. The costs of visiting the Site shall be at the Bidder's own expense. Further, Water Supply arrangement complete in all respects, Electric Supply arrangement complete in all respects has to be made by the bidder.

(c) An inventory of the Site including the land, buildings, structures, road works, trees and any other immovable property on, or attached to, the Site shall be prepared jointly by the Authority Representative and the Contractor, and such inventory shall form part of the memorandum referred to in Clause 8.2 (i) of this Agreement.

(d) Detailed architectural drawings of the building with complete details of foundation and its design, detailed structural drawings, detailed E&M drawings and designs with specifications, water supply and plumbing services design with specifications along with site development involving filling of 6.35 m with due regard to filling and construction of boundary wall complete in all respects as per design, the entire planning shall be part of the EPC contract. It is further clarified that the responsibility of investigations, designing, planning, procurement, construction, safety, quality, and risk of engineering lies with the contractor. In addition to the above it is again retraited that the entire scope including mandatory services and optional services relevant to the building and its development shall also be part of the EPC contract. Enitre building and its services with the development should be designed complete in all respects as an RCC framed structure to have an economic life of 75 (Seventy Five) years.

Annex – I

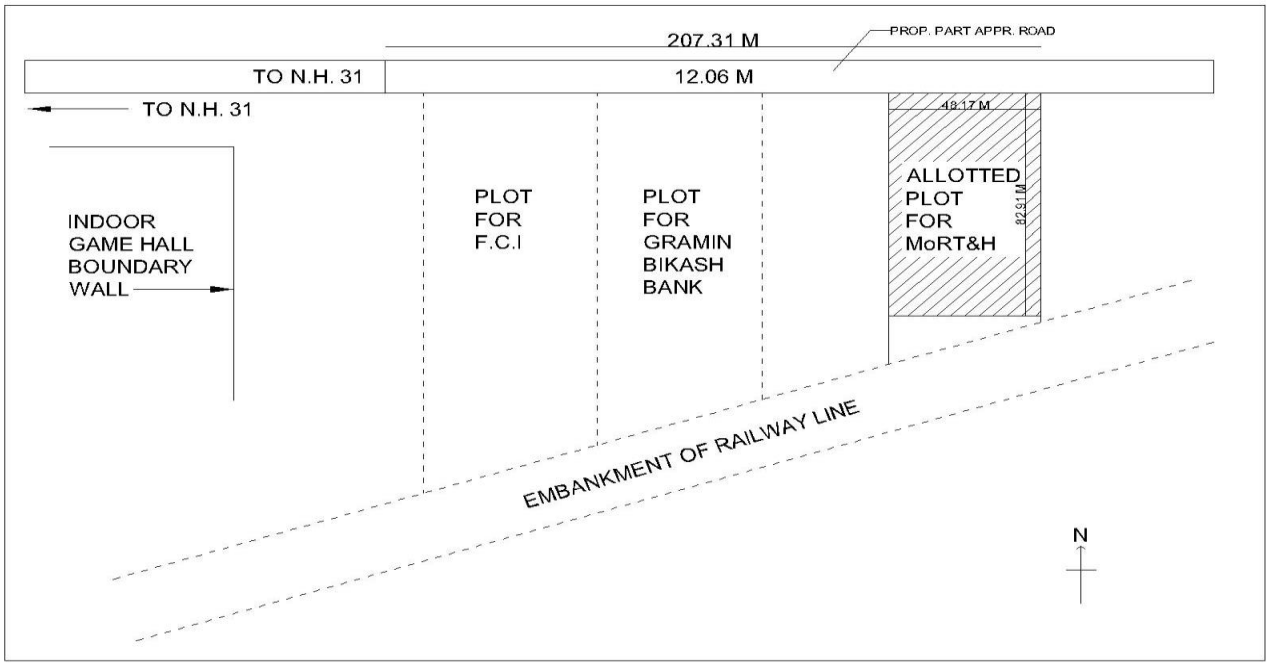
(Schedule-A)

Site

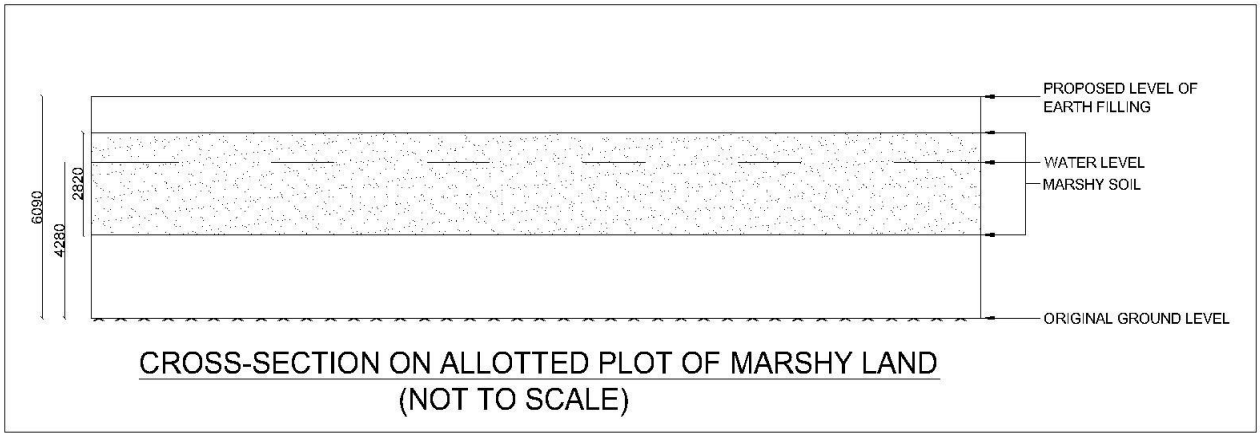
1. The plot allotted for construction of Regional Office of NHIDCL is situated along road (on northern of the plot side) which is yet to be developed in full length. The road of width is 12 m has been constructed up to the exsisting D.C. Office and Rajiv Gandhi Stadium beyond which the Kucha road has been constructed by filling earth in front of the plot of proposed FCI Building and thereafter up to the plots of Gramin Bikash Bank and Census Office which has been constructed by M/s Wapcos as PMC. It was observed that the road embankment has been extended by filling earth by each plot owners from the last end of the available road to make access to their plot. The site of proposed RO Office of NHIDCL is next to the Census Building (on eastern side) as shown in the attached site plan.

2. Entire area is Marshy land within a big pond with firm ground being 4-5 meter below the marshy soil floating over the water. Following sketch contains the site plan and cross section of the proposed road and the plot allotted for RO office of NHIDCL.

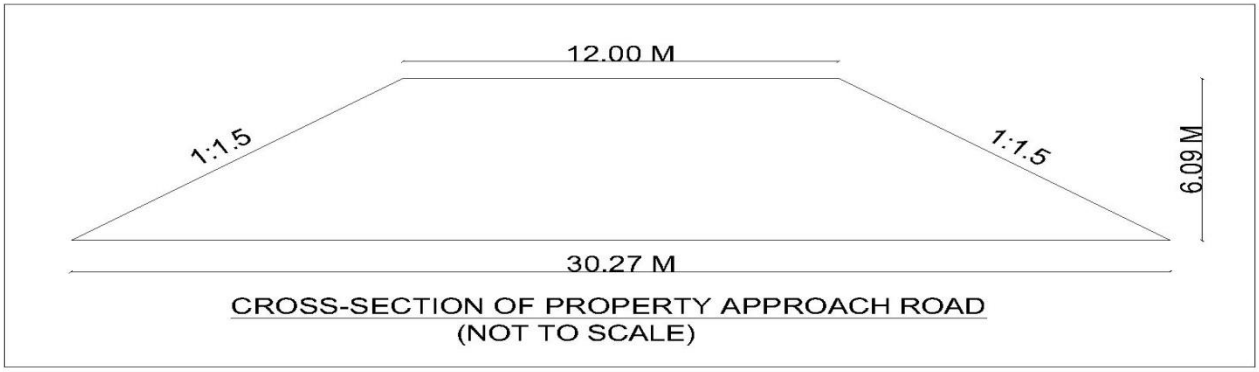
Site Plan and Cross-Section of Alloted Plot for NHIDCL



Site Plan (Not to Scale)



CROSS-SECTION ON ALLOTTED PLOT OF MARSHY LAND
(NOT TO SCALE)



CROSS-SECTION OF PROPERTY APPROACH ROAD
(NOT TO SCALE)

3. It has been observed that all construction has been done by filling up the area with sand and good earth and raising the Ground level of the plot by around 30 cm above the existing road level (which may rise in future after strengthening/ recarpeting of road is carried out). The plinth of all the buildings which have been constructed in the surrounding area like DC Office, Census Building (next to RO Office of NHIDCL) have been kept around 30-45 cm above the filled-up ground level of the plot. The depth of water above the firm soil and below the floating soil varies from 4-6 meters and it is proposed to fill up entire area after removing the vegetation and marshy soil and keep the plinth of the building 60 cm above the crown of the proposed road level. It is suggested to take up original ground level being 4.28 m below the water level/top of marshy soil as shown in the sketch above while calculating quantity of earth filling and keep the proposed level of earth filling 6.09 meter above the original ground level i.e. approximately 1.80 meter above the top of marshy soil (as shown in the sketch above).

4. The entire plot first needs to be made accessible (as the local govt. has not constructed the approach road) thereafter good earth/ sand in the entire plot needs to be filled up to the required level duly compacted. Thereafter, the equipment for boring holes for casting piles in-situ can be made operational and foundation work can start. Further, keeping in view that adequate drainage system is yet to be put in place by the local government, it would be advisible to keep the ground level of the plot and the plint level of the building at the same level as that of the Census department on the adjacent plot.

5. The above details are for rough guidance only, the efficiency has to be made by the Contractor through detailed design & engineering and the contractor has to maintain the levels of the building as given which may be subject to further increase with the consultation & prior approval of the Authority.

Annex - II

(Schedule-A)

Alignment Plans/ Plot

The Authority shall provide site/ land/ plot of Construction Zone to the Contractor at the earlest convinence after declaration of appointed date.

Annex – III

(Schedule-A)

Alignment Plans/ Polt location

Refer Annex – I

Annex – IV

(Schedule-A)

Environment Clearances

As per applicable laws and Acts as amended from time to time, if any. Necessary assistance will be provided by NHIDCL on request of the EPC Contractor.

Schedule – B

Development of the Project

(A). CIVIL WORK, INTERIOR WORK AND PUBLIC HEALTH BOQ FOR THE REGIONAL OFFICE BUILDING FOR NHIDCL			
Item No.	**DESCRIPTION OF ITEM**	**UNIT**	**QTY.**
1	**EARTH WORK**		
1	Earth work in excavation by mechanical means (Hydraulic excavator)/ manual means over areas (exceeding 30 cm in depth , 1.5 m in width as well as 10 sqm on plan) including getting out and disposal of excavated earth lead upto 50 m and lift upto 1.5 m as directed by Engineer - in - Charge.(the rate shall be inclusive of waterand/or liquid mud, including pumping out water as required). All kinds of soil.	cum	5947.63
1.2	Close timbering over areas including strutting, shoring and packing cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered): Depth exceeding 3 m but not exceeding 5m	sqm	630.85
1.3	Excavating marshy soil through safe disposal away from site as per directions of Engineer-in-Charge, supplying and filling of good earth (including royalty) by mechanical transport for all leads including ramming and compaction of the earth in layers not exceeding 20 cm in trenches, plinth, sides of foundation etc. complete with due regard to long term stability & avoidance of settlement through investigation & design.	cum	41428.67
1.4	Extra for every additional lift of 1.5 m or part thereof in excavation /banking excavated or stacked materials. (1.5 m to 3m) (the rate shall be inclusive of waterand/or liquid mud, including pumping out water as required). All kinds of soil.	cum	5947.63
1.4.1	Extra for every additional lift of 1.5 m or part thereof in excavation /banking excavated or stacked materials.(3 m to 4.5m).(the rate shall be inclusive of water and/or liquid mud, including pumping out water as required). All kinds of soil	cum	5947.63
1.4.2	Extra for every additional lift of 1.5 m or part thereof in excavation /banking excavated or stacked materials.(4.5 m to 5m).(the rate shall be inclusive of waterand/or liquid mud, including pumping out water as required). All kinds of soil	cum	1982.54
1.4.3	Extra for every additional lift of 1.5 m or part thereof in excavation /banking excavated or stacked materials.(5m to 6m or upto hard strata ,whichever is less). (the rate shall be inclusive of waterand/or liquid mud, including pumping out water as required). All kinds of soil	cum	407.95
1.4	Supplying and filling in plinth with sand under floors, including watering, ramming, consolidating and dressing complete.	cum	99.80
1.5	carriage of material beyond 10 to 20 km -Carriage of manure/loose soil by mechanical transport including loading ,unloading and stacking.(rates inclusive of Contractor's profit and over heads & all taxes).	cum	8093.35
	TOTAL AMOUNT OF EARTH WORK		
2	**CEMENT CONCRETE WORK**		
2.1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :		

2.1 (a)	1:4:8 (1Cement:4 coarse sand:8 graded stone stone aggregate. 40 mm nominal size	cum	158.60
2.1 (b)	1:5:10 (1 Cement : 5 coarse sand (Zone III : 10 graded stone aggregate 40 mm nominal size)	cum	179.91
2.2	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, piers, abutments, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets, sunken floor,etc., up to floor five level, excluding the cost of centering, shuttering and finishing : 1:2:4 (1 Cement : 2 coarse sand (Zone III): 4 graded stone aggregate 20 mm nominal size).	cum	242.73
	TOTAL AMOUNT OF CEMENT CONCRETE WORKS		
3	**REINFORCED CEMENT CONCRETE WORK**		
	Centering and shuttering including strutting, propping etc. and removal of form for:		
3.1 (a)	Foundations, footings, bases of columns, etc. for mass concrete.	sqm	2614.00
3.1 (b)	Walls (any thickness)including attached pilasters, butteresses, plinth and string courses etc.	sqm	365.86
3.1 (c)	Suspended floors, roofs, landings, balconies and access platform	sqm	5391.33
3.1 (d)	Shelves (Cast in situ)	sqm	158.90
3.1 (e)	Lintels, beams, plinth beams, girders, bressumers and cantilevers	sqm	4678.67
3.1 (f)	Columns, Pillars, Piers, Abutments, Posts and Struts	sqm	3547.71
3.1 (g)	Stairs, (excluding landings) except spiral-staircases	sqm	433.79
3.1 (h)	Small lintels not exceeding 1.5 m clear span, moulding as in cornices, window sills, string courses, bands, copings, bed plates, anchor blocks and the like	sqm	374.72
3.2	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc., including cost of de-shuttering and decentering at all levels, over a height of 3.5 m, for every additional height of 1 metre or part thereof (Plan area to be measured): Suspended floors, roofs, landing, beams and balconies (Plan area to be measured)	sqm	7139.16
3.3	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level: Thermo-Mechanically Treated bars of grade Fe-500D or more.	Kg	627922.58
3.3 (b)	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete above plinth level: Thermo-Mechanically Treated bars of grade Fe-500D or more.	Kg	428077.89
3.4	Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. (Note:- Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/ recoverable separately).		
3.4 (a)	All works upto plinth level	cum	3192.12
3.4 (b)	All works above plinth level upto floor V level	cum	1509.86
3.4 (c)	All works above xtra for R.C.C./ B.M.C/ R.M.C. work above floor V level upto Terrace	cum	724.52

3.5	Extra for providing richer mixes at all floor levels. Note:- Excess/less cement over the specified cement content used is payable /recoverable separately.		
3.5(a)	Providing M-30 grade concrete instead of M-25 grade BMC/ RMC. (Note:- Cement content considered in M-30 is @ 340 kg/cum)	cum	395.15
3.5(b)	Providing M-35 grade concrete instead of M-25 grade BMC/ RMC. (Note : Cement content considered in M-35 is @ 350 kg/ cum)	cum	907.51
3.6	Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-InCharge. The joints system will be of extruded aluminum base members, self aligning / self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various vertical locations in load application areas that accommodates multi directional seismic movement without stress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness required to satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. The Self - centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of Moisture Barrier Membrane in the Joint System to have watertight joint is mandatory requirement all as per the manufactures design and as approved by Engineer -in- Charge. (Material shall conform to ASTM 6063). Floor Joint of 100 mm gap	metre	143.50
3.7	Providing and fixing of expansion joint system related with wall joint (internal/ external) location as per drawings and direction of Engineer-In- Charge. The joints shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221- 02. The material shall be such that it provides an Expansion Joints System suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office Buildings & complexes with no slipping down tendency amongst the components of the Joint System. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multicellular to facilitate movement. (Material shall conform to ASTM 6063.): Wall Joint of 100 mm gap	metre	52.00
3.8	Providing and fixing of expansion joint system of approved make and manufacture for various roof locations as per approved drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members with, self aligning and self centering arragement support plates as per ASTM B221-02. The system shall be such that it provides water tight roof to roof /roof to corner joint cover expansion control system that is capable of accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. The Self centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. The Joint System shall resists damage or deterioration from the impact of falling ice, exposure to UV, airborne contaminants and occasional foot traffic from maintenance personnel. Provision of Moisture Barrier Membrane in the Joint System to have water tight joint is mandatory requirement. (Material shall confirm to ASTM 6063.) Roof Joint of 100 mm gap	metre	20.50
	TOTAL AMOUNT OF REINFORCED CEMENT CONCRETE WORK		
4	**MASONRY WORK**		
4.1	Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:6 (1 cement : 6 coarse sand)	cum	29.95
4.2	Extra for brickwork /AAC Block masonary in superstructure above floor level V level,	cum	344.21

	for each four floors or part there of by mechanical means.		
4.3	Extra for half brick masonry in superstructure, above floor V level for every four floors or part thereof by mechanical means.	sqm	454.49
4.4	Brick work with non modular fly ash bricks conforming to IS:12894,class designation 10 average compressive strength in super structureabove plinth level up to floor V and above level in : Cement mortar 1:6 (1 cement : 6 coarse sand).	cum	1024.93
4.5	Half brick masonry with non modular fly ash bricks of class designation 10, conformingio IS :12894, in super structure above plinth and upto floor V level and above: Cement mortar 1:4 (1 cement :4 coarse sand).	sqm	1385.69
	TOTAL AMOUNT OF MASONRY WORK		
5	**CLADDING WORK**		
5.1	**GRANITE SKIRTING (IN ALL STAIRCASES & FLOORS)** Granite work gang saw cut (polished and machine cut) of thickness 18 mm for wall lining (veneer work), backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement : 3 coarse sand), including pointing with white cement mortar 1:2 (1 white cement : 2 marble dust) with an admixture of pigment to match the marble shade (To be secured to the backing by means of cramps, which shall be paid for separately). Raj Nagar Plain white marble/ Udaipur green marble/ Zebra black marble : Area of slab upto 0.50 sqm	sqm	1382.93
5.2	**GRANITE COUNTERS (IN KITCHEN, PANTRY & ALL TOILET AREAS)** Providing and fixing 18 mm thick gang saw cut, mirror polished, premoulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills , facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels. Granite of any colour and shade: Area of slab over 0.50 sqm.	sqm	41.26
5.3	**GRANITE EDGE MOULDINGS FOR COUNTERS** Providing edge moulding to 18 mm thick marble stone counters, Vanities etc., including machine polishing to edge to give high gloss finish etc. Complete as per design approved by Engineer-in-Charge : Granite work.	metre	471.41
5.4	**EXTERNAL STONE WORK** Providing and fixing dry cladding upto 10 metre heights with 30mm thick gang saw cut stone with (machine cut edges) of uniform colour and size upto 1mx1m, fixed to structural steel frame work and/ or with the help of cramps, pins etc. and sealing the joints with approved weather sealant as per Architectural drawing and direction of Engineer-in-charge. (The steel frame work, stainless steel cramps and pins etc. shall be paid for separately). White sand stone - 30mm thick gang saw cut stone.	sqm	504.00
5.5	**STRUCTURAL STEEL FRAME (FOR FIXING OF DRY CLADDING)** Providing and fixing structural steel frame (for dry cladding with 30 mm thick gang saw cut with machine cut edges sand stone) on walls at all heights using M.S. square/ rectangular tube in the required pattern as per architectural drawing, including cost of cutting, bending, welding etc. The frame work shall be fixed to the wall with the help of M.S. brackets/ lugs of angle iron/ flats etc. which shall be welded to the frame and embedded in brick wall with cement concrete block 1:2:4 (1 cement :2 coarse sand :4 graded stone aggregate 20 mm nominal size) of size 300x230x300 mm, including cost of necessary centring and shuttering and with approved expansion hold fasteners on CC/RCC surface, including drilling necessary holes. Approved cramps/ pins etc. shall be welded to the frame work to support stone cladding, the steel work will be given a priming coat of Zinc primer as approved by Engineerin- charge and painted with two or more coats of epoxy paint (Shop drawings shall be submitted by the contractor to the Engineer-in-charge for approval before execution). The frame work shall be fixed in true horizontal & vertical lines/planes. (Only structural steel frame work shall be measured for the purpose of payment, stainless steel cramps shall be paid for separately and nothing extra shall be paid).	Kg	93.68

5.6	**STAINLESS STEEL CRAMPS WITH NUTS, BOLTS & WASHER** Providing and fixing adjustable stainless steel cramps of approved quality, required shape and size, adjustable with stainless steel nuts, bolts and washer (total weight not less than 260 gms), for dry stone cladding fixed on frame work at suitable location, including making necessary recesses in stone slab, drilling required holes etc complete as per direction of the Engineer-in-charge.	each	2015.99
5.7	**CERAMIC WALL TILES, SKIRTING & DADO** Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineer-in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per sqm, including pointing in white cement mixed with pigment of matching shade complete.	sqm	540.89
5.8	**GLASS REINFORCED CONCRETE (GRC) WALL CLADDING TILES** Providing and fixing of Glass Reinforced Concrete (G.R.C) Wall Cladding Tiles in approved design, size, texture, thickness, pattern and color. The thickness of the tiles should range between 12 to 18 mm (depending on the texture of the tile), allowing variance of ±2 mm in accordance with IS: 1237-1980. The composition of tiles should be '43' Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by 'BAYFERROX (Germany)' or equivalent. The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz, super plasticizers and integrated water proofing agents and others. The tiles should be produced with high vibration technology and should have compressive strength equivalent to M-40 Grade@28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs immersion method, less than 8%. The tiles should be applied on a rough plaster of cement mortar 1:3 (1 cement: 3 coarse sand) and the fixing of tiles should be done by tile adhesive or equivalent as per manufacturer's laying instruction. GRC Wall Cladding Tiles Pattern: Unibrick country Brick Size: 7.5" x 2.25 Colour-Copper Red	SQM	2784.43
	TOTAL AMOUNT OF CLADDING WORK		
6	**WOOD AND P.V.C WORK**		
6.1	**DOOR FRAMES** Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia & length (hold fast lugs or dash fastener shall be paid for separately): Second class teak wood.	cum	6.93
6.1.1	Providing wood work in frames of partitions / panelling etc 1"X2"Battens sawn and fixed in position with necessary stainless steel screws etc. : Salwood	cum	4.93
6.2	**FLUSH DOOR SHUTTER** Providing and fixing ISI marked flush door shutters conforming to IS : 2202 (Part I) 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: 35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	sqm	241.40
6.3	**M.S. SLIDING DOOR BOLTS** Providing and fixing ISI marked oxidised M.S. sliding door bolts with nuts and screws etc. complete : 250x16 mm.	each	24.00

6.4	**MORTICE LATCH LOCK & HANDLES** Providing and fixing bright finished brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles of approved quality with necessary screws etc. complete.	each	132.00
6.5	**DOOR STOPPER / BUFFER** Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.	each	61.00
6.6	**TOWER BOLT** Providing and fixing aluminium tower bolts, ISI marked, anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade, with necessary screws etc. complete : 300X10 MM	each	264.00
6.7	Providing and fixing fire resistant door frame of section 143 x 57 mm having built in rebate made out of 16 SWG G.I. sheet (zinc coating not less than 120 gm/sqm) duly filled with vermuculite based concrete mix, suitable for mounting 60 minutes fire rated door shutters. The frame is fitted withintumuscent fire seal strip of size 10x4 mm (minimum) alround the frame and fixing with dash fastener of approved size and make, including applying a coat of approved brand fire resistant primer etc. complete as per direction of Engineer-in-charge (Dash fastener to be paid for separately).	metre	136.80
6.7(a)	Supplying Dash fastener / Chemical fastener	each	144.00
6.8	Providing and fixing 50 mm thick glazed fire resistant door shutters of 60 minutes fire rating conforming to IS:3614 (Part-II), tested and certified as per laboratory approved by Engineer-in-charge, with suitable mounting on door frame, consisting of vertical styles, lock rail, top rail 100 mm wide, bottom rail 200 mm wide, made out of 16 SWG G.I.sheet (zinc coating not less than 120 gm/m2) duly filled FR insulation material and fixing with necessary stainless steel ball bearing hinges of approved make, including applying a coat of approved fire resistant primer etc. all complete as per direction of Engineer-in-charge	sqm	75.60
6.9	Providing and fixing panic bar / latch (Double point) fitted with a single body, Trim Latch & Lock on back side of the Panic Latch of reputed brand and manufacture to be approved by the Engineer- in- charge, all complete.	each	24.00
6.10	**STAINLESS STEEL HANDLE** Providing and fixing bright /matt finished Stainless Steel handles of approved quality & make with necessary screws etc all complete: 125 mm	each	132.00
6.11	Providing and fixing UPVC (un-plastisized polyvinyl chloride) sliding windows size 2400w x 2070h (53.48 sqft) complete in all respect with specification of SY05 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , 2.00mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000,Slider O/F : 41201-01000,Mechanical T-Joins, 74mmFrame T/M Stan., White Sash Colour, Slider Sash : 41201-03000, Slider Screen-: Track + Screen, Super Screen Sas type,White Handle Colour,: Grooved SL Alumi Rail, Patio sliding Handle,SS430 (CS) Espag. Type,White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	each	89.00
6.12	Providing and fixing UPVC (un-plastisized polyvinyl chloride) sliding windows size 1200w x 2070h (26.74 sqft) complete in all respect with specification of SY05 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000,Slider O/F : 41201-01000, White Sash Colour, Slider Sash : 41201-03000, Slider Screen-: Track + Screen, Super Screen Sas type,White Handle Colour,: Grooved SL Alumi Rail, Patio sliding Handle,SS430 (CS) Espag. Type,White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	each	14.00

6.13	Providing and fixing UPVC (un-plastisized polyvinyl chloride) sliding windows size 600w x 2070h (13.37 sqft) complete in all respect with specification of SY05 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, C'ment T- Sash : 41101-13000, ,White Handle Colour,Casement Handle - Espag, SH Friction hinge type, SS Friction Hinge,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	Each	48.00
6.14	Providing and fixing UPVC (un-plastisized polyvinyl chloride) sliding windows size 900w x 2070h (20.05 sqft) complete in all respect with specification of SY05 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, C'ment T- Sash : 41101-13000, ,White Handle Colour,Casement Handle - Espag ,SH Friction hinge type,SS Friction Hinge,SS430 (CS) Espag. Type,White Bead Colour all complete as per drawing Fixing should be done as per company specifications.	each	49.00
6.15	Providing and fixing UPVC (un-plastisized polyvinyl chloride) sliding windows size 750w x 2070h (16.71sqft) complete in all respect with specification of SY05 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Slider Series ,Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, Slider O/F -41201-01000,White Sash Colour, Slide Sash : 41201-03000, Slider Track+Screen,Super Screen Sas Type,White Handle Colour,Grooved shape SL Alumi rail,Patio Sliding handle,SS430 (CS) Espag. Type,White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	each	8.00
6.16	**VENTILATORS** Providing and fixing UPVC (un-plastisized polyvinyl chloride) ventilator size 900w x 900h (8.72sqft) complete in all respect with specification of SY01 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys,Tilt/Turn F ,White colour, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , White frame colour,Window O/F -41101-11000,White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	each	16.00
6.17	Providing and fixing UPVC (un-plastisized polyvinyl chloride) ventilator size 600w x 600h (3.88sqft) complete in all respect with specification of SY01 Combination System,Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys,Tilt/Turn F ,White colour, Full Reinforcement, Channel Reinfof type, 1.5mm Rein thick frame , White frame colour,Window O/F -41101-11000,White Bead Colour all complete as per drawing Fixing should be done as per Approved brand specifications.	each	71.00
6.18	**FULLY AUTOMATIC SLIDING DOOR** Providing and fixing Automatic Sliding glass door operator 4150mm , compliant with future European standards and produced according to the guidelines for power-operated windows, doors and gates, BGR 232, the UVV and the VDE regulations. TÜV design tested, tested according to the low voltage guidelines, fulfils DIN 18650 standards, for framed glass door application with 12mm tougned glass for 2 Nos. sliding door panels and 2 Nos. fixed panels, both sliding Operator & Frame Finish should be Silver Anodised E6/C0, with operator dimensions (H x D) : 100 x 180 mm and of length as required to suit the opening size given below. TThe track profile should be separate from the main profile for enabling reduction in vibration insulation. Microprocessor-controlled control unit, Self-learning, with adjustable parameters for opening and closing speed, hold-open time and opening and closing force, reversing when obstruction is encountered, Class of protection IP 20. Activators- 6 Safe Combinations Radars with Motion & Presence Detection (02 Nos.), Light barrier comprising of receiver and transmitter - 01 Pair, with Electro-mechanical locking, Program Switch with Key. Max Panel Weight Carrying Capacity of 2 X 100 Kgs. tem shall have constant power supply 230V+ 5%, 50Hz, AC . The requirement in total is as mentioned ,wall cconneting profiles be used on top of overpanel and on all sides to fixed panels only .The above work should complete in all respect as per approved drawings and to the satisfaction of Architect /Engineer-in-Charge. (Note: For 100% power back up we have D.G Set)	sqm	24.00

6.19	**GLASS DOOR** Supply & Fixing of Glass Door (Single Leaf) size 0f 2100 mm x 1050mm of 10mm toughened glass with Slim line 45mm frames clip in profiles all around the door with complete assembly . DP45 Door Profile frame of size 45X50mm with seals with Junior Office Hinges (3nos) & Studio Gala Locks (1no) & Studio Gala lever handles in aluminium silver (EV1) finish , Euro profile cylinder and TS 89 Door closer with slide channel (as per EN 1154) and saddle plate for fixing on the Glass door and necessary seals to be provided all around the door frames. The slim line profiles shall be suitable for Glass thickness of 10mm .The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system. All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.	EACH	37.00
6.20	**FULL HEIGHT GLASS PARTITIONS** Supply and Fixing of Glass partition of 10mm Toughened Glass using slim line System-45 Frames clip in profile to a height of maximum 3m or as per drawing.The Fixed glass to be fixed using BP45 Profiles at Top & Bottom & fixed frame cleat . The profile size to be 45x25MM to be fixed on to the floor/ ceiling as per the architect design. H Junction profile to be used at all Glass to Glass vertical joints, 90 Deg L Junction Profiles and T Junction profiles necessary as per design.In case of Glass overall panel MP45 & BP45 Overpanel Profile to be used. The clip in profiles shall be suitable for Glass thickness of 10 mm .The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system. All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.	sqm	274.76
6.21	**FULL HT. PARTITION** Providing and fixing 69 mm thick of Approved brand drywall partition system, which include "Approved brand Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51mm Floor and Ceiling track profile, 0.5mm thick, having two equal flanges of 32mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610mm; Vertical G.I studs of size 51mm, 0.5mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610mm centers. 9mm Approved brand Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either sid of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame. **Jointing and Finishing**: Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with Approved brand compound of standard. make with Self adhesive Fiber glass mesh tape. The rate shall be inclusive of providing & finishing 2 coats of top paint and labour for cutouts for light fixtures, AC grills,diffusers etc,	sqm	474.44
6.22	**LOW HT. PARTITION** Providing and fixing 69 mm thick X1350 mm height , approved brand drywall partition system/ approved equivalent, which include "Approved brand Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51mm Floor and Ceiling track profile, 0.5mm thick, having two equal flanges of 32mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610mm; Vertical G.I studs of size 51mm, 0.5mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610mm centers. 9mm approved brand Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either side of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame. **Jointing and Finishing**: Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with approved brand compound of std. make with Self adhesive Fiber glass mesh tape. The rate shall be inclusive of 2 coats of top paint and labour for cutouts for electrical, telephone, computer conduites etc.	SQM	86.56

6.23	**1MM THK LAMINATE FINISH:** Providing ,fixing 1 mm thk selected laminate of approved colour & approved make, glued with approved phenol formaldehyde based adhesive or approved equivalent overlaying on substrate without any gap/air bubbles pressed uniformly to line level and plumb, item complete with all edge lipping with water based PU TW lipping mounted flush to surface as per detailed drawings and Architects recommendations: all accessories, fixing implements , men material and lift upto 6 mtrs. Finished complete with all necessary masking with avg. mim 10mm wide masking tape before applying polish to edge lipping and getting mock up approved by Enginner in charge/ Architect. Item to include protecting finished item by avg. 20 microns thk polythene sheet till handover of facility complete.	SQM	1251.097
6.24	**1-(F) UNICOLOR LAMINATE:** Providing ,fixing Uni + unicolour decorative laminate with homogeneous same color of decorative surface and core layers as per 438:3 -2005, FSC & Green Guard . Item to be completed in all respects as per drawings and instructions from Project in charge.	SQM	357.456
6.25	**1-(B))MR+(MAR RESISTANT)TUFF GLOSS LAMINATES:** Providing ,fixing Merino MR+(Mar Resistant)Tuff Gloss Laminates 1mm thickness , conforming to IS 2046:1995, 3to 4 times more resistant than normal Gloss Laminate, gloss meter reading is over 110 at 60 degree angle reading as per ASTM D6037-96. Item to be completed in all respects as per drawings and instructions from Project in charge.	SQM	178.73
6.26	**9.75mm THICK MDF EXTERIOR GRADE PLAIN PARTICAL BOARD:** Providing and fixing MDF Exterior grade plain partical board of approved makes: Plain Exterior Grade MDF Boards of 9.75mm thickness, Exterior grade wood base (Grade-I), Melamine Bonded, Stamped IS 12406. All accessories, screws, fixing implements , labours, material and all lifts. Item to be completed in all respects as per drawings and instructions from Engineer in charge.	SQM	986.00
6.27	**12 mm THK. 710 BWP PLY:** Providing and fixing partition skinning with avg 12 mm thk BWP Grade Plyboard IS 710 BWP grade on over Al. skeletal frame/wooden frame , as approved by Architect. Plywood shall be 12mm thick, non-decorative, factory made as per IS:710 and should be ISI marked and be made of non-coniferous timber red hard wood with moisture contents not more than 12% and dimension as given in IS code. The panel comprising of plywood should be 9 ply construction and cross bend and panel core shall be glued by hot pressed with Quadra process, while the thickness of face veneer (Okume/Gurjan) shall not be less than 0.5mm. all core shall fully confirm to the requirement specified in the IS code. All timber used should be well seasoned and chemically treated. Adhesive used shall be phenol formaldehyde synthetic resin BWP type specified in IS:848-1974. All dimensions shall be finished dimension and manufacturers test certificate for test specified in IS:710 shall be rendered." Item shall be complete in all respect.	SQM	33.21
6.28	**CHANNELED WOODWORKS WALL PANELLING OF SIZE: 192X2400X15MM** Providing and Fixing Channeled Woodworks perforated panels of width 192mm, thickness of 15mm and length 2400 mm or as required by the Architect/ approving engineer, made of a Moisture Resistant fibre board with minimum 595 Kg/M3 density substrate with a laminated facing as per the approved shade & finish and a melamine balancing layer on the reverse side. The boards shall have a special perforation pattern where the visible surface has a "Helmholtz" fluted perforation of 3mm width and 13mm of visible panel each. The edges of the panels shall be "tongue-and-grooved" to receive special clips for installation. The back of the perforated panel shall have sound absorbing non-woven acoustical fleece having NRC of 0.59. The panels shall be mounted on special aluminium splines (keel) using clips provided by Approved brand and approved by the Architect/ Engineer-in-Charge. **INSTALLATION**: Install wooden battens (provided by others) of section 50x50mm or as approved by the Architect on the solid wall horizontally using screws and plugs at spacing of 600mm centre-to-centre. Screw the aluminium extruded keel for channelled woodworks provided by Approved brand over the lowest and second wooden batten at an on-centre distance of 600mm. Install the Skirting (provided by others) of width 50mm or more as required by the Architect/ Engineer-in-Charge and insert the tongue end of the panel in the skirting. Place the inside clip on the groove end of the panel along the Al keel and then place the tongue end of the next panel. Continue installing rows of panels by inserting the tongue into the groove of the earlier inserted panel and progressively installing inside clips into the next keel till the actual height is achieved.	SQM	189.77

	Finish off the edges using wooden moulding of matching colour (provided by others). Installation to be carried out by Approved brand Trained Installation team & Installation should be carried out as per Approved brand recommended procedure.		
6.29	**OPTRA ACOUSTICAL WALL PANELING** Providing and supplying 'Optra Acoustical Wall Paneling' of approved brand with square edges made of fibre glass substrate 25mm thick and wrapped on the front side with an acoustically transparent and classified for Fire reaction Class A as per ASTM E-84, fabric with an option of colors – Husk, Copper, Sangria, Sesame, Coffee, Charcoal, Titanium, Flame, Peanut & Shell as per the choice of the Architect of size 600X600 mm providing a minimum sound absorption level of 0.85 NRC to be affixed to wall using Wall panel impalers supplied by approved brand and construction adhesives as per the instructions laid down by the manufacturer. **INSTALLATION**: 4nos. of approved brand wall panel Impalers of shall be fixed to the wall surface using self-tapping screws. Silica based construction adhesive to be dabbed on to the projecting elements (spikes) of the impalers. Approved brand Optra wall panels shall be pierced through the spikes of the impalers ensuring the line and level of the panels are maintained. Installation to be carried out by approved brand Trained Installation team & Installation should be carried out as per approved brand recommended procedure.	SQM	21.140
6.30	**ARTIFICAL GREEN WALL** Providing testing and commissiong of Artificial boxwood matt is a matt prepared with synthetic PVC leaves made to look like actual plant for vertical applications both in indoors & outdoors. The main reason for usage of this matt is maintenance-Artificial matt stands up to heavy use and requires no irrigation and trimming and no sunlight but only requires periodic cleaning if used in interiors.Since major cities across globe are turning into concrete jungles with very less space for greenery, so artificial green matt in different leave patterns which almost look real is best solution to create a soothing green effect without any maintenance.For exterior applications UV matt are recommended for long life Application is done using rubber adhesive or by simply hanging matt on walls with screws giving a long lasting installation.Further artificial flowers or bushes to be added in matt to give more natural look as per requirement.TechArtz Global is major importer of this material from Germany & China to India. The Rate shall be includive of providing and fixing SS Fastner of 10mmdia. and 100mm Long (IS code) duly Fixed the ply to Wall .	SQM	50.1
	TOTAL AMOUNT OF WOOD AND P.V.C WORK		
7	**STEEL WORK**		
7.1	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc. including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete i/c making provision for fixing glass if required and fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge. (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)	Kg	2187.94
	TOTAL AMOUNT OF STEEL WORK		
8	**FLOORING**		
8.1	**RECTIFIED GLAZED CERAMIC FLOOR TILES** Providing and laying rectified Glazed Ceramic floor tiles of size 300x300 mm or more (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in colours White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick cement mortar 1:4 (1 Cement: 4 Coarse sand), jointing with grey cement slurry @ 3.3 kg/ sqm including grouting the joints with white cement and matching pigments etc., complete.	sqm	337.93

8.2	**VITRIFIED FLOORING** Providing and laying vitrified floor tiles in different sizes (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand), jointing with grey cement slurry @ 3.3 kg/ sqm including grouting the joints with white cement and matching pigments etc., complete.The tiles must be cut with the zero chipping diamond cutter only. Laying of tiles will be done with the notch trowel, plier, wedge, clips of required thickness, leveling system and rubber mallet for placing the tiles gently and easily.Glazed vitrified tiles matt/ antiskid finish of size.Size of Tile 600x600 mm.	sqm	3743.38
8.3	**VITRIFIED SKIRTING** Providing and laying Vitrified tiles in different sizes (thickness to be specified by manufacturer), with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, in skirting, riser of steps, over 12 mm thick bed of cement mortar 1:3 (1 cement: 3 coarse sand), jointing with grey cement slurry @ 3.3 kg/ sqm including grouting the joint with white cement & matching pigments etc. complete: Size of Tile 600x600 mm.	sqm	49.54
8.4	**VITRIFIED WALL TILES/ DADO** Providing and laying Vitrified tiles in different sizes (thickness to be specified by the manufacturer), with water absorption less than 0.08% and conforming to IS: 15622, of approved brand & manufacturer, in all colours and shade, in skirting, riser of steps, laid with cement based high polymer modified quick set tile adhesive (water based) conforming to IS: 15477, in average 6 mm thickness, including grouting of joints (Payment for grouting of joints to be made separately). Size of Tile 800x800 mm.	sqm	100.00
8.5	GROUTING the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling / grouting and finishing complete as per direction of Engineer-in charge. Size of Tile 800x800 mm.	sqm	100.00
8.6	Providing and fixing removable raised/false access flooring with system and its components of approved make for different plenum height with possible height adjustment upto 50 mm, comprising of modular load bearing floor panels supported on G.I. rectangular stinger frame work and G.I. Pedestal etc. all complete, as per the architectural drawings, as specified and as directed by Engineer-in-charge consisting ofa) Providing at required spacing to form modular framework, pedestals made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mm x 100mm x 3mm at the bottom of the pedestal tube, G.I. pedestal head of size 75mmx75mmx3.5 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto 50mm, locking and stabilizing the pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) throughbase plate using epoxy based adhesive of approved make or the machine screw with rawl plug.b) Stringers system in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterruptedclearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge. c) Providing and fixing Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones.The top and bottom plates of Steel Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20 welds along each flange). The panel should be corrosion resistant epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with Pyrogrip noncombustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm.The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without	sqm	58.194

	collapse in the centre of the panel which is placed on four steel blocks.The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and, an impact load of 50kg all complete as per the approved manufacturers specification and as per the direction of Engineer-in-charge. All specification must be printed on the side of the panel to ensure the quality of the product: 300 mm Finished Floor Height (FFH)		
8.7	**FLAMED GRANITE FLOORING (IN PARKING AREAS)** Providing and laying flamed finish Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : Flamed finish granite stone slab Jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.	sqm	708.41
8.8	**GRANITE FLOORING** Providing and laying Polished Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand), laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge: Polished Granite stone slab jet Black, Cherry Red, Elite Brown, Cat Eye or equivalent.	sqm	1382.93
8.9	**TEXTURE LAMINATED WOODEN FLOORING** Providing and laying of 8mm thick AC5 grade textured laminated wooden flooring (as/ EN 13329) , including 100mm high skirting with 0.2mm thick direct laminate on top of specially developed substrate core of planks size 1288mm x196mm having smart lock tongue and grove construction with edges dullly impregnated to secure long lasting joints secure together confirm to EN 13329. the approved decorplanks to be placed on a 0.2 mm thick alkali resistant polyethylene foam (density 3920-935kg/m3) with a 1.5mm thick extruted polythylene foam(density 30-32 kg/m3) on top to secure the floating floor to resist any moisture movement from the sub floor on top to secure the floating instalation . the skirting is to be secured with the help of matching wall based ,60mm high, with t-profile &reducer/ beading . the instalation at site has to be done by company trained and approved inatallers. all complete as per instructions from engineer-in-charge. (the item icludes skirting &all necessary profiles,beading etc. complete in all respect).	SQM	259.86
8.10	**VINYL FLOORING** Sports flooring of Vinyl flooring polaris consists of following specifications for Badminton court, General performance sports flooring,shock absorption, vertical deformation,vertical ball behaviour,resistance of rolling load,resistance to wear ,specular gloss having overall thickness 6.5mm weight 4200 g/sqm sheet size 1.5m width & 10m length shall all be conforming to BS EN 14904.h shall all be conforming to BS EN 14904.	SQM	96.00

8.11	Providing and fixing of Glass Reinforced Concrete (G.R.C) Flooring Tiles in approved design, size, texture, thickness, pattern and color. The thickness of the tiles should range between 22 to 25 mm, allowing variance of ±5 mm in accordance with IS: 1237-1980. The tiles should be made with M-40 Grade Concrete mix design having '43' Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by 'BAYFERROX (Germany)' or equivalent. The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz, super plasticizers and integrated water proofers and others. The tiles should be produced with high vibration technology and should have compressive strength equivalent to M-40 Grade@28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs immersion method, less than 8%. The beds where the tiles are to be laid shall be clean, wet and mopped. The bedding for the tiles shall be 20mm thick and with cement mortar 1:3 (1 cement: 3 coarse sand) and it shall be spread properly and the usage shall begin only after 48 hours. GRC Paving TilePattern:-WeatherdaleSize: 12"x12"Colour-Delhi Stone	SQM	991.34
	TOTAL AMOUNT OF FLOORING WORK		
9	**ROOFING**		
9.1	Making khurras 45x45 cm with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate of 20 mm nominal size) over P.V.C. sheet 1 m x1 m x 400 micron, finished with 12 mm cement plaster 1:3 (1 cement : 3 coarse sand) and a coat of neat cement, rounding the edges and making and finishing the outlet complete.	each	28.00
9.2	Providing and fixing thermal insulation of ceiling (under deck insulation) with Resin Bonded Rockwool conforming to IS: 8183, density 48 kg/ m3, 50 mm thick, wrapped in 200 G Virgin Polythene bags fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5mm x 24 gauge wire mesh, for top most ceiling of building.	sqm	1059.00
9.3	Providing and fixing M.S. holder bat clamps of approved design to C.I. or S.C.I. rain water pipes embedded in and including cement concrete blocks 10x10x10 cm of 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) and cost of cutting holes and making good the walls etc. : 100 mm diameter	each	220.00
9.4	Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) Single socketed pipes. 110 mm diameter	metre	440.00
9.5	Providing and fixing on wall face unplasticised - PVC moulded fittings/ accessories for unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion.: Bend 87.5° 110 mm bend.	each	35.00

9.5.(a)	**GYPSUM FALSE CEILING** Providing and fixing false ceiling at all height 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 recomme-nded 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 but excluding the cost of painting with 12.5 mm thick tapered edge gypsum plain board conforming to IS: 2095- Part I	sqm	1449.15
9.6	Providing and fixing to the inlet mouth of rain water pipe PTMT (an Engineering Thermoplastic) grating square (Slit) 150 mm square with a height of 8 mm and weighing not less than 100 gms	each	18
9.7	**PLAIN PANEL SUN LOUVERS**: Providing and fixing Plain Panel Sun Louvers of approved make having approved colour. The system shall consist of panel 84 mm wide X 16mm deep X 0.6mm thick with round edges panel length upto 6 Mtrs. The panel shall be coil coated on a continuous paint line double baked and roll formed enamelled corrosion Resistance Aluminium Alloy AA5050 (Al. Mg.) for higher strength and good roll forming characteristic. The Panel shall be clipped to Aluminium SL-4 panel stringer of Size: 33mm wide and 86mm deep X 0.95mm thick in a standard length of 5 Mtrs, made of double baked enamelled Aluminium Alloy AA 5050 (Al. Mg.) in white colour with cutouts to hold the panel in a module of 86mm C/C. The prongs on SL–4 stringers shall be to accommodate an angle of 21.30 Degrees between two panels. The first stringers shall be fixed at 150mm from both ends & thereafter at a distance of 0.75 to1 Mtr, depending on Wind Load. The Stringer shall be fixed to a suitable sub-structure with Nut/Bolt & Washer. All properties and specifications shall comply with ECCA directives and more specifically EN 1396:1996. Paint Finish: Panel shall be stove enamelled and finished with special three layered coating system of approved make (consisting of first a conversion layer of thickness 800-2000mg/sq mtr, a polyurethane basecoat of 16-20 microns, and a special top coat of polyamide particles of 8-12 microns thick to provide excellent abrasion and damage resistance) in a continuous coil coating process of the approved colour on the exposed side and the reverse side with epoxy.	SQM	85.00
9.8	**GI METAL LAY IN BLACK GROOVE CEILING** Providing & Fixing of GI Metal Suspended Ceiling System - Approved make In Perf. With fleece 600x600x0.5mm (MICROLOOK) EDGE TILES in global white colour to be laid on Black Groove 15mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 38mm. The	SQM	2474.65

	tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%, NRC 0.7. **INSTALLATION:** To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit at 1200mm maximum centre. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centres. **SUSPENSION SYSTEM** accessories supplied by Hilti consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanised steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.		
9.9	**BAFFLE CLOSED** Providing & fixing Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x 25 x 3600mm in Wood grain finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing in multiples of 25mm. Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps. **Installation of U-Grid**: The U profile to be suspended at every 1200mm on-centre using 6mm threaded rod from the structural soffit using U-profile hanger. U-profile splice to be used to join more than one U profiles of length 3.75M. 1st U-Grid Channel must be no more than 400mm from the perimeter. **Installation of Baffles**: Locate the slot for Baffle Hangers in slot of Baffle section at 1200mm centres. Hangers are inserted into the slot, then rotated 90° and fixed into position by tightening the grub screw. Baffle to be lifted into position and hangers engage over lip of U-Grid Channel. Each Hanger to be secured into position by inserting the Locking Clip. Baffles blades to be connected at ends with Baffle Joiner, which are inserted into the top and bottom slots of the Baffle closed profile for alignment only. The bottom Joiner to be located first and fastened on one side only. The top Joiner to be fitted then and secured with grub screws on one side. Then the two Baffle sections shall be joined and the top Joiner is screw fastened on the 2nd Baffle profile. End Caps to be located by pushing the End Cap tongues into Baffle slots.	SQM	116.74

9.10	**CELLIO OPEN CELL 100MM X 100MM 'LAY-IN' ALUMINIUM CEILING WITH 15mm GRID** Providing and fixing in true horizontal level Cellio Open cell Aluminum lay-in ceiling tiles with border panels forming flush-tegular edge of size 600mmx600mmx38mm having Fire Performance CLASS 0/Class 1 (BS 476). The tile of 'Global white' color with cell size 100mm X 100mm shall be laid on white painted Suprafine XL15mm profile grid system comprising Main runners (3000mm), 1200mm and 600mm cross tees with 15mm white flanges and 38mm web height.The grid should be of "Approved" make with 15mm wide T - section flanges color white having rotary stitching on all T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of 100 Kgs. Suspension system is to be of Approved make.INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit by approved hangers at 1200mm maximum centre & not more than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long cross tees centrally between the 1200 mm cross tees. Installation to be carried out by Trained Installation team & Installation should be carried out as per recommended procedure.Perimeter trim to be wall angles, secured to walls at 450 mm maximum centers. SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanized steel of size 26 x 26 x 25 x 1.2mm with a Galvanized Thickness of 80gsm, A pre Straightened Hanger wire of dia – 2.65 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm.The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.	SQM	195.53
9.11	**SOUND SCAPE BLADE 400X1200X40MM** Providing and Fixing Approved SoundScapes – Blades which are 40 mm thick, pre-formed fiberglass blades with sizes of 200X1200mm, 200mmX1600mm, 400X1200mm, 400X1600mm,400X1800mm, 500mm X 1200mm and 500X1600mm with Dura brite finish on all sides and edges, Acoustical performance of 0.65 NRC in standard White color with Light reflectance 87%, or in the color specified by the Architect (Light Ivory, Pale Green, Pastel blue, Traffic Grey, Pale Brown) and Fire Performance Class B – s1, d0 as per En 13501-1.INSTALLATION WITH U-PROFILE HANGER:The U-profile of size 20mmX30mmX3750mm to be suspended based on the on-centre distance between the factory fitted spiral hooks on the blades. The on-centre distance between the factory fitted spiral anchors is length of the blade – 600mm. U profile to be suspended using 6mm threaded rod from the structural soffit no further than 450mm from each wall. U- Profile splice to be used to join longer lengths more than 3.75M. U- Profile hanger kit comprising of Blade hanger and snap hooks to be used to suspend the Blades to the U –profile. Blade hanger to be locked on the U-profile using the Locking clips on the square slots with on centre spacing in multiples of 50mm. Snap hooks to be fixed on the blade hanger. SoundScapes Blades to be installed on the snap hook by inserting the factory fitted spiral hooks into the snap hooks on both sides.Blade connector kit comprising of bottom connector and top connector to be used to join two blades side by side.Installation to be according to the instructions provided by manufacturer.	SQM	205.19

9.12	**SOUNDSCAPE SHAPES - ACOUSTICAL CLOUDS (INDIVIDUAL SUSPENSION)** Providing and Fixing Approved Soundscape - Acoustical clouds which are 30 mm thick, flat glass fibre panels with Humidity Resistance RH 90% & Recycled Content of minimum 30%, come in various shape options like Square and in standard Traffic White colour with LR 90% or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown). or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown). The size and sound absorption details are as below: Square 1200x1200mm 2.48 The back of each panel to have embedded square frame bracket system of 610x610mm in which provisions are already made for integration of installation system for suspension of individual or grouped panels. **INSTALLATION**: The panels to be suspended individually using the Soundscape Deck hanging kit. Each kit to consist of gripper structure anchors, aircraft cables and bottom end cable adjusters. Each panel to be suspended using the aircraft cables which are suspended from the soffit using the gripper structure anchors and its other end passing through the bottom end cable adjuster which are screwed in the 4 corners of the frame bracket system. The height & level of the panels can be adjusted using the bottom end cable adjusters.	SQM	76.00
9.13	**G.I LAY-IN PLAIN** Providing & Fixing of GI Metal Suspended Ceiling System GI Lay In Plain Fleece 600x600x0.5mm (regular) EDGE TILES in global white colour to be laid on 24mm normal Grid 24mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 32mm. The tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%. INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from theadjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers. SUSPENSION SYSTEM accessories supplied by Approved make consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanised steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.	SQM	515.56
9.14	"**WOODWORKS GRILLE WITH DOWEL MADE OF NATURAL BAMBOO WITH 24MM PRELUDE 43 BLACK" SYSTEM** Providing & fixing of woodworks grille with dowel made of natural bamboo with 24mm prelude 43 black exposed grid. The Woodworks (WW) Grille panel of nominal size 57x300x2400mm comprising 6 blades of 57x16x2376mm with on center spacing of 50mm fixed thru dowel of dia-12mm x 300mm with on center spacing of 300mm and additional end dowels at 150mm from both the edges. Ledger of 6.5x24x2400mm to be used for covering face of wall angle. WW Grille should comply with ASTM-E84: Class A and have Relative Humidity of RH70. The panels are UV coated to Natural or Carbonized shades. Optional : Open edges may be covered using "Edge Caps" of 66x19x2400mm and "Blade Junction" of 66x38x2400mm to be used along the connection of two WW Grille Panels.The grid should be of "Approved" make Prelude 43 with 24mm wide T - section flanges Black powder coating having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 43mm for the main runner & the Cross Tees and with a load carrying capacity of 20 Kgs/M2. Black dowel clips of spring steel to be used for fixing panelto suspension system.INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using Approved suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally betweenthe 1200 mm cross tees. Perimeter trim to be wall angles of size 19x19x3000mm, secured to walls at 450 mm maximum centers.	SQM	94.79

9.15	**PORTLAND MAPLE CEILING(WOODWORKS 600X600X18MM MICROLOOK EDGETILES IN RG3003 (RG3) PERFORATION WITH 15mm SUPRAFINE 43 EXPOSED GRID") SYSTEM** : Providing & Fixing of Wooden finished Suspended Ceiling System with Woodworks Microlook edge tiles with 15mm Suprafine 43 exposed grid. The Tile in RG3003 (RG3) perforations having hole diameter as 3mm and open area as 3% with approved laminate finish with 0.7mm matching PVC edge banding and having an NRC of 0.42, Humidity Resistance (RH) of 70%in module size of 600mm x 600mm x 18mm and density of 725 Kgs/M3. The tile shall be laid on Suprafine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs.. The T Sections have a Galvanizing of 90 grams per M2 and need to be installed with Suspension system of Approved make.INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum centre. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally betweenthe 1200 mm cross tees. Perimeter trim to be Armstrong wall angles of size 3000x19x19mm, secured to walls at 450 mmmaximum centers. ARMSTRONG SUSPENSION SYSTEM accessories manufactured and supplied by ArmstrongWorld Industries consisting of M6 Anchor Fasteners with hanger hole, pre Straightened Hanger wire of dia – 2.5 mm of 1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).	SQM	24.34
9.16	**PLAIN PORTLAND MAPLE CEILING (WOODWORKS 600X600X18MM MICROLOOK EDGE TILES IN PLAIN WITH 15MM SUPRAFINE 43 EXPOSED GRID) SYSTEM**: Providing & Fixing of Wooden finished Suspended Ceiling System withWoodWorks Microlook edge tiles with 15mm Suprafine 43 exposed grid. The Tile in Plain with approved laminate finish with 0.7mm matching PVC edge banding, would have Humidity Resistance (RH) of 70% in module size of 600x600x18mm and density of 725 Kgs/M3. The tile shall be laid on Armstrong Suprafine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs. The T-Sections have a Galvanizing of 90 grams per M2 and need to beinstalled with Suspension system of Approved make.INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum centre. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally betweenthe 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mmmaximum centers. SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with hanger hole, pre Straightened Hanger wire of dia – 2.5 mm of 1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).	SQM	47.235
	TOTAL AMOUNT OF ROOFING WORK		

10	**FINISHING**		
10.1	12 mm cement plaster of mix : 1:6 (1 cement: 6 fine sand)	sqm	6188.19
10.2	15 mm cement plaster on the rough side of single or half brick wall of mix : 1:6 (1 cement: 4 fine sand)	sqm	6188.19
10.3	18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 coarse sand) and a top layer 6 mm thick cement plaster 1:3 (1 cement : 3 coarse sand) finished rough with sponge.	sqm	815.91
10.4	6 mm cement plaster of mix : 1:3 (1 cement : 3 fine sand)	sqm	6653.13
10.5	White washing with lime to give an even shade : New work (three or more coats)	sqm	6653.13
10.6	Distemering with oil bound washable distemper of approved brand and manufacture to give an even shade: New work (two or more coats) over and including water thinable priming coat with cement primer.	sqm	2567.62
10.7	Applying one coat of water thinnable cement primer of approved brand and manufacture on wall surface: Water thinnable cement primer	sqm	3950.56
10.8	Finishing walls with water proofing cement paint of required shade : New work (Two or more coats applied @ 3.84 kg/10 sqm).	sqm	195.00
10.9	Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete.	sqm	19029.50
10.10	**LUSTRE PAINT** Providing and applying on all exposed surfaces of beams, ceiling & walls etc. 3 coats of Lustre paint of approved make and shade as per manufacturer specification with a brush or roller after levelling the surface to a smooth finish with the help of putties etc & having base coats of approved primer before applying three coats of paint. Rate to include additional coat of paints in any requried to get smooth and uniform finish.Rate to include scrapping & sand papering for wall, beam & ceiling surfaces. Rate quoted by the contractor shall include necessary cleaning, prperation of surface, centering, scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and provision of suitable platform with railing all around the scaffolding. Only pipe scafflolding is permitted. Scaffolding is mandatory for any height above 1.2 m from floor level. (included in structural glazing item) actual area shall be measured.	sqm	20
10.11	**SPECIAL EFFECT PAINT** : Providing & Applying Special effect or textured paint of approved by Architect Painting the specified area in 3 coats of special effect paint by making the necessary surface of wall to receive the special effect paint as per direction of manufactures of approved quality, shade over one coat of primer and leveling course. Rate to include scrapping wall surfaces, applying Birla putty for proper finish, applying necessary.coat of primer to get firm surface to receive paint. Rate quoted by the contractor shall include necessary cleaning, prperation of surface, centering, scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and provision of suitable platform with railing all around the scaffolding. Scaffolding is mandatory for any height above 1.2 m Rate quoted by the contractor shall include necessary cleaning, prperation of surface, centering, scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and provision of suitable platform with railing all around the scaffolding. Only pipe scafflolding is permitted. Scaffolding is mandatory for any height above 1.2 m.	sqm	276.59

10.12	**CONCRETE PROTECTIVE PAINT** Providing and application of concrete protective paint, including initial coat of priming coat by spray or brush by diluting with water in ratio as specified by manufacturer, followed by two neat coats of finishing without any dilution. Application shall be as reccomended by Manufacturer. Dry Film thickness of one priming coat and two finishing coats shall be 225-250 microns. The datasheet of the concrete protective paint shall be submitted and approved by architect/ HPCL before begining of work. Concrete protective paint of approved make on all ceilings/ RCC extension of approved shade including supply of all materials tools as per direction of engineer in charge. Rate quoted by the contractor shall include necessary centering, provision of suitable platform with railing all around the scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and scaffolding.	sqm	200.00
10.13	**WALLPAPER**: Providing and applying select approved Wall paper of approved make and shade on all surfaces & at all heights including scaffolding, preparing the surface by brushing and brooming down, etc. complete. The dry/wet cleaning of floors etc. after wall paper is to be carried out. Item to include getting mock-up for approved by Architect/ Engineer in charge, all approved gluing as per detailed specifications and approval, all accessories, men material and all lifts, protecting finished surface with min. 20 microns thk polythene sheet till facility handover, finished cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge.	sqm	24.66
10.14	**ARTWORKS ON WALLS:** Providing and arranging Artwork on walls, with any material of selection by architect and fixing Artworks on walls of approved size, select mural mounted as approved by Architect/Engineer-in-charge. all installation & cleaning mt. & all fixing implements complete, with finished products. including protecting exhibits from damage till handover. The art work will be sourced from reputed professionals depending up on the quality of the work with in the basic rate as per approval from EIC/Architect.	sqm	50
10.15	**ROLLER BLINDS**: Providing & fixing of Roller Blinds make of Vista Eco translucent /Eco Blackout/ Sun screen classic Aerolux Non Blackout/ Vyoma Non Blackout, Blind Shade, Color Decided as per site Color matching to be decided by site engineer-in-charge.	sqm	132.36
10.16	**PROVIDING WPM310 (Shelter guard)**: Single Component, flexible, waterproofing and decorative coating. which is UV stable flexible, premixed liquid applied waterproofing membrane. It has been specifically formulated as a general purpose membrane for exposed wall.Membrane shall confirm to : Membrane shall confirm to: Characteristics of liquid Form & colour: Viscous Liquid in standard Colours. Special colours on request at a premium: Specific gravity: Approx. 1.3 g/cm3; Characteristics of cured membrane - Water Vapour Transmission (ASTM E96)at 1.0 mm: 21.9 g/Sqm/24hrs; Tensile strength: AS 1145 - after 28 days dry: 2.1 Mpa, after 14 days UV exposure: 3.0 Mpa, after 2500 Hrs QUV: 5.9 MPa; Elongation at break AS 1145 - after 28 days dry: 460 %, after 14 days UV exposure: 315 %, after 2,500 Hrs QUV: 180 %; Overcoat time: 4 hrs @ 23 Deg C 50 % RH; Dry through (2nd coat): 24 hrs @ 23 Deg C 50% RH; Application temperature: 10 Deg C to 35 Deg C; Service temperature: 0 to 60 Deg C; VOC Content: 100g/L.	sqm	1720.20
	TOTAL AMOUNT OF FINISHING WORK		
11	**DISMANTLING & DEMOLISHING**		
11.1	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer - in- charge.	cum	0.05

11.2	Extra for cutting reinforcement bars manually/ by mechanical means in R.C.C. or R.B. work (Payment shall be made on the cross sectional area of R.C.C. or R.B. work) as per direction of Engineerin-charge.	sqm	0.35
	TOTAL AMOUNT OF DISMANTLING & DEMOLISHING		
12	**ROAD WORK**		
12.1	**SUB BASE** Preparation and consolidation of sub-grade power road roller of 8-12 tonne capacity after excavating earth to an average of 22.5 cm depth,dressing to camber and consolidating with road roller including making good the undulations etc. and rerolling the subgrade and disposal of surplus earth with lead upto 50 meters	sqm	1787.39
12.2	**KERBS CHANNEL** Providing , laying and making kerb channel 30 cm wide and 50 mm thick with cement conc. 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75mm bed of dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand , including finishing the top smooth etc.complete & as per direction of Engineer-in-charge.	sqm	84.54
12.3	Providing and laying 60mm thick factory made paver block of M-30 grade made by block making paver block of M-30 grade made by block making machine with strong vibratory compaction of approved size,design and shape,laid in required colour and pattern over and including 50mm thick compacted bed of coarse sand,fillingthe joints with fine sand etc.all complete as per direction of Engineer-in-charge.	sqm	70.45
12.4	Providing and laying C.C. pavemanent of mix M-25 with ready mixed conc. from batching plant.The ready mixed conc. Shall be laid and finished with screed board vibrator,vaccum dewatering process and finally finished by floating,brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge.(The panel shuttering work shall be paid for seprately.) (Note : Cement content considered in this item is @ 330 kg/cum. Excess/less cement used as per design mix is payable/recoverable separately)	cum	357.48
12.5	Construction of granular sub- base by providing close graded Material conforming to specification , mixing in a mechanical mix plant at OMC ,carriage of mix material by tippers to work site , for leads and 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 specification and direction of Engineer-in -charge With material conforming to GRADE-II(size range 53mm to 0.075mm) having CBR Value-25.	cum	268.11
	TOTAL AMOUNT OF ROAD WORK		
13	**SANITARY INSTALLATIONS**		
13.1	**KITCHEN SINKS** Providing and fixing Stainless Steel A ISi 304 (18/8) kitchen sink as per IS: 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required : Kitchen sink with drain board 510x1040 mm bowl depth 250 mm.	each	16.00
13.2	**MIRRORS OF TOILET** Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	each	36.00

13.3	Supply, installation, testing and commisioning of PP mineral filled low noise pipes and fittings,with push fit rubber ring sockets pipes and fittings of confirming to EN12056,with density 1.9gm/cm3 . Piping is to be suspended from ceiling level & fixed on ceiling with necessary cutting to the required length including short pieces assorted fittings such as Bend -Plain or with door/Swept Tee with or without door, 45° bends, collers, cowls etc. should have B1 fire classification according to EN4102 and is hot water resistant up to 95º C for short term loading & 90º C long term loading and has chemical resitance of pH 2-12 and completly provides sound protection and giving water tightness test for all the piping (refer technical specifications for additional details.) The rate shall include chasing of walls, laying of pipes as per standard working procedures. All the internal drainage pipes are to be suspended below the ceiling level and the pipes are to be supported by modular clamps. The rate includes the cost of all types of clamping and no other separate rate shall be given. The supports required for the Pipes should be made up of cold rolled steel of quality DX51 or greater with minimum GSM of 275 or greater and should have universal mounting slot on the front of the rail for accurate positioning of fasteners and system compatible round and long holes on back of the rail the pipe. The pipe clamps should be either split type with EPDM inner rubber lining or should be MSS-SP manufactured with FM approval and UL listing. Threaded rods should be of 4.8 strength class or greater and necessary accessories such as Hexagonal Nuts and Bolts should be of 8.8 strength class.		
13.3(a)	DN 110 mm o/d PP mineral filled SWR pipe (To be used for connection of Wc Soil Stack Vertical Stacks)	metre	200
13.3(b)	DN 75 mm o/d PP mineral filled SWR pipe	metre	264
13.3(c)	DN 50 mm o/d PP mineral filled SWR pipe (To be used for connection of Floor Drain to Trap)	metre	76
13.4	Supplying and fixing approved make UPVC multi inlet floor trap with 75mm dia outlet and C.P. cover on top etc., complete with cement concrete support alround the floor trap.	each	69
13.5	**European Water closet** Providing and fixing approved make collection, white wall hung glazed EWC soft seat Cover of reputed brands as approved by Architect / Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	1.00
13.6	Providing and fixing approved make collection wall hung glazed 100 % Rimless EWC soft seat Cover of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	36.00
13.7	Providing and fixing Conceal Single piece concealed cistern of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.8	Providing and fixing Control plate of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.9	Providing and fixing health faucet brass with double lock 1m brass plated flexible hose and wall hook of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00

13.10	Providing and fixing 2 way bib cock with wall flange and flow restricator of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.11	Providing and fixing concealed brass body of stop cock for 15mm pipeline of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.12	Providing and fixing exposed part kit of concealed stop cock with fitting sleeves , operating lever and adjustable wall flange of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.13	Providing and fixing C.P. toilet paper holder of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good ethe walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.14	Providing and fixing Concealed brass body of Hi-Flow single lever Concealed mixer and divertor for bath and shower system with divertor assemble and cartridge sleeve of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.15	Providing and fixing Single lever Exposed Part kit of HI-flow Divertor consisting of operating lever, knob and wall flange of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.16	Providing and fixing Element bath spout with wall flange of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.17	Providing and fixing Shower arm round heavy casted 450mm Long with 90 degree bend suuitable and wall flange of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.18	Providing and fixing Overhead shower 120mm round shape single flow(ABS body chrome plated) of reputed brands as approved by Architect/ Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge/Architect.	each	6.00
13.19	Providing and fixing Towel shelf with lower hanger of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.20	Providing and fixing shower basket ,stainless steel,silver 51cm ,hanging shower caddy,chromium plated , 54x25.3x10.9 cm of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	3.00

13.21	Providing and fixing of electric Water heater (25 ltrs.) of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	5.00
13.22	Providing and fixing of Bib cock self closing pressmatic wall mounted basin tap with wall flange and flow restrictor of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.23	Providing and fixing of Rubbic, italian collection table top wash basin 48x37.5x140mm of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.24	Providing and fixing of Waste coupling full thread 32 mm of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.25	Providing and fixing of bottle trap 32mm with 300mm Long wall connection pipe and wall flange of reputed brands as approved by Architect /Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.26	Providing and fixing of Single towel rail of reputed brands as approved by Architect/ Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	6.00
13.27	Providing and fixing of pure stainless steel push button 1000 ml liquid soap dispensor of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	37.00
13.28	Providing and fixing of Aquisense sensor concealed type flushing valve for urinal of reputed brands as approved by Architect/ Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	13.00
13.29	Providing and fixing of Dyna , Hindware itallian collection urinal of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	13.00
13.30	**MIST ROOM FRESHNER** Providing and fixing of Room freshner of reputed brands as approved by Architect/ Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	16.00
13.31	**SINK TAP**: Providing and fixing of sink mixer swivel spout wall mounted of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	16.00

13.32	Providing and fixing of stainless steel grating frame of 18 gauge thick with circular perforation of 'approved pattern over CI 'traps. The grating size shall be 125 mm dia '(as directed) and shall 'be set in cement, sand mortar 1:5 reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	114.00
13.33	Providing and fixing of SS Grab bar 600mm long of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	3.00
	TOTAL AMOUNT OF SAINTARY INSTALLATION		
14	**WATER SUPPLY**		
14.1	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 testing of joints complete as per direction of Engineer in Charge.		
14.1 (a)	20 mm nominal dia Pipes.	metre	66.00
14.1 (b)	32 mm nominal dia Pipes	metre	12.00
14.1 (c)	40 mm nominal dia Pipes	metre	18.00
14.1 (d)	50 mm nominal dia Pipes	metre	92.00
14.2	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, i/c 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. Concealed work, including cutting chases and making good the walls etc.		
14.2(a)	20 mm nominal dia Pipes	metre	152
14.2(b)	25mm nominal dia Pipes	metre	45
14.2(c)	32 mm nominal dia Pipes	metre	90
14.3	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply including all CPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step CPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge.: 50 mm nominal dia Pipes	metre	350
14.4	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) : 50 mm nominal bore	each	4
14.5	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete :		
14.5(a)	20 mm nominal bore	each	7
14.5 (b)	25 mm nominal bore	each	1
14.5 (c)	32 mm nominal bore	EACH	19

14.6	Constructing masonry Chamber 60x60x75 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 coarse sand) for sluice valve,with C.I. surface box 100mm top diameter, 160 mm bottom diameter and 180 mm deep (inside) with chained lid and RCC top slab 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 coarse sand) 12 mm thick, finished with a floating coat of neat cement complete as per standard design, with common burnt clay F.P.S.(non modular) bricks of class designation 7.5	each	22
14.7	Providing and laying S&S Centrifugally Cast (Spun) / Ductile Iron Pipes conforming to IS : 8329 : 100 mm dia Ductile Iron Class K-7 pipes	metre	280
14.8	Providing, Stringing out, cutting, Jointing and testing of ISI Marked D.I. Pipe (S&S) as per IS 8329 and laying the same in trenches to correct alignment and gradients, jointed with rubber tyton joints fitted complete including all cartage. 80mm i/d pipe lines laid complete	metre	250
14.9	Providing and fixing of 50mm brass ball valve pn 25 of reputed brands as approved by Architect /Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects.	each	5
14.10	Providing and fixing 100mmx50mm PVC saddle clamp threaded suitable for installation on the distribution pipe for tapping of water connection to individual buildings complete in all respects.	each	10
14.11	Providing & fixing 100 mm i/d sluice valves flanged C.I/D.I Flanged end, stem of SS (AIS 1410) and Bronze (gunmetal) working parts Sluice Valves ISI marked 148462000, including jointing , testing & cost of Nut, Bolt & insertion sheet, all carriage complete (with the approval of Engineer in-charge).	each	12
14.12	Supply, installation, testing and commissioning of a set of hydro-pneumatic horizontal inline water transfer pump set, skid mounted with PLC panel , for domestic water with single floating VFD suitable for automatic operation and delivering the specified discharge at the specified head. Each Pump shall be of Cast Iron casing in along with NRV & ball/butterfly valves at suction & delivery line, impeller and shaft in SS 304 and shaft and sleeve with mechanical seal capable of delivering suitable capacity and connected by a flexible coupling to a totally enclosed fan cooled (TEFC) induction motor as per IEC standard.Th motor should be IE3. The set shall be complete with all the required valves , NRV's on suction and discharge, complete with GI suction and delivery header piping of suitable size. The motor shall be suitable for 415 ± 10% volts, 3 phase, 50 Hz A.C. power supply. The set shall include an automatic control panel and presssure tank of capacity 200 ltrs. with common base frame and complete connecting accessories. The set shall be completely equipped with floating variable frequency drive for automatic operation as per load requirements and will run alternately in sequence in cascade mode based on water demand. The pump set includes pressure switch along with dry running preventer. No. of pumps - 2 working + 1 standby Head - 65 mtrs Flow - 330 LPM	SET	1
14.13	Providing & fixing 100 mm i/d sluice valves flanged C.I/D.I Flanged end, stem of SS (AIS 1410) and Bronze (gunmetal) working parts Sluice Valves ISI marked 148462000, including jointing , testing & cost of Nut, Bolt & insertion sheet, all carriage complete (with the approval of Engineer in-charge).	each	5
14.14	Providing and fixing 25x600x6mm pipe , puddle 200x200x6mm , both side MS puddle flanged , 600mm long puddle flanges fabricated out of 6mm thick M.S. plates along with flanges of suitable size properly fixed in walls and top slabs of overhead tanks.		

14.14 (a)	25mm dia	each	2
14.14 (b)	32mm dia	each	5
14.14 (c)	50mm dia	each	7
14.14 (d)	80mm dia	each	3
14.14 (e)	100mm dia	each	1
14.15	Providing & fixing MS vent pipe 100 MM dia C.C.I. (spun) socketed soil, waste and vent pipe 1.80 metres long: 100 mm dia. complete with 2 Nos. bends & painting with enamel paint all complete. (For OHT)	each	3
14.16	Providing & fixing ManHole Cover of size 560mm dia of reputed brands as approved by Architect/Engineer-in-charge . Rate shall be inclusive of cutting, grooving making good the walls, men material and lift up to G+6 story building, installed complete. Item to be completed in all respects. 560mm dia	each	3
14.17	Providing & fixing of 20 & 32mm dia Pipe Clamps	each	39
14.18	Providing & fixing of 40 & 50mm dia Pipe Clamps	each	54
	TOTAL AMOUNT OF WATER SUPPLY		
15	**DRAINAGE**		
15.1	Providing and fixing square-mouth uPVC gully trap complete with grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design: 180x100 mm size P type, with common burnt clay F.P.S. (non modular) bricks of class designation 7.5.	each	30
15.2	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 :		
15.2 (a)	450 mm dia. R.C.C. pipe	metre	550
15.2 (b)	600 mm dia. R.C.C. pipe	metre	60
15.3	Constructing brick masonry manhole in cement mortar 1:4 (1 cement : 4 coarse sand) with R.C.C. top slab with 1:1.5:3 mix (1 cement : 1.5 coarse sand (zone- III) : 3 graded stone aggregate 20 mm nominal size), foundation concrete 1:4:8 mix (1 cement : 4 coarse sand (zone- III) : 8 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand) finished with floating coat of neat cement and makingchannels in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size) finished with a floating coat of neat cement complete as per standard design :		
15.3(a)	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 common burnt clay F.P.S. (non modular) bricks of class designation 7.5.	each	20
15.3(b)	Inside size 120x90 cm and 90 cm deep including C.I. cover with frame (medium duty) 500 mm internal diameter, total weight of cover and frame to be not less than 116 kg (weight of cover 58 kg and weight of frame 58 kg) : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5.	each	26
15.4	Extra for depth for manholes :		
15.4(a)	Size 90x80 cm: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	metre	10
15.4(b)	Size 120x90 cm: With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	metre	15

15.5	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 23 mmx25 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 the bend test and chemical resistance test as per specifications and having the bend test and chemical resistance test as per specifications and having 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.	each	132
15.6	Constructing brick masonry road gully chamber 50x45x60 cm with bricksin cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450 mm pre-cast R.C.C. horizontal grating with frame complete as per standard design : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5	each	44
15.7	Constructing brick masonry chamber for underground C.I. inspection chamber and bends with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) C.I. cover with frame (light duty) 455x610 mm internal dimensions, total weight of cover with frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg), R.C.C. top slab with 1:1.5:3 mix (1 cement : 1.5 Fine sand : 3 graded stone aggregate 20 mm nominal size), foundation concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm nominal size), inside plastering 12 mm thick with cement mortar 1:3 (1 cement : 3 coarse sand), finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete as per standard design: Inside dimensions 500x700 mm and 45 cm deep for pipe line with one or two inlets : With common burnt clay F.P.S. (non modular) bricks of class designation 7.5.	each	60
15.8	Extra for depth beyond 45 cm of brick masonry chamber: For 500x700 mm size. With common burnt clay F.P.S. (non modular) bricks of class designation 7.5.	metre	20
15.9	Providing and laying Non Pressure NP-3 class (Medium duty) R.C.C. pipes including collars/spigot jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete. 450 mm dia RCC pipes. metre	metre	80
15.10	Providing and laying of tibba sand 100mm thick all around the uPVC sewer pipe for cushioning before refilling the trench with soil to protect it against damages during re-filling.	cum	20
15.11	Supply, installation, testing and commissioning of a set of hydro-pneumatic horizontal inline water transfer pump set, skid mounted with PLC panel , for domestic water with single floating VFD suitable for automatic operation and delivering the specified discharge at the specified head. Each Pump shall be of Cast Iron casing in along with NRV & ball/ butterfly valves at suction & delivery line, impeller and shaft in SS 304 and shaft and sleeve with mechanical seal capable of delivering suitable capacity and connected by a flexible coupling to a totally enclosed fan cooled (TEFC) induction motor as per IEC standard.Th motor should be IE3. The set shall be complete with all the required valves , NRV's on suction and discharge, complete with GI suction and delivery header piping of suitable size. The motor shall be suitable for 415 ± 10% volts, 3 phase, 50 Hz A.C. power supply. The set shall include an automatic control panel and presssure tank of capacity 200 ltrs. with common base frame and complete connecting accessories. The set shall be completely equipped with floating variable frequency drive for automatic operation as per load requirements and will run alternately in sequence in cascade mode based on water demand. The pump set includes pressure switch along with dry running preventer. No. of pumps - 2 working + 1 standby Head - 65 mtrs Flow - 200LPM	Each depth of 0.30 mtr Set	1

15.12	Providing, laying in trenches to correct gradient and alignment and jointing of UPVC Foam core pipes confirming ISI specification IS : 16098 (Part-1) : 2013 class- SN-4 & SN-8, laying the same in trenches to correct alignment and gradients, cutting and jointing, testing for water tightness and making good the leakages and defects including cost of specials (Specials and Solvent should be of same make as that of pipes) complete in all respects.		
15.12(a)	160 mm o/d pipes : SN-8	metre	984
15.12(b)	200 mm o/d pipes : SN-8	metre	296
15.12(c)	110 mm o/d pipes : SN-8	metre	625
	TOTAL AMOUNT OF DRAINAGE WORK		
16	**PILE WORK**		
16.1	Boring, providing and installation bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by percussion drilling using Direct mud circulation (DMC) or Bailer and chisel technique by tripod and mechanical Winch Machine all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap). Note: Truck Mounted rotary/TMR/Tubewell boring machine shall not be used .		
16.1(b)	600 mm dia piles	metre	6450.00
16.2	Vertical load testing of piles in accordance with IS 2911 (Part IV) including installation of loading platform by Kentledge/Anchor piles method and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification & the direction of Engineer in-charge. Note: 1. Initial and Routine Load Test shall not be carried out by Dynamic method of testing. Note: 2. Testing agency shall submitt the design of loading platform for the approval of Engineer-in-charge. Single pile above 50 tonne and upto 100 tonne Safe capacity.:		
16.2.1	Initial test (Test Load 2.5 times the Safe capacity)	per test	1.00
16.3	Routine test (Test Load 1.5 times the Safe capacity)	per test	4.00
	TOTAL AMOUNT OF PILE WORK		
17	**WATER PROOFING**		
17.1	Providing and laying water proofing treatment in sunken portion of WCs, bathroom etc., by applying cement slurry mixed with water proofing cement compound consisting of applying : First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/ sqm. This layer will be allowed to air cure for 4 hours. Second layer of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement compound @ 0.126 kg/sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. (The rate includes preparation of surface, treatment and sealing of all joints, corners, junctions of pipes and masonry with polymer mixed slurry.)	sqm	170.86

17.2	Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations : a) Applying a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300 mm height including cleaning the surface before treatment. b) Laying brick bats with mortar using broken bricks /brick bats 25 mm to 115 size wiht 50 % of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer -in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of juncitons of walls and slabs. (c) After two days of proper curing applying a second coat of cement slurry using 2.75 kg/ sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin- charge. (d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineerin- charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3 mm deep. (e) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test."All above operations to be done in order and as directed and specified by the Engineer-in-Charge :With average thickness of 120 mm and minimum thickness at khurra as 65 mm.	sqm	1059.00
17.3	Providing and applying integral crystalline dry shake of hydrophilic in nature for waterproofing treatment to the RCC structures like basement raft, foundation slab, sewage & water treatment plant slab, warehouses floor, parking structures and water tank base slab etc. sprinkled @ 0.60kg per sqm or higher as recommended by the manufacturer's specification over the lean concrete of above cited structures. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 85%, compared control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline dry-shake shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-incharge. The product performance shall carry guarantee for 10 years against any leakage.	sqm	188.25
	TOTAL OF WATER PROOFING		
18	**STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL**		
18.1	Providing and supplying aluminium extruded tubular and other aluminium sections as per the architectural drawings and approved shop drawings , the aluminium quality as per grade 6063 T5 or T6 as per BS 1474,including super durable powder coating of 60-80 microns conforming to AAMA 2604 of required colour and shade as approved by the Engineer-in-Charge. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminium frame work. Nothing extra shall be paid on this account). The weight of aluminium extruded section shall be taken for purpose of payment.	Kg	14070.12

18.2	Designing,fabricating,testing,protection,installing and fixing in position semi (grid) unitized system of structural glazing (with open joints) for linear as well as curvilinear portions of the the building for all heights and all levels , including : (a) Structural analysis & design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)-cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation & drainage and protection against fire hazard including: (b) Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimentional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry / structural steel framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers. (c) Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment, including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass. (d) Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight. (e) Making provision for drainage of moisture/ water that enters the curtain glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary holes of required sizes and of required numbers etc. complete. This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, T&P, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working structural glazing as specified, cleaning and protection till the handing over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer- in-Charge. Note:- 1. The cost of providing extruded aluminium frames, shadow boxes, extruded aluminium section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this subhead. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the external face shall be measured in sqm. up to two decimal places. Note:-2. The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accreditated by NABL(National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. Cost of testing is payable separately. The NIT approving authority will decide the necessity of testing on the basis of cost of the work, cost of the test and importance of the work. Performance Testing of Structural glazing system Tests to be conducted in the NABL accredited lab or by any other accreditation body which operates in accordance with ISO / IEC 17011 and accredits labs as per ISO/ IEC 17025. 1. Performance Laboratory Test for Air Leakage Test (-50pa to - 300pa) & (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr. 2. Static Water Penetration Test. (50pa to 1500p) as per ASTME- 331-09 testing method for a range up to 2000 ml. 3. Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01- 05 testing method for a range upto 2000 ml. 4. Structural Performance Deflection and deformation by static air pressure test (1.5 times design wind pressure without any failure) as per ASTME-330-10 testing method for a range upto 50 mm. 5. Seismic Movement Test (upto 30 mm) as per AAMA 501.4- 09 testing method for Qualitative test, Tests to be conducted on site. 6. Onsite Test for Water Leakage for a pressure range 50 kpa to 240 kpa (35psi) upto 2000 ml.	sqm	1503.78

18.3	Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6-12- 6 mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade, an inner Heat strengthned clear float glass 6mm thick, spacer tube 12mm wide, dessicants, including primary seal and secondary seal (structural silicone sealant) etc. all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The IGUs shall be assembled in the factory/ workshop of the glass processor. (Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.11.2) For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm. (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Airgap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m2 degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.	sqm	601.51
18.4	**ALUMINIUM COMPOSITE PANEL (ACP)(4 MM THICKNESS)** Designing, fabricating, testing, installing and fixing in position Curtain Wall with Aluminium Composite Panel Cladding, with open grooves for linear as well as curvilinear portions of the building , for all heights and all levels etc. including: (a) Structural analysis & design and preparation of shop drawings for pressure equalisation or rain screen principle as required, proper drainage of water to make it watertight including checking of all the structural and functional design. (b) Providing, fabricating and supplying and fixing panels of aluminium composite panel cladding in pan shape in metalic colour of approved shades made out of 4mm thick aluminium composite panel material consisting of 3mm thick FR grade mineral core sandwiched between two Aluminium sheets (each 0.5mm thick). The aluminium composite panel cladding sheet shall be coil coated, with Kynar 500 based PVDF/ Lumiflon based fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc. (c) The fastening brackets of Aluminium alloy 6005 T5 / MS with Hot Dip Galvanised with serrations and serrated washers to arrest the wind load movement, fasteners, SS 316 Pins and anchor bolts of approved make in SS 316, Nylon separators to prevent bi-metallic contacts all complete required to perform as per specification and drawing The item includes cost of all material & labour component, the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working curtain wall with aluminium composite panel cladding, cleaning and protection of the curtain wall with aluminium composite panel cladding till the handing over of the building for occupation. Base frame work for ACP cladding is payable under the relevant aluminium item.s The Contractor shall provide curtain wall with aluminium composite panel cladding, having all the performance characteristics all complete , as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge. However, for the purpose of payment, only the actual area on the external face of the curtain wall with Aluminum Composite Panel Cladding (including width of groove) shall be measured in sqm. up to two decimal places.	sqm	902.27

18.5	**OPENABLE PANEL** Extra for openable side/top hung vision glass pannel (IGU) including providing and supplying at site all accessories and hardware for the openable pannel as specifide and of the approved make such as heavy duty stainless steel friction hinges min 4-point cremone locking sets with stainless steel plates , handles buffers etc. including necessary stainless steel screws /fstners nuts.bolts washers etc. all complete as per architecture drawings as per the approved shop drawings, as specified and as directed by the engineer in charge.	sqm	64.8
	TOTAL AMOUNT OF STRUCTURAL GLAZING ALUMINIUM COMPOSITE PANEL		
(A)	TOTAL OF CIVIL WORK, INTERIOR WORK, ROAD WORK AND PUBLIC HEALTH WORK	(a+b+c+d+e+f+g+h+i+j +k+l+m+n+o+p+q+r)	
	INTERNAL ELECTRICAL ESTIMATE		
19	**Internal Wiring**		
19.1	Wiring for light point/ fan point/ exhaust fan point/ call bell point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed steel conduit, with modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required. Group B	Point	2047
19.1(a)	Wiring for circuit/ submain/Light Plug/ Power Plug wiring alongwith earth wire with the following sizes of FRLS PVC insulated copper conductor, single core cable in surface/ recessed steel conduit as required. 2 X 1.5 Sq mm + 1 X 1.5 Sq mm earth wire (for LP & SB) (40 x 4.5 x 63) x1 = 11340)	metre	2208
19.1(b)	2 X 2.5 Sq mm + 1 X 2.5 Sq mm earth wire (for PP) (40 x 4.5 x 9) x1 = 1620	metre	9600
19.1 (c)	2 X 4 Sq mm + 1 X 4 Sq mm earth wire (for AC) (40 x 8.5 x 3) x 1 = 1020	metre	800
19.2	Wiring for twin control light point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable in surface / recessed medium class PVC conduit, 2 way modular switch, modular plate, suitable GI box and earthing the point with 1.5 sq.mm FRLS PVC insulated copper conductor single core cable etc. as required.	Point	56
19.3	Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit alongwith 1 No. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required. (PP for AC157+ PP190=347X15=8655)	metre	5200
	TELEPHONE, TV POINTS		
19.4	Supplying and drawing following pair 0.5 mm dia FRLS PVCinsulated annealed copper conductor, unarmored telephonecable in the existing surface / recessed steel / PVC conduit as required. 2 Pairs (80Tel points 80X15=1200)	metre	1200
19.5	Supplying and drawing co-axial TV cable RG-6 grade, 0.7 mm solid copper conductor PE insulated, shielded with fine tinned copper braid and protected with PVC sheath in the existing surface/ recessed steel/ PVC conduit as required.(40x15=600)	metre	250
19.6	Supplying and fixing of following sizes of medium class PVC conduit along with accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required. 25 mm (for telephone / TV cable/Lan cable) 1200+210+3200=4610	metre	4610
19.7	Supplying and fixing following modular switch/ socket on the existing modular plate & switch box including connections but excluding modular plate etc. as required.		
19.7 (a)	5/6 A switch	each	387

19.7 (b)	15/16 A switch	each	157
19.7 (c)	3 pin 5/6 A socket outlet	each	387
19.7 (d)	Telephone socket outlet	each	80
19.7 (e)	TV antenna socket outlet	each	14
19.7 (f)	Bell push	each	20
19.8	Supplying and fixing two module stepped type electronic fan regulator on the existing modular plate switch box ncluding connections but excluding modular plate etc. as required.	each	192
19.9	Supplying and fixing modular blanking plate on the existing modular plate & switch box excluding modular plate as required	each	540
19.10	Supplying and fixing following size/ modules, GI box along with modular base & cover plate for modular switches in recess etc. as required. 1 or 2 Module (75 mmX75 mm) for TV/Tel points	each	94
19.11	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 3 pin 5/6 A modular socket outlet and 5/6 A modular switch, connections etc. as required.	each	750
19.12	Supplying and fixing suitable size GI box with modular plate and cover in front on surface or in recess, including providing and fixing 6 pin 5/6 A & 15/16 A modular socket outlet and 15/16 A modular switch, connections etc. as required.	each	190
19.13	Installation, testing and commissioning of wall bracket /ceiling fittings of all sizes and shapes containing upto two GLS/CFL/ LED lamps per fitting, complete with all accessories including connections etc. as required.	each	750
19.14	Supplying and fixing call bell/ buzzer suitable for single phase, 230 V, complete as required.	each	20
19.15	Installation, testing and commissioning of ceiling fan, including wiring the down rods of standard length (upto 30 cm) with 1.5 sq. mm FRLS PVC insulated, copper conductor, single core cable, including providing and fixing phenolic laminated sheet cover on the fan box etc. as required.	each	192
19.16	Installation of exhaust fan in the existing opening, including making good the damage, connection, testing, commissioning etc. as required. Upto 450 mm sweep	each	31
19.17	Extra for fixing the louvers/ shutters complete with frame for a exhaust fan of all sizes.	each	31
19.18	Wiring for group controlled (looped) light point/fan point/exhaust fan point/ call bell point (without independent switch etc.) with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed steel conduit, and earthing the point with 1.5 sq. mm FRLS PVC insulated copper conductor single core cable etc. as required. Group B	Point	750
20	SHEET METAL DOUBLE DOOR DISTRIBUTION BOARD FOR MCB/ RCBO/ RCCB's: Supplying and fixing following way, horizontal type three poleand neutral, sheet steel, MCB distribution board, 415 V, onsurface/ recess, complete with tinned copper bus bar, neutralbus bar, earth bar, din bar, interconnections, powder painted including earthing etc. as required. (But without MCB/RCCB/Isolator) Approved Make- Schneider (Acti-9), L&T (AU Series), Hager.		
20 (a)	4 way (4 + 12), Double door	each	7
20 (b)	6 way (4 + 18), Double door	each	2
20(c)	8 way (4 + 24), Double door	each	12

20.1 (a)	Supplying and fixing 5 A to 32 A rating, 240/415 V, 10 kA, "C" curve, miniature circuit breaker suitable for inductive load of following poles in the existing MCB DB complete with connections, testing and commissioning etc. as required. Single pole	each	408
20.1 (b)	Double pole	each	10
20.1 (c)	Triple pole	each	2
20.1 (d)	Triple pole and neutral	each	4
20.2 (a)	Supplying and fixing following rating, four pole, (three phase and neutral), 415 V, residual current circuit breaker (RCCB), having a sensitivity current 30 mA in the existing MCB DB complete with connections, testing and commissioning etc. as required. 40A	each	7
20.2 (b)	63A	each	14
	Internal Lighting Fixtures		
21	Supply of Heavy Duty Metallic ventilating exhaust fan 300 mm sweep 900 RPM, complete with blade etc.	each	31
21.1	Supply of Louver shutter size 300mm complete in all respect	each	31
21.2	Supply of Ceiling fan double ball bearing complete with petty material , conopy for errecction as per satisfaction of Engineer in-Charge, approved brand as approved by engineer in-Chare white in colour without fan regulator: Ceiling fan 48" (1200mm)	each	192
21.3 a	Supply and erection of wipro/phillips make cat no. CRCO10R038HP57SLAB Recess mounted LED luminaire 2'x2' square light with minimalist trim and full diffuser. Immaculate led light of approved make.	each	333
21.3 b	Supply,installing testing and commsssioning of wipro/ phillips make 2x2' verge led light cat no. LM29-451-XXX-57-XX High efficiency recess mounted versatile LED luminaire	each	21
21.3 c	Supply,installing testing and commsssioning of Trunk liena 4feet (31091) tubelight of approved make.	each	5
21.3 d	Supply,installing testing and commsssioning of approved make Cob Deep Resseced 7wt light .	Each	48
21.4	Supply,installing testing and commsssioning of approved make 6 W LED downlighter . Recessed mounted round slim panel LED downlighter	each	18
21.5	Supply,installing testing and commsssioning of pendent hanging ceiling lamp.	Each	114
21.6	Supply,installing testing and commsssioning of Led recessed linear light fitting (1200mm length) for making continous linear arrangement including cascading kit etc with aluminium extrusion housing CCT 4000k with system lumen output better than 3200 lumens and system efficacy better than 115 Lumens/watts,driver efficiency better than 85%,PF better than 0.95 CRI better than 80 percent Service Life 50000 Hr@ L70, UGR<19.	Each	77
21.7	Supply,installing testing and commsssioning of 15W Spheris LED - circular LED Downlighter	Each	364
21.8	Supply,installing testing and commsssioning of Surface light 12wt (59152)	Each	130
22	**XLPE/ PVC INSULATED ARMOURED CABLES** Supply & laying of aluminium conductor XLPE/ P.V.C. insulated PVC sheathed armoured and served cable to be laid1 m below ground level including excavation, sand cushioning, covering with sand & bricks and back filling the trench etc., of the required size :		
22.1	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 300sq.mm (3 ½ Core)	mtr	100

22.2	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 185sq.mm (3 ½ Core)	mtr	150
22.3	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 50sq.mm (3 ½ Core)	mtr	200
22.4	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 16sq.mm (4 Core)	mtr	300
23	XLPE/ PVC INSULATED ARMOURED CABLES (LOOSE): Supply & laying of aluminium conductor XLPE/ P.V.C. insulated armoured and served cable to be laid loose in the existing trench or pipe as per PWD General Specifications 2010:-		
23.1	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 185sq.mm (3 ½ Core)	mtr	100
23.2	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 150 sq.mm (3 ½ Core)	mtr	100
23.3	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 120sq.mm (3 ½ Core)	mtr	100
23.4	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 70sq.mm (3 ½ Core)	mtr	500
23.5	Aluminium conductor XLPE/ PVC insulated PVC sheathed armoured and served cable working voltage 1100volts grade 35sq.mm (3 ½ Core)	mtr	100
	ELECTRICAL NS ITEMS		
24	Supply, Carriage and laying of Power Copper Cables, Solid Copper Conductor Upto 6 Sqmm And Balance Stranded Copper, XLPE Insulated, Cores Laid Up, PVC Innersheathed, Unarmoured, Extruded PVC Type ST2 Sheathed, 650/1100 V Grade As Per IS 7098 (Part 1) 1988. The cable is to be laid in existing trench / pipe / duct fixed with suitable clamps as per site requirements including their cost. The work should be completed as per satisfaction of Engineer-in-charge / Architect.		
24.1	4Sqmm 3Core	metre	80
24.2	16Sqmm 4Core	metre	50
24.3	25Sqmm 4Core	metre	30
24.4	35Sqmm 4Core	metre	60
25	**Supply and erection of modular type 25A Switch with indicator and 2Nos. 25A Sockets (for incoming and outgoing supply for stabiliser) on existing modular sheet (Legrand (Arteor) / North-west /Crabtree / MK make) with making connection including cost of copper wire**. Supply, fabrication and carriage of cubical type panel compartmentalized fabricated out of 16G CRCA sheet complete with erection of incoming and outgoing switchgear, supply and erection of busbars meters, indicators, cable end boxes as required. The panel shall be wall mounted as per drawing and site. The panel shall be totally enclosed dust and vermin proof construction with square sections rubber gaskets. The wall mounted panels shall be strictly as per specifications. The busbar will be wrought aluminium E91E grade suitable for 50KA fault level for one second (The fabricator will have to give manufacturer's certificate of E91E grade wrought aluminium busbar). All four busbars should be insulated with colour should PVC heat shrinkable sleeves. The panel should be complete as per the drawing and includes all internal wiring with PVC copper cable of requisite size complete with name plates of each feeder, danger plate, solid bus connections, cable alleys, busbar chamber etc. and other petty material The panel will be powder coated after chemical treatment. The degree of protection panel should be IP54 and should be extendable on both sides. All MCCBs are to be provided with extended rotary handles and spreaders for proper termination of cables. All MCBs are to be 'C' series .	Each	2

26	Main LT Panel (Normal Supply) To be installed in Electrical room at Ground Floor.	Each Panel	1
	INCOMER		
	a) 250A 4P MCCB with thermal magnetic release Ics-50KA = 1No.		
	b) S/E of Multifunctional Meter with CTs 400/5A, 3Phase Indicating lamps with protection MCB including necessary wiring = 1No.		
	c) S/E of 1set of 3Phase Indicating lamps with protection MCB including 3Phase Voltmeter 0-500V with voltmeter selector switch and Ammeter 0-400A with selector switch and necessary wiring = 1set.		
	d) S/E of Bus bar 400A TPN with Al strip E-91 grade with DMC insulators and heat shrink sleeve with extendable provision.		
	OUTGOING		
	a) 200A 4P MCCB with thermal magnetic release Ics-36KA = 1No.		
	b) 100A 4P MCCB with thermal magnetic release Ics-25KA = 3Nos.		
	c) 63A 4P MCB with thermal magnetic release 10KA = 3Nos.		
27	Main DG Panel (Emergency DG Supply) To be installed in Electrical room at Ground Floor.	Each Panel	1
	INCOMER		
	a) 250A 4P MCCB with thermal magnetic release Ics-36KA = 1No.		
	b)S/E of 1set of 3Phase Indicating lamps with protection MCB including 3Phase Voltmeter 0-500V with voltmeter selector switch and Ammeter 0-250A with selector switch and necessary wiring = 1set.		
	c)S/E of Bus bar 400A TPN with Al strip E-91 grade with DMC insulators and heat shrink sleeve with extendable provision.		
	OUTGOING		
	a) 160A 4P MCCB with thermal magnetic release Ics-36KA = 1No.		
	b) 100A 4P MCCB with thermal magnetic release Ics-25KA = 12No.		
	c) 63A TPN MCB 10KA 'C' series = 3No.		
28	DG AC PANEL(Emergency DG Supply)To be installed in Electrical Room top floor.	Each Panel	1
	INCOMER		
	a) 160A 4P MCCB with thermal magnetic release Ics-36KA = 1No.		
	b) S/E of 1set of 3Phase Indicating lamps with protection MCB including 3Phase Voltmeter 0-500V with voltmeter selector switch and Ammeter 0-160A with selector switch and necessary wiring = 1set.		
	c) S/E of Bus bar 250A TPN with Al strip E-91 grade with DMC insulators and heat shrink sleeve with extendable provision.		
	OUTGOING		
	a) 100A 4P MCCB with thermal magnetic release Ics-25KA = 7No.		
	b) 63A 4P MCB with thermal magnetic release 30KA = 3No.		
	NS)Supply and erection of modular type switch socket accessories on existing modular box		
29	MAIN AC PANEL(Normal Supply) To be installed in Electrical Room top floor.	Each Panel	1
	INCOMER		
a	250A 4P MCCB with thermal magnetic release Ics-36KA = 1No.		
b	S/E of 1set of 3Phase Indicating lamps with protection MCB including 3Phase Voltmeter 0-500V with voltmeter selector switch and Ammeter 0-250A with selector switch and necessary wiring = 1set.		

c)	S/E of Bus bar 400A TPN with Al strip E-91 grade with DMC insulators and heat shrink sleeve with extendable provision.		
	OUTGOING		
d	100A 4P MCCB with thermal magnetic release Ics-25KA = 10No.		
e	63A TPN MCB 10KA 'C' series = 3Nos.		
30	Supply, Erection of RJ-45 computer Jack for CAT-6 cable	EACH	128
	TOTAL INTERNAL ELECTRICAL WORK		
ABSTRACT OF COST - ELECTRICAL INSTALLATION WORKS FOR 125KVA DG SET			
31	DG SET	1	each
	SOUND PROOF DG SETS OF 125 KVA		
	"Supply ,installation ,testing and commissioning of 125 KVA water cooled silent DG set comprising of water cooled Diesel Engine developing 156 BHP @ 1500 RPM & 125 KVA alternator rated at three Phase , 415 Volts , 50 Hz: 0.8 P.F. @ 1500 RPM Both mounted , and alighed on a common MS base Frame Complete with MS Fuel tank , Standard AMF Control Panel , Residential Exhaust Silencer , AVM Pads fitted on base frame , 1 nos. 12 Volts DC Battery ,Battery Leads , 1st fill of lube oil all housed in sound proof Acoustic Enclousre as per specification attached as per satisfaction of engineer in-charge Note : The Agency Will provide first filling of full tank Diesel with supply of DG set" DG AMF PANEL supply, installation ,testing and commisioning of DG , cubical type,totally enclosed ,free standing type ,dust ,damp and vermin proof made up of 14/16 SWG CRCA sheet ,complete with busbars, M.V . Danger notice plate,inter connections with suitable capacities aluminium leads / solid aluminium strips / rods ,power coats painted and having incoming and outgoing switchgear as mentioned below and complte as required. 1. All relays to operate at 240 V single phase , 50HZ , AC supply through UPS 2. Panel should be suitable for mannul and autommatic operation (AMF) and shall be complete as required. one no. 250 A auto change over switch for changeover state electricity board power and DG set power incuding by pass facility as approved by the engineer - incharge. 1 no. MCCB as per following details specifiations		
	250 AMP. 415 V , 4 pole MCCB with Microprocessor realse and variable current settings 0.8 to 1.0) with earth fault realese		
	"ON" LED indicating Lamp and 2A control SP MCB		
	Extended rotary operating mechanisum		
	digital energy meter with one set of suitable CTs, CT storting link		
	Digital Ampere Metre of suitable range with suitable set of CTs and ASS		
	Digital Volt meter with VSS and HRC fuse		
	Digital multi function meter to show ,KWH ,KVAH ,P.P and frequency meter one set of suitable CTs , CT shorting links.		
	PROTECTION AND AMF COMPONENTS FOR ABOVE MENTION DG SET		
	Over voltage relay		
	under voltage relay		
	Battery charger (with trickle and boost charging).		
	Digital voltmeter and ammeter.		
	8 window Alarm annuciator with separate hooter , accept ,reset and push button		
	Hooter		
	Engine cranking relay		
	main supply voltage monitor ,alternator voltmeter monitor and engine starting releys		
	Auxillary relays,Timer ,Push button and control fuses		
	Phase sequence relays		

	ENCLOSURE:		
	Fabrication, PVC sleeving ,Control/power wiring and necessary electrical / mechanical interlocking etc. any other item required for proper functioning of the system complete as required		
	Providing and fixing oil tank of suitable capacity complete with suitable M.S Fabricated ,M.S stand oil leve;l indicator gauge tank and stand duly painted complete with float switches etc. including its connetions to the fuel tank of the DG set complete as required		
	The silencer should be minimum 20'-0" long nothing extra shall be paid		
	125KVA DG set with AMF panel mentined as above Model No: 6BTAA5.9G13		
	Earthing of DG Set.		
31.1	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.(2No for DG body earthing)	2	set
31.2	Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.(2No. For DG Neutral earthing)	2	set
31.3	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	50	metre
31.4	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	50	metre
31.5	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.	50	metre
	CONCRETE WORK FOR DG SET FOUNDATIONS		
31.6	Providing & laying in position cement concrete 1:3:6 (1Cement:2Coarse sand :6 graded stone aggregate 20mm nominal size) in foundation of DG sets etc including form work etc as required. (1No DG set+1No CSS 2X6x5X.6Mtr)	36	cum
	TOTAL ELECTRICAL INSTALLATION WORKS FOR 125KVA DG SET		
SCHEDULE NO. 3 - (11KV SUB STATION ETC)			
32.1	Providing and fixing of FIRE EXTINGUISHER ABC Powder type (stored pressure) as per is :15683 complete with all accesories as per manufactures specification.ISI Mark complete in all respect. 4 kg capacity.	Each	4
32.2	Providing and fixing of FIRE EXTINGUISHER CO2 type as per is :15683 complete with all accesories as per manufactures specification.ISI Mark complete in all respect. 4.5 kg capacity	Each	4
32.3	**PCC POLES**		
	Supply and erection of pre-stressed cement concreete pole of suitable length with a given planting depth confirming to IS1678-1978 below ground level in excavated pit of suitable dimensions complete in all respect as per satisfaction of engineer in charge. PCC pole overall length 11metre planting depth 1.83 metre, top dimensions 152.4mmx 203.2mm bottem dimensions 152.4mmx368.3mm load capacity 363Kg and wt 1146Kg.ACSR- Supply and sagging of al conductor steel reinforced (ACSR) on pole including binding with insulators.	Nos.	2

32.4	**GO SWITCH 200A & POLE ACCESSORIES**		
	Supply & erection of 11KV 400-800A GO switch confirming to ISI specifications. The item includes supply and erection of operating pipe and handle arrangement of MS flate 50mmX6mm and chennels 75mmx40mm sheet. The GO switch is to be fitted with locking arrangement so as it locks upward on"ON" position and locks downward in "OFF" position. The entire GO switch assembly/unit should be properly earthed and the job is to be completed as approved by engineer-in-charge.	Nos.	1
32.5	ACSR DOG conductor (100sq mm) Size (6/4.5Al+1/4.5GI)	Mtr	100
32.6(a)	Supply and Erection of MS angle iron size 50mm x 50mm x 6mm thick with cutting, bending and necessary holes as desired by Engineer-in-charge at site.	Mtr	50
32.6 (b)	Supply and erection of MS chennel iron size 100mmx50mmx6mm thick with cutting,bending and necessary holes as desired by engineer in charge	Mtr	50
32.6(c)	Supply and erection of MS flat size 50mmx5mm thick with cutting,bending and necessary holes as desired by engineer in charge	Mtr	50
	XLPE INSULATED HT ARMOURED CABLES		
33	Supply & laying of Circular Aluminium conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanised steel strip armoured and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade to be laid 1 m below ground level including excavation, sand cushioning, covering with sand & bricks and back filling the trench etc., of the required size:- Circular Aluminium conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanised steel strip armoured and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade 70sq.mm (Three Core)	Mtr	50
34	**Earthing of Sub- Station.**		
34.1	Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required.(2No for Transformer body earthing)	Set	2
34.2	Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 metre long etc. with charcoal/ coke and salt as required. (Neutral Earthing)	Set	2
34.3	Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.	metre	50
34.4	Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.	metre	50
34.5	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.	metre	50
34.6	Supply and making outdoor cable termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3X70Sq mm XLPE A conductor cable of 11 KV grade as required.	Each	2
34.7	Supply & Erection of galvanised D iron clamps complete with shakle insulator (100mmx110mm) GI bolts, Nuts and washers, coach screws etc as required.	Set	6
34.8	Supply & erection of 75 mm x 90 mm shackle insulators with G I bolt, nuts and straps etc. as required.	Set	3

34.9	Supply & erection of galvanised stay sets for 11KV over head lines complete with 19/20mm dia 1.8mtr long GI stay rod , anchor plate of size 45cmx45cmx7.7mm thick, thimbles, stay clamps, turn buckle) 20mmx600mm), 7/4,00 mm dia GI Stay wire and 11 KV strain insulator etc in cement concreat 1:3:6 (1 cement: 3 Coarse sand : 6 graded stone aggregate 40mm nominal size) foundation including excavation and backfilling as required.	Set	2
34.10	Supply & erection of 11KV pin insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer incharge.	Set	3
34.11	Supply & erection of 11KV Disc insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. The job is to be completed as approved by engineer incharge.	Set	3
34.12	Supply & erection of 11KV Lightning Arrestors suitable for 3 wire , 11KV overhead lines with rated voltage 9KV(rms) with nominal discharge current rating 5KA and complete with galvanised clamping arrangement G.I. bolts nuts washers etc etc as required confirming to ISI specifications. .A seprate earth to be provided to Lightning arrestor complete as approved by engineer incharge.	Set	1
34.13	Supply & Erection of 11KV / 110V, 30/5A CT/PT Pole mounting type for Metering duly approved by HSEB.	Nos.	1
35	Supply & Erection of 11KV / 110V 630KVA, 11kV Outdoor Package Sub-Station consisting of following , Approved Makes- Schneider, ABB, Siemens	Each	1
	HT Switchgear		
	MV COMPARTMENT 11 KV, 630A, 25KA/1Sec indoor type non-extensible, SF6 gas insulated Ring Main unit with sealed pressure system criterion in accordance with the IEC: 60298,62271 - 202.IAC of 20 kA for 1 s for tank and cable box category IAC-AFL . The indoor non -extensible SF6 insulated RMU consist of 2 No. incomer Isolator and 1 no. outgoing Vacuum Breakers with self powered relay for protection of transformer . Rated for Voltage 12kV, 400A, 25 KA for 1 sec. The Switchgear includes the following HV cubicles with series trip,self powered microprocessor based Over current & Earth Fault (IDMTL + Inst.) relay x 95.sq.mm Al. unarmoured XLPE (E) Cable.		
	protection,Interconnection between HT and Transformer shall be using 1C x 3		
	Transformer		
	630 KVA,11KV/433V,DYn11, ONAN OIL Type, hermetcially sealed Copper wound transformer with corrugated wall design & top bushings for HT & LT with off load tap Changer of rating+5 to -5% @2.5% on HT side of transformer. Magnetic Core: Prime grade of M4 or better. H.V. Impulse withstand voltage (KV peak): 75 kVp.Transformers shall be designed for 110% continuous overfluxing withstand capability. The Losses of Transformer should be as per IS 1180 part 1 Eff level 2 norms		
	LT PANEL		
	LT Indoor panel 433 V air insulated Aluminium busbar having capacity 1000A, 50Hz,50KA withstand fault level capacity, MFM - EM6400NG in incomer . Fabrication using 1.5/2 MM CRCA sheet steel , Ingress protection IP4X , complete with internal wiring.		
	INCOMER cum OUTGOING		
	Incomer - 4 Pole, 1000A, Microporcessor based , Drawout type ACB with O/C, S/C & earthfault release. The fault system of 50kA, Ics=Icu=Icw for 1 sec. Suitable for Isolation as per IEC 60947-2. ACB should have LCD Display (Voltage & Current) with %age loading graph of each phase on release. Tripping time < 30 msec. Outgoing- 4 no MCCBs 250A FP and 2 no MCCB 125 A FP with thermal magnetic release with double break mechanism. APFC Panel- Incomer 1 no MCCB TP Pole 315A Ics= 50kA Thermal magnetic with Double break roto mechanism. Intelligent APFC Relay with 200 kVAr MPP Heavy duty Capacitor with suitable rating of contactors & Short ckt protection device for each banking. Banking of Capacitor should be 12.5 X2 no, 25 X 3no, 50 X 2no.		

	Outdoor Enclosure		
	Outdoor Enclosure :- The enclosure shall be made of 2.0 mm thickness Galvanized Sheet Steel tropicalised to meet Indian weather conditions including all the partition sheets & doors.The base of the enclosure shall be of 4.0 mm thickness Hot Dip Galvanized Sheet Steel to ensure rigidity for easy transport & installation. The entire Package Substation shall be Factory Assemble & Factory Fitted. The enclouser shall have IP54 degree of protection for HT & LT switchgear compatment IP34 degree of protection for Transformer compartment. The Enclosure to be tested for Internal Arc fault test to the tune of atleast 20 KA for 1 second adhering to as per latest IEC 62271-202.The temperature rise test on enclosure for K10class.The enclosure exterior shall be powder courted.The compartment illumination lamp with door operated switch shall be provided for MV & LV comparatment.		
	Interconnection & Earthing		
	Interconnection Between HT switchgear & Transformer using 1Cx3x95Sq.mm XLPE Single core cable & Interconnection between Transformer & LT switchgear using Busbars. Internal earthing connections by GI strips.		
	HT switchgear/Transformer/LT switchgear, MFM, must be of same make.		
	Packge Sub-Station is outdoor plinth mounted type. Civil work for package substation is not in our scope. The Foundation details will be furnished.		
	Package Sub-staion will be complete with the internal interconnections & earthing. Accessories required for the external connections of HT & LT cables like termination kits , lugs , glands etc & extending of earth bar to earth pits is not included in our scope.		
	TOTAL FOR 11KV SUB STATION ETC		
	SCHEDULE NO.2 - FANS & FITTINGS& OTHERS		
36	**SUB STATION LIGHTING**		
36.1	SITC 20W LED 1200mm Batten Light. The Astra Fixture is a surface & wall mounted LED batten with extruded aluminium housing and robust construction . PF>.95, System Wattage LED 20W with Minium 1500 lumens in 5700k.	Each	6
36.2	Supply of energy efficeint AC ceiling fan with 5star rating complete in all respect of approved quality by the Engineer on charge of work. Ceiling Fan 48"	Each	2
36.3	S/E of heavy duty industrial type of Exhaust fan 900 RPM including the cost of making hole in the wall or providing and fixing MS Sheet 14 SWG with painting as per satisfaction of engineer-in charge. (Commercial / industrial model only). Size 300mm sweep, 900 RPM	Each	2
36.4	Supply of louver shutter size 300 mm complete in all respect	Each	2
36.5	SITC Surface Mounted wall light Light. The Fixture should be Made of chrome&metal Housing.PF>.95, System Wattage Tronto E27,24Ww with Minium 1500 lumens in 5700k.	Each	4
36.6	SITC of LED Surface mounted round/square type downlighter. The Fixture should be Made of Extruded Aluminium Housing. Inbuilt Protection of 2kv, PF>.95, integral housing for driver. Minium 100 lumens/W in 5700k.	Each	2
37	**STREET LIGHTING/AREA LIGHTING**		
37.1	SITC 45W LED Street Light. The Fixture should be Made of pressure diecast housing with TOUGHNED GLASS diffuser and indivisual LEDs with secondary optics with IP 66 protection. PF>.95, System Wattage LED 45W with Minium 1500 lumens in 5700k.	Each	20
37.2	SITC Focuslight/Post Light/Bollard Light/ Gate Light. The Fixture should be Made of Dark grey & Glass, Cast Al Metal Spigot Housing with decorative clear opal acrylic diffuser with IP 65 protection. PF>.95, System Wattage LED 40W with Minium 1500 lumens in 5700k.	Each	50

38	**FIDDER PILLER BOX**	Each	1
	Supplying , Installation, testing and commissioning of front and back openable, double door outdoor feeder pillar not less than 800 mm x 500mm x 300 mm depth fabricated out of M.S. sheet of thickness not less than 2 mm having inside door with cut out for operating accessories mounted after opening front and slanting top suitably over hang on all sides, ventilator louvers with wire mesh, earthing bus & stud base mounting angle frame of size 45 mm x 45 mm x 5 mm thick, and concrete / brick foundation cable entry knock out, locking arrangement, rubber gasket suitable for providing & fixing the following switch gear and accessories and 100 Amp TPN aluminium .		
	Busbar, including connection etc. as required		
	A) Incomer : -		
	i) 60-100 AMP, 4 pole, 35 KA, MCCB i/c Rotary Handle(Similar to M/s Schneider-Easypact CVS) - 1 No.		
	B) Outgoing :-		
	i) 40 Amp 3P & N MCB 'C' Series - 2 Nos.		
	ii)32A 3Pole contactors 2No Legrand LC1D40		
	iii) Analogue 24hrs time switch		
	iv) Danger notice plate - 1 set		
	v) Phase indicating lamp (R,Y,B) - 1 set		
	vi) 2.0mm thick FP with 100Amp,4 strip Alu Bus Bar (0.80 x 0.50)		
	vii) 45x45x5mm angle iron frame with CC foundation		
39	**Street Light Poles Earthing**		
39.1	Earthing with G.I. earth pipe 4.5 metre long, 40 mm dia including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe etc. with charcoal/ coke and salt as required.	Each	5
39.2	Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing along with existing surface/ recessed conduit/ submain wiring/ cable as required.	metre	1000
40	**LIGHTNING ARRESTERS ON BUILDING**		
40.1	Providing and fixing of lightning conductor finial, made of 25 mm dia 300 mm long, G.I. tube, having single prong at top, with 85 mm dia 6 mm thick G.I. base plate including holes etc. complete as required.	each	4
40.2	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required.(For horizontal run)	metre	500
40.3	Providing and fixing G.I. tape 20 mm X 3 mm thick on parapet or surface of wall for lightning conductor complete as required. (For vertical run)	metre	500
41	**GALVANIZED STEEL OCTAGONAL POLES FOR WIND VELOCITY OF 160 Km/ HOUR:**		
	Supply and erection of galvanized steel octagonal pole of suitable length conforming to IS 2629/IS 2633/ IS4759. The pole shall be in single piece (single hot dip galvanized) and shall tapered towards the top.The bottom section shall have open able slot with exterior surface door & shall have suitable locking arrangement for housing three phase 4wire cable connection, bakelite sheet, MCB, loop in and out arrangement for incoming/ outgoing cables. There shall also be suitable arrangement for the purpose of earthing. Rigid Base plate of suitable size and thickness shall be welded inside and outside at the bottom of pole with provision for fixing 4 foundation bolts.The octagonal pole shall be bolted on a pre- cast foundation with a set of four foundation bolts for greater rigidity. The foundation shall be erected over cement concrete M20 of given size to fixed up to a required planting depth below ground level as required:-		
	Galvanized octagonal pole overall length 6 metre (sheet thickness 3mm), top dia.(A/F) 70mm and bottom dia. (A/F) 130mm, foundation size below ground level 550mm x 550mm x 1200mm, 4Nos. foundation bolts size 20mm dia., length≥ 600mm with base plate dimensions 220mm x 220mm x 12mm thick.	Each	20
	Supply and erection of single arm bracket 1 metre long for 4 to 6 metre long galvanized octagonal pole, the bracket should be fixed on the top of the pole having top outer dia. 70mm (A/F) complete in all respect as approved by the Engineer-in-charge at site.	Each	20
	TOTAL FOR FANS & FITTINGS& OTHERS		
(B)	TOTAL OF INTERNAL & EXTERNAL ELECTRICAL WORK		

(C). FIRE FIGHITNG, FIRE DETECTION, ACCESS DOOR & CCTV			
SCHEDULE OF QUANTITY FOR FIRE SUPPRESSION WORK			
42.1	Supplying, installation, testing and commissioning of Electric driven Main Fire Pump suitable for automatic operation and consisting of following, complete in all respects, as required : (a) Horizontal type, multistage, centrifugal, split casing pump of cast iron body & bronze impeller with stainless steel shaft, mechanical seal conforming to IS 1520. (b) Suitable HP Squirrel cage induction motor, TEFC, synchronous speed 1500 RPM, suitable for operation on 415 volts, 3 phase 50 Hz, AC supply with IP 55 protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS-325. (c) M.S. fabricated Common base plate, coupling, coupling guard, foundation bolts etc. as required. (d) Suitable cement concrete foundation duly plastered with anti vibration pads. 1620 LPM AT 56 M HEAD Note : The head of the pump is selected in a manner so as to give a minimum 3.5kg/sqcm pressure at the highest/farthest point.	1	set
42.2	Supplying, installation, testing and commissioning of electric driven pressurisation pump suitable for automatic operation and consisting of following, complete in all respects, as required : (Jockey Pump) Horizontal type, multistage, centrifugal pump of cast iron body and bronze impeller with stainless steel shaft,mechanical seal conforming to IS : 1520. Suitable HP squirell cage induction motor TEFC type suitable for operation on 415 volts, 3 phase 50 Hz AC supply with IP 55 class of protection for enclosure, horizontal foot mounted type with Class-'F' insulation, conforming to IS : 325. M.S.fabricated Common base plate, coupling, coupling guard, foundation bolts etc. as required. Suitable cement concrete foundation duly plastered and with anti vibration pads. 180 LPM AT 56 M HEAD:Jockey Pump	1	set
42.3	Supplying, installation, testing and commissioning of diesel engine driven main fire pump suitable for automatic operation and consisting of following, complete in all respects, as required : (Diesel Driven Pump) Horizontal type, multistage, centrifugal pump of cast of iron body and bronze impeller with stainless steel shaft,mechanical seal conforming to IS 1520.Suitable HP, 1500 RPM water cooled with radiator, diesel engine conforming to relevant IS standard complete with auto starting mechanism, 12 /24 volts electric starting equipment, diesel tank, exhaust pipe extended upto 10 m outside pump house duly insulated with 50 mm thick glass wool with 1.0 mm thick aluminium sheet cladding, residential silencer,instruments and protection as per standard specification, stop solenoid for auto stop in the event of fault with audio indications, painted with post office red colour etc. as required. M.S fabricated, common base plate, coupling, coupling guard, foundation bolts etc. as required. Suitable cement concrete foundation duly plastered and with anti vibration pads. 1620 lpm at 56 m Head Note : The head of the pump is selected in a manner so as to give a minimum 3.5kg/sqcm pressure at the highest/farthest point.	1	set
42.4	Supplying and fixing air vessel made of 250 mm dia, 8mm thick MS sheet, 1200 mm in height with air release valve on top and flanged connection to riser, drain arrangement with 25 mm dia gun metal wheel valve with required accessories, pressure gauge and painting with synthetic enamel paint of approved shade as required.	1	set
42.5	Providing & fixing of pressure switch in M.S. pipe line including connection etc. as required.	7	Each
42.6	Providing, laying, testing & commissioning of 'C' class heavy duty MS pipe conforming to IS 3589/IS 1239 including Welding, fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required :		
a	150 mm dia	35	metre
b	100 mm dia	31	metre
c	80 mm dia	6	metre

d	50 mm dia	9	metre
42.7	Providing and fixing S.S Pressure Gauge complete as required complete in all respect. : Dial diameter 150mm calibration 0-16 Kg	11	Each
42.8	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :		
a	150 mm dia	14	set
b	100 mm dia	7	set
c	80 mm dia	1	set
42.9	Providing & fixing ISI Marked Cast Iron Dual Plate Wafer Type Check Valve flanged end class PN-1.6 as per IS with nitrile seat SS shaft & springs in pipe lines including jointing with rubber insertion, nuts, bolts and washers, matching flanges of required thickness, etc. complete in all respects.		
a	150 mm dia	6	Each
b	80 mm dia	2	Each
42.10	Providing, installation, testing and commissioning of stainless steel Y-strainer fabricated out of 1.6 mm thick stainless steel, Grade 304, sheet with 3 mm dia holes with stainless steel flange.		
a	For 200 mm dia	3	each
b	For 150 mm dia	2	each
42.11	Providing & fixing flow switch in following sizes M.S. pipe including connection etc as required. : For 100mm dia	1	Each
42.12	Providing, fixing and jointing Forged Brass Ball valve screwed with SS/BRASS ball & spindle & Teflon seats, on Pipe lines including all carriages complete. : 15mm i/d Brass Ball valves	4	Each
42.13	Providing, fixing, testing & commissioning of installation control valve of cast iron body, brass/ bronze working parts comprising of water motor alarm, bronze seat clapper, clapper arm and hydraulically driven mechanical gong bell to sound continuous alarm when the wet riser/sprinkler system activates, pressure gauges, emergency releases, strainer, pressure switch, cock valve complete with drain valve and bypass, test control box, ball valves, MS pipe of required size, flanges, orifice plate, gasket etc of follwing sizes as required :150mm dia	1	set
	TOTAL OF FIRE SUPPRESSION WORK		
	INTERNAL & EXTERNAL FIRE HYDRANT SYSTEM		
43.1	Providing, laying, testing & commissioning of 'C' class heavy duty MS pipe conforming to IS 3589/IS 1239 including Welding, fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. and fixing the pipe on the wall/ceiling with suitable clamp/support frame and painting with two or more coats of synthetic enamel paint of required shade complete as required :		
a	80 mm dia pipe	33	metre
b	100 mm dia pipe	55	metre
c	150 mm dia pipe	87	metre
43.2	Providing laying, testing & commissioning of 'C' class heavy duty MS Pipe conforming to IS 1239/3589 i/c fittings like elbows, tees, flanges, tapers, nuts bolts, gaskets etc. in ground including welding, excavation & providing cement concrete blocks as supports, anticorrosive treatment with coaltar/asphalt tape as per IS 10221, refilling the trench etc. of following sizescomplete as required. :-150 mm dia i/d	189	metre
43.3	Supplying and fixing single headed internal hydrant valve with instantaneous Gunmetal/Stainless Steel coupling of 63 mm dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank Gunmetal/Stainless Steel cap and chain as required : Single headed Stainless steel	8	set

43.4	Supplying and fixing Single headed external yard hydrant valve with 1 No. 63 mm dia instantaneous FM Gunmetal/Stainless Steel coupling and cast iron wheel, ISI marked, conforming to IS 5290 (type A) with blank Gunmetal/Stainless Steel cap and chain as required :Single headed Stainless steel	8	set
43.5	Supplying and fixing 63 mm dia, 15 m long RRL hose pipe with 63 mm dia male and female couplings duly bound with GI wire, rivets etc. conforming to IS 636 (type-A) as required : stainless steel (Grade 304)	33	set
43.6	Supplying & fixing 63 mm dia gun metal short branch pipe with 20 mm nominal internal diameter size nozzle conforming to IS 903 suitable for instantaneous connection to interconnect hose pipe coupling as required :- Gun metal	33	Each
43.7	Supplying and fixing first-aid Hose Reel with MS construction spray painted in post office red, conforming to IS 884 complete with the following as required. 20 mm nominal internal dia water hose thermoplastic (Textile reinforced) type -2 as per IS: 12585 20 mm nominal internal dia gun metal globe valve & nozzle. Drum and brackets for fixing the equipmets on wall. Connections from riser with 25 mm dia stop gun metal valve & M.S. Pipe and socket.: - 40 m	8	set
43.8	Supplying, Installation, Testing and Commissioning of weather proof cabinet for hose fabricated out of 1.6mm thickness M.S. sheet with front glass door having locking arrangement, suitable to accommodate all the necessary pipes, accessories, fittings etc including painting the metal portion with one coat of ready mixed primer paint and two coats of synthetic enamel paint of approved shade and quality, sign writing etc. : 900 mm wide x 600 mm high x500 mm deep size (for yard hydrant)	9	Each
43.9	Supplying, fixing, testing and commissioning of butterfly valve of PN 1.6 rating with bronze/gunmetal seat duly ISI marked complete with nuts, bolts, washers, gaskets conforming to IS 13095 of following sizes as required :		
a	80 mm dia	10	set
b	150 mm dia	4	set
43.10	Providing and fixing fire brigade inlet connection of cast iron body with ss-304 grade 63mm dia instantaneous type male coupling with built in check valves and 150mm dia flanged outlet complete with bolts, nuts and rubber insertions as per IS:904. (to be connected to static tank). : Two Way inlet connection	2	set
43.11	Supplying, Installation, Testing and Commissioning standard Fire Man's axe with heavy insulated rubber conforming to IS 936 complete in all respect.	7	Each
	TOTAL OF INTERNAL & EXTERNAL FIRE HYDRANT SYSTEM		
	SPRINKLER SYSTEM		
43.12	Providing, laying, fixing, testing and commissioning of 'C' Class heavy duty MS Pipe conforming to Indian Standard IS : 1239/3589 including fittings like tees, bends, sockets, elbows, flanges, tapers, nuts bolts, gaskets etc. fixing the pipe on the wall / ceiling with suitable clamps and painting with two or more coats of synthetic enamel paint of required shade complete as required.		
a	100 mm dia	43	metre
b	80 mm dia	141	metre
c	65 mm dia	53	metre
d	50 mm dia	110	metre
e	40 mm dia	94	metre
f	32 mm dia	264	metre
g	25 mm dia	649	metre
43.13	Providing and fixing S.S-304 grade Pressure Gauge complete as required complete in all respect. Dial dia 100 mm calibration 0-16Kg/cm2.	16	Each

43.14	Providing, fixing, testing & commissioning of 15mm dia quartzoid bulb type sprinklers of rating 68 degree centigrade with required accessories : Pendent Sprinkler	560	Each
	TOTAL OF SPRINKLER SYSTEM CARRIED OVER TO SUMMARY		
	HAND APPLIANCES		
44.1	Providing and fixing of FIRE EXTINGUISHER, ABC Powder type (stored pressure) as per IS: 15683 complete with all accessories as per Manufactures Specification. ISI Mark complete in all respect. :Capacity 6.0kg. I.S.I. Marked.	7	Each
44.2	Providing and fixing of FIRE EXTINGUISHER, CO2 type as per IS: 15683 complete with all accessories as per Manufactures Specification. ISI Mark complete in all respect. : Capacity 4.5 kg. I.S.I. Marked	7	Each
44.3	Providing and fixing of FIRE EXTINGUISHER,mechanical foam type (stored pressure) as per IS: 15683 complete with all accessories as per Manufactures Specification. ISI Mark complete in all respect. :Capacity 9 ltr.	1	Each
	TOTAL OF HAND APPLIANCES CARRIED OVER TO SUMMARY		
45	**ELECTRICAL WORKS**		
	FIRE FIGHTING PUMP PANELS & EQUIPMENTS		
	Fabrication, supply, Insallation testing & commissioning of Electrical control panel of cubical construction, floor mounted type, fabricated out of 2mm thick CRCA sheet, compartmentalised with hinged lockable doors, dust and vermin proof, powder coated of approved shade after 7 tank treatment process, cable alley, interconnection with suitable size copper conductor cable/solid copper strip, having switchgears and accessories, mountings and internal wiring, earth terminals, numbering etc. complete in all respect, suitable for main fire pump, pressurisation pump & diesel pump set complete as per CPWD specification with following in coming and Outgoings, suitable for operation on 415V, 3 phase, 50Hz Ac Supply with enclosure protection class IP 42 as required :	1	set
	Incomings 630A, 50kA 4 Pole MCCB, Ics=100% Icu Rating Digital Voltmeter 0-500V with selector switch Ammeter (0-630 A) with selector swtich & CTs etc. LED type RYB phase indicating lamps, ON, OFF, trip indicating lamps Set of Copper Bus Bar 800Amps. Outgoings (Note : All outgoing feeders for pumps should have digital Ammeter with selector switches, and LED type ON, OFF, trip indicating lamps) Main Fire Pump 200 Amp, 50kA TPN MCCB, Ics=100% Icu, with fully automatic Star/Delta starter suitable for 75 hp pump with overload protection, current sensing type single phase preventor complete with all acceessories and internal wiring required for automatic operation, selector switch for local/remote, auto/manual/OFF operation. - 2 sets Jockey Pump 100 Amp, 50kA TPN MCCB, Ics=100% Icu, with Suitable HP fully automatic Star/Delta starter with overload protection, current sensing type single phase preventor complete with all acceessories and internal wiring required for automatic operation, selector switch for local/ remote, auto/ manual/ OFF operation. - 2 sets Diesel Engine Control Control for diesel engine comprising - Automatic/ Manual selctor switch & 3 attempts starting device, timers and relays as required, push buttons, start/stop in manual mode Indicating lamp for high/ Low Lub. Oil pressure, High Water Temp and Engine on indication Battery charger suitbale for 12V/24 V DC with boost and trickle selector switch, 0-30 V DC volt meter, and 0-20 A DC Ammeter All standard relays and accessories for automatic operation of diesel engine System Controller Designing, Supply, Installation, Testing and commissioning of system controller to control operation of main electric fire pump, diesel pump, Pressurization pump, Terrace pump in sequence as per specification consisting of relays, timers. Sensors, annunciation window for fault indication, complete as per specification		
	TOTAL OF ELECTRICAL WORKS		

47.1	Supply, Installation, Testing and Commissioning of 2 loop addressable fire alarm control panel, expandable upto 32 loops. Controller shall be 5.7 inch color touch screen display with stylus(320*240 pixels), inbuilt networking port(both RS485&Ethernet), TCP/IP port,Serial port for printer,two supervisory inputs,two position key switch and USB port for programming. The Panel shall handle 4096 detection points, 10,000 history events,menu driven user interface with smart search. The events shall be displayed in different colors- red for alarm events & yellow for trouble etc. for easy identification. The Panel shall be VDS/EN 54/UL approved.	No.	1
47.2	Supply, Installation, Testing and Commissioning Active Repeater Panel. Controller shall be 5.7 inch color touch screen display with stylus(320*240 pixels), inbuilt networking port (both RS485&Ethernet), Serial port for printer,two supervisory inputs,two position key switch and USB port for programming. The Repeater Panel shall allow users to acknowledge, reset,silence, program, view hisory events...etc (All functions similar to main panel)The user interface of the repeater panel shall be same as the Main Controller with menu driven user interface with smart search. The events shall be displayed in different colors- red for alarm events & yellow for trouble etc. for easy identification. The Panel shall be VDS/EN 54/UL approved.	No.	1
47.3	Supply, Installation, Testing and Commissioning of addressable multisensor detector with a combination of Optical and Thermal including mounting base, auto addressing feauture as required. Detetctor should have 2 inbuilt isolators as per NFPA 72 style 7 wiring requirements (one for incoming and one for outgoing line) for maintaining operational availability of all elements in the loop in the event of a short circuit and to meet style 7 requirements. High resistance to electromagnetic effects in accordance with EFSG agreement EFSG/F/97/005 .Detector should monitor Electromagnetic interference and report to the panel - current and average values. EMC safety for detector shall be 50 V/m. Shall be EN54/ VDs/UL certification..(Detectors without Inbuilt Isolators may be considered with an additional Isolator Module per detector)	No.	260
47.4	Supply, Installation, Testing and Commissioning of addessable manual break glass unit (Double action) with inbuilt isolators as per NFPA 72 style 7 wiring requirements, with flexible network structures & necessary fixing arrangements with key complete as required. Shall be EN 54/Vds/UL Certification.	No.	30
47.5	Supply, Installation, Testing and Commissioning of Stand alone Loop Powered detector base sounder with inbuilt isolators as per NFPA 72 style 7 wiring requirements & with 32 different tone variants selection options & adjustable sound pressure by 5 levels, the sound pressure 92.1 dB(A), with flasher having Synchronized flash rate of 1 Hz and Light intensity > 2 cd, should be programmed from the panel. Shall be EN54 / Vds/UL Certification.	No.	30
47.6	Supply,ssable Control Relay Module with inbuilt isolators as per NFPA 72 style 7 wiring requirements & with flexible network structures with a maximun switching current of 1A @ 30V DC. Shall be EN54/ Vds Certification/UL	No.	6
47.7	SITC of Glow Type EXIT Sign Board photo luminescent of size 300 mm x 250 mm x 1.5 mm rigid sheet signage containing Zink Sulphate as bare chemical class – 1 material PSPA fixed on 3 mm acrylic sheet on both side showing marking (running man, Arrow and Exit) and hanged with the ceiling with chain and fastener including cost of labour & material required to complete the job in all respect up to the entire satisfaction of Engineer-in-Charge of work	No.	22
47.8	Supply and erection of 1.5sqmm PVC unsheathed copper conductor cable single core 1100 volts grade in pipe of suitable size excluding cost and erection of pipe .	No.	3500

47.9	Supply, Installation, Testing and Commissioning of Voice Alarm Controller Heart of the Voice Alarm System Compliant with standards for emergency sound systems (IEC60849) 6-zone system controller Built-in 240 W booster amplifier 12 Business and emergency control inputs and outputs. Frequency response - 60 Hz – 18 kHz (+1/-3 dB, @ -10 dB ref. rated output),Distortion,- < 1% @ rated output, 1 kHz,Bass control -8/+8 dB @ 100 Hz,Treble control -8 /+8 dB @ 10 kHz, Voice Alarm Call station with 6 zone selection.Nominal sensitivity 85 dB SPL (gain preset 0dB), Nominal output level -700 mV Maximum input sound level 110 dB SPL, Limiter threshold 2 V,Compression ratio limiter 20:1,Distortion < 0.6% (maximum input), Equivalent input noise level -25 BSPLA,Frequency response -100Hz – 16kHz,Speech filter(-3 dB @ 315 Hz, high-pass), 6 dB/oct,Output impedance - 200 Ohms.	No.	1.0
47.10	Supply, Installation, Testing & commissioning of celling Mount Speaker with operation 6 Watts.	No.	70
47.11	Supply, Installation, Testing & commissioning of 480W Booster amplifier, Battery voltage -24Vdc (max.10%deviation), Frequency response-60Hz to 15 kHz(+1/-3 db), Distortion (at rated out power ar 1 khz)- <3%, InputsXLR, Impendence-20k , Sensitivity-1V (mic inputs), S/N->80 DB.	No.	1
47.12	Supply, Installation, Testing & commissioning of 3KVA UPS on line, Double conversion, Microprocessor controlled, With LCD, Input Voltage: 230V Freq : 40-70HZ P.F. :0.95 Output : 220Volt ± 2% Freq: 50HZ ± 0.05HZ, P.F.: 0.8 With SMF Batteries for 60min backup on full load.	No.	1
47.13	Supply, installation, testing and commissioning of 2 core multistrand 1.5 sq mm annealed copper conductor speaker cable in existing pipe/ channel I/C connection etc.	Mtr	1200
47.14	Supply and erection of PVC pipe 25mm dia ISI marked (Medium) recessed in wall / ceiling etc. including the cost of PVC bends, inspection boxes, iron hooks and cement concrete etc. complete in all respect upto the entire satisfaction of Engineer-in-charge of work.	Mtr	4500
47.15	Supply, installation, testing and commissioning of 17 U Standard rack to place all equipment.	No	1
	Total Fire Alarm System		
	Estimate of CCTV system		
48.1	Supply, installation, testing and commissioning of UL Listed IP CCTV fixed dome Varifocal Coloured Camera, with motorized focal lenz , Full HD (1920 x 1080) high resolution,1/3" Progressive scan CMOS, 0.2 lux with 3-9 mm auto/DC iris lens or equivalent high definition, motion detection,76dB wide dynamic range, H.265 / H.264 / MPEG4 / MJPEG, quad stream, Bit rate 32 Kbps-45 Kbps, 12 VDC ± 10%, PoE (802.3af), with ONVIF supported, in built HD card slot up to 128 GB, connectors complete as required in dome shape fixed type for mounting recessed in false ceiling or mounted on wall complete as required in accordance with laid specification or upto the satisfaction of engineer in charge.	Nos	42
48.2	Supply, installation, testing and commissioning of UL Listed IP CCTV True Day/Night Camera, 2 megapixel (1920 x 1080) high resolution, 1/3" Progressive scan CMOS, 0.01@F1.2, AGC ON. 0 Lux with IR on, H.265/H.264 / MPEG4 , Quad stream, Bit rate 32 Kbps-45 Kbps, Standard IP66, PoE (802.3af), Varifocal lens (2.8mm - 10mm) or equivalent high definition,IR range 50-60 mtr, motion detection, Analytics required with Licences for mentioned Analytics (Line crosing, Loitering, Tracking, Counting, Forensic search), with ONVIF Profile S supported, in built micro SD card slot up to 128 GB, connectors complete as required IR Bullet fixed type for mounting on wall or surface mounted with back box and adapter plate complete as per tender specifications required. (For Outdoor area) th laid specification or upto the satisfaction of engineer in charge.	Nos	5

48.3	Supply, installation, testing and commissioning of UL Listed IP PTZ Camera, 2 megapixel (1920 x 1080) high resolution, 1/3" Progressive scan CMOS, 30X Optical zoom, 12X digital Zoom,, H.265/H.264 / MPEG4 , Quad stream, Bit rate 32 Kbps-45 Kbps, Standard IP66, PoE (802.3af), lens (4.5mm - 135mm) or equivalent high definition,IR range(Internal / Exteral) 150-200 mtr, motion detection, Analytics required with Licences for mentioned Analytics (Line crosing, Loitering, Tracking, Counting, Forensic search), with ONVIF Profile S supported, in built micro SD card slot up to 128 GB, connectors complete as required PTZ for mounting on wall or surface mounted with back box and adapter plate complete as per tender specifications required. (For Outdoor area) th laid specification or upto the satisfaction of engineer in charge.	Nos	2
48.4	Supply, installation, testing and commissioning of 32-channel NVR/NAS with 24TB with RAID5 configure,NVR /NAS should be 32camera licences as required & Analytics Licences for Functioning of Item No.2 & 3 should be considered, NVR with video input as required for Camera mentioned above in Item no. 1.Third-party network cameras supported, H.265 Compression - Up to 3 Megapixels resolution recording, Hard Disk of minimum 6 TB as required for minimum 60 days recording required for viewing @ 25 Frames per second and one megapixel resolution (Real Time) and recording @25 Frames per second. HDD quota and group management, 4 SATA interfaces, 2 USB2.0, Recording on Motion, Scheduled or Alarm based. Remote backup through TCP/IP, HTTP Networkable, backup by USB/DVDWR, Same OEM ONVIF Video management & recording software , min 5 user License (Client), complete as required in accordance with laid specification or upto the satisfaction of engineer in charge. th laid specification or upto the satisfaction of engineer in charge.	Nos	2
48.5	Supply installation Testing and commissioning of 24 Port Layer 2 Switch 10/100/1000BASE-T,4 x1GE port should be upgradable to 10GbE SFP+ in same hardware, 1 Fixed AC PSU, 1 RPS port. RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASET/100BASE-TX: half or full; 1000BASE-T: full only 4 SFP 100/1000 Mbps ports Should support AVB and SDN. Should support sflow/NetFlow/jflow and IGMP, MLD.	Nos	1
48.6	Supply installation Testing and commissioning of 12 Port Layer 2 Switch 10/100/1000BASE-T, 2x1GE port should be upgradable to 10GbE SFP+ in same hardware, 1 Fixed AC PSU, 1 RPS port. RJ-45 autosensing 10/100/1000 ports (IEEE 802.3 Type 10BASE-T, IEEE 802.3u Type 100BASE-TX, IEEE 802.3ab Type 1000BASE-T); Duplex: 10BASET/100BASE-TX: half or full; 1000BASE-T: full only 2 SFP 100/1000 Mbps ports Should support AVB and SDN. Should support sflow/NetFlow/jflow and IGMP, MLD.	Each	6
48.7	Supply Installation Testing & Commissioning of 4U outdoor Pole mount cabinet Rack with dual pole mounting clamp with IP6 rated with Dual Channel for rack mount support with FAN and MCB power supply. Rack should be air perfurated and watter proof and suitable for outer envirnment. Rack body should be powder coated paint with rust free. Rack should have 2 cable manger with 5 socket PDU.	Nos	6
48.8	SITC of 12U Equipment Rack with provision for housing all control equipment with front & rear door, Blower for cooling and proper locking arrangements. Rack should have depth of 550 MM and PVC 4 cable manager with cable separator, 15 AMP X6 power socket PDU with MCB,mounting hardware with earthing provision. as per the specifications, complete in all respect upto the entire satisfaction of Engineer - in - Charge of the work.	Nos	1
48.9	Supply Installation Testing & Commissioning of 43" LED Monitor, Full HD, HDMI Port, Component Video Inputs, 1 Digital Audio Out.	Nos	2
48.10	Supply Installation Testing & Commissioning of 3 Core Power Cable 1.5 sqmm.	Per/Mtr	300

48.11	Supply Installation Testing & Commissioning of CAT 6 UTP Cable.Transmission frequency of 250 MHz (Minimum),cable Should be 4 pair and Cable should be jacket FR PVC Lbp 69% required with certification report.	Per/Mtr	3000
48.12	Supply installation & testing of Cat6 RJ45 Keystone Jacks-White Color complete in all respect to the entire satisfaction of engineer in charge	Nos.	55
48.13	Supply installation Testing and commisioning of Cat 6 Field Termination Plug.	Nos.	55
48.14	Supply installation Testing and commisioning of Back box and face plate set 3x3 forRJ45 face plate.	Nos.	55
48.15	Supply ,Installation ,Testing and Commissioning of Cat6 UTP 24-26 AWG Patch Cord - 1mtr with cross separator, Manufactured from stranded wires for flex-life, Minimum length 1m, LSZH (Low Smoke Zero Halogen) standards like IEC 60332-1	Nos.	55
48.16	Supply and erection of PVC pipe25mm dia ISI marked (Medium) recessed in wall / ceiling etc. including the cost of PVC bends , inspection boxes , iron hooks and cement concrete etc. complete in all respect upto the entire satisfaction of Engineer-in-charge of work	Per/Mtr	2200
48.17	Supply installation ,testing and commisioning of 3KVA UPS Overvoltage cut-off device (OVCD),Support for up to 90 AH external battery cabinets, Generator Compatible with Wide Input. Wide Input Voltage window (110 – 280Vac) for IndianEnvironmental Condition andfor Optimized BatteryPerformance. UPS should be display the digital contents and warranings on screen.UPS would support SNMP Managaer and web browser On Line With 20 min Backup	Nos	1
	Total of CCTV System		
	Estimate of Access Control System, Visitor Management Solution		
	A. Access Control System		
	Software, Server & Access Controller		
49.1	Supply, Installation, Testing, Commissioning of Intelligent Access Management Software shall be designed and configured in such a way so that single point failure will have no degradation in overall functionality, shall have distributed Architecture, shall have both Access & Time Attendance system in single interface and the one database only, ACS software must be integrated with Multiple OEMs Access Controllers & Smart Card Readers.	Nos	1
49.2	Supply, Installation, Testing, Commissioning of operator/ user Management Software license, shall be designed and configured in such a way so that single point failure will have no degradation in overall functionality, shall have both Access & Time Attendance system in single interface, shall support graphycal interface of the premises from where operator can manage and control.	Nos	1
49.3	Supply, Installation, Testing, Commissioning of 10/100 based IP based two reader controller shall support integration with OPIN based software, can be program as either to protect two doors with a single reader, or in/out reading on a single door, built-in 4 input and 2 output for Door position switch, Request to exit and door lock as minimum, Shall support Card holder capacity: 250000 as minimum & Event buffer in offline mode: 99000 as minimum, UL294, EN 301 489-3 EN 55022 EN 50130-4 (EU), FCC and as per technical specification and with all necessary power supply, battery back-up and Enclosure.	Nos	30
	Reader and Credentials		
49.4	Supply, Installation, Testing, Commissioning of Mobile Enabled Multitechnology Smart Card Reader, shall work on transmit Frequency of 2.4GHz & 13.5MHz, Support, Shall support consistent user experience across different devices and operating systems, including iOS and Android. The readers can be configured to using a smartphone with a “tap” or “Twist and Go” gesture technology and specification as per technical specification. Bluetooth SIG certification, UL-294, FCC, CE, RoHS II, BIS,.	Nos	60

49.5	Supply, Installation, Testing, Commissioning of High Security 8K Contactless smart card can store data for multiple application, shall support multi-layered trusted management of secure identities using the portable Secure Identity Object data model, shall support traceable identifiers exchanged during card sessions, preventing data associated to a card from being divulged or cloned. badge must be available under the same technology both for passive 13.56 MHz contactless badges and for virtual badges hosted in smartphones operation via Bluetooth low energy or NFC interface. Support AES-128 bits cryptographic algorithms for data protection and specification as per technical specification.	Nos	400
	Networking Components		
50	Supply, Installation, Testing, Commissioning of Layer 2 Gigabit Ethernet standalone chassis in a 1/2 U form factor with 8 nos 10/100/1000 BaseT PoE+ ports and 2 combo uplink ports, Minimum Switching capacity 20 Gb/s and Minimum throughput 35 Mbps, PoE power budget of 120W & as per features mentioned in technical specification.	Nos	5
	Networking Components - Passive		
51	Supply, Installation, Testing, Commissioning of Category 6 Unshielded Twisted Pair 4 pair 100W cable shall be compliant with ANSI/TIA/EIA-568-C.2 Additional Transmission Performance Specifications for 4-pair 23AWG, UTP, 100W Category 6 Cabling as per technical Specification.	Mtrs	2250
	Gate Management System		
51.1	Supply, Installation, Testing, Commissioning of door lock suitable for single leaf door with holding force of 600lbs as per technical specification.	Nos	35
51.2	Supply, Installation, Testing, Commissioning of door monitoring sensor for monitoring door opening and closing as per technical specification.	Nos	35
51.3	Supply, Installation, Testing, Commissioning of manual call point (green colour) for emergency opening the door as per technical specification.	Nos	5
	Cable & Conduit		
52.1	Supply, Laying, connecting and testing of 6 core, 0.75sq.mm multi strand cable to connecting readers to controller .	Mtrs	3500
52.2	Supply, Laying, connecting and testing of 6 core, 1 sq.mm multi strand cable to connecting door lock and door sensor to controller.	Mtrs	4200
52.3	Supply, Laying, connecting and testing of 3 core, 1 sq.mm multi strand power cable.	Mtrs	500
52.4	Supply , Installation, Testing and commissioning of MS Conduits of following dia, complete with all accessories:		
a	25mm dia	Mtrs	4200
b	25 mm/20 mm dia GI Flexible Conduit	Mtrs	1500
	B. Visitor Management System		
53.1	Supply, Installation, Testing, Commissioning of Server – Client Architecture built on .NET Platform & Back end database supporting Microsoft SQL Server. The deployment shall be in such a way where the client could be connected through LAN (Local Area Network), Wide Area Network (WAN) as well through internet in another location, shall be a single point management for managing Visitors, Vendors, Contractors, including the Sub Employees of the contractors, Vehicles coming to the facility, fully expandable & futuristic with provision to integrate with multi-location Access Control & Time Attendance System as per technical specification.	Nos	1
53.2	Supply, Installation, Testing, Commissioning of 360 deg swivel mount, HD, web camera for visitor image capture as per technical specification.	Nos	1

53.3	Supply installation Testing and Commissioning of Intel Core i7 or better Min 3.4 GHz, 8MB Cache or better with 16 GB RAM or better operator workstation. It should run on latest Windows® platform Enterprise 64-bit or latest. It should have 1TB storage. 1 DVI-I + 1 HDMI + 1 VGA, max 2 Monitor Output, 22inch LCD monitor, Optical Mouse, Keyboard, DVD writer.	Nos	1
53.4	Supply, Installation, Testing, Commissioning of Indirect Electrostatic Photographic Method/ OPC / Laser Printing Heat Roller Fusing based multifunction printer as per technical specification.	Nos	1
	Total Access Control System, Visitor Management Solution		
(C)	TOTAL OF FIRE FIGHITNG, FIRE DETECTION, ACCESS DOOR & CCTV ESTIMATE		(a+b+c+d+e +f+g+h)
(D)	**SCHEDULE OF QUANTITY FOR HVAC WORK**		
	Variable Refrigerant Flow Air-conditioning System		
54	**EQUIPMENT WORK (HIGH SIDE)**		
	Supply, Installation, Testing & Commissioning of Variable Refrigerant Flow type multi unit air-conditioning system complete with indoor and outdoor units with individual controller for cooling & heating type operations. System shall be BMS compatible, contractor shall be shall be responsible for coordination between BMS and Airconditioning. Supply/ Installation of Modular type VRF Outdoor System, equipped with Efficient Scroll 100% Inverter compressor, Hot & Cold both option, special acrylc precoated heat exchanger, low noise condenser fan, auto check function for connection error, auto address setting of following capacity. Outdoor shall be capable to operate in Ambient conditions (Cooling / Heating) from -5 Deg C to 52 Deg C and from -15 Deg C to 24 Deg C. VRF / VRV must be equiped with Variable Energy Efficiency Regulation device feature which shall be enabling the ODU to perform in #3 Modes (Basic Mode / Turbo Mode and High Efficiency Mode) with varied EER in all three modes.		
	Outdoor Unit		
	No De-Ration of capacity upto 39°C, shall be in accordance to new RAMA guidelines. Auto Dust Removal, DC Motor Drive for Comressor motor and Condensing Fan Brushless DC Fan Motor, 0.5 W stand by power, Auto Restart Function, All Round Voltage Protection with Voltage fluctuations withstandable upto +/- 15%, With Enhanced DC Inverter Scroll compressor and Sub Cooling circuit technology, the ODU shall be capable to feed indoor unit at a distance of 240 RMT, with an Outdoor to Indoor elavational difference of 110 RMT and Indoor to Indoor elevational difference of 30 RMT. The ODU shall be capable to have commulative piping of 1000 RMT.		
(a)	40 HP (Minimum 4 Nos Compressor);Must be Modular Type. Should have COP of 4.0 @ 100% load and 6.2 @ 50% load at AHRI Conditions.	1	Nos.
(b)	38 HP (Minimum 4 Nos Compressor);Must be Modular Type. Should have COP of 4.0 @ 100% load and 6.2 @ 50% load at AHRI Conditions.	1	Nos.
(c)	36 HP (Cooling & Heating) (Minimum 3 Nos Compressor);Must be Modular Type. Should have COP of 4.0 @ 100% load and 6.2 @ 50% load at AHRI Conditions.	10	Nos.
(d)	30 HP for TFA (Minimum 2 Nos Compressor);Must be Modular Type. Should have COP of 4.0 @ 100% load and 6.2 @ 50% load at AHRI Conditions.	3	Nos.
(e)	16 HP (Minimum 1 Nos Compressor);Must be Modular Type. Should have COP of 4.0 @ 100% load and 6.2 @ 50% load at AHRI Conditions.	1	Nos.

55	Treated fresh Air Units		
	Supply Installation Testing and Commissioning of Treated Fresh Air Units with EXV Valve.		
	Supply, installing, testing and commissioning of factory built Ceiling suspended double skin type Treated Fresh air handling units made of 40 mm thick panels consisting of G.I. Casing of thickness 0.63 mm outside layer 0.63 mm thickness inside layer with polyurethene foam (PUF) insulation of density not less than 38 Kg/Cum factory injected between them by injection molding machine, complete with blower section with blower, cooling coil section with aluminum finned copper tubes (tube thickness not less than 0.5mm), 6RD ,suitable for 220+- 6% volts, 50 HZ, 1 Phase, A.C. supply, drain connections, stainless steel drain pan to be connected with existing VRF system.		
a	2500 C.FM. Capaciity	6	each
56	Indoor VRF Units		
	Supply Installation testing and commissioning of Indoor VRV Units Hi-wall /ceiling mounted cassette type Normal (3X3) and Compact (2X2)/ Slim Ductable unit, as specified. The indoor unit shall have independent electronic control valve to control the refrigerant flow rate respond to variations of the air-conditioning load of the room. The fan shall be aerodynamically designed turbo multiblade type. Statically and dynamically balanced to ensure lowest noise. The cooling coil shall be made of seamless copper tube. The tube shall be hydraulically or mechanically expanded and tested for 21 Kg/cm2. Indoor units shall have a wired remote control. They shall be operated through from the wired remote control from the respective rooms.		
	Indoor Units- Ceiling Suspended Cassette Type		
(a)	2.02 TR	12	each
(b)	2.28 TR	1	each
(c)	2.56 TR	7	each
(d)	2.85 TR	10	each
(e)	3.19 TR	3	each
(f)	3.56 TR	74	each
57	Indoor Units- Ceiling Suspended Ductable Type		
(a)	2.02 TR	1	Nos.
(b)	2.28 TR	1	Nos.
58	Indoor Units- Wall Mounte Type		
(a)	1.03 TR	3	Nos
(b)	1.28 TR	3	Nos.
59	SITC of fittings, Y-joints set , including distributor and headers for all Indoor units as per layout drawings include ODU pipe connection kit etc complete as required.	132	Set.
60	Supply,Installation, testing and commissioning of Cordless/Corded remote controllers for operation of Indoor unit	148	Nos
61	Supply, Installation, testing & commissioning of Main Intelligent central controller system suitable for above indoor/outdoor units to operate, Schedule, monitor, on/off, temperature setting etc as required.	3	Nos.
	LOW SIDE WORK		
62	Supply, Installation, Testing & commissioning of interconnecting suitable sized as per Drawing/Design - copper refrigerant pipe work duly insulated with (19mm/13mm thick) elastomeric nitrile rubber type tubular insulation between indoor & outdoor units as per specifications. All piping shall be laid on cable tray to be provided as required.		
(a)	41.3 mm O.D.(insulation : 19 mm)	70	Rmt
(b)	38.1 mm O.D.(insulation : 19 mm)	35	Rmt

(c)	31.8 mm O.D.(insulation : 19 mm)	90	Rmt
(d)	28.6 mm O.D.(Insulation : 19mm)	80	Rmt
(e)	25.4 mm O.D.(insulation : 13 mm)	10	Rmt
(f)	22.2 mm O.D.(insulation : 13 mm)	100	Rmt
(g)	19.1 mm O.D.(insulation : 13 mm)	140	Rmt
(h)	15.9 mm O.D.(insulation : 13 mm)	345	Rmt
(i)	12.7 mm O.D.(insulation : 13 mm)	85	Rmt
(j)	9.53 mm O.D.(insulation : 13 mm)	445	Rmt
(k)	6.35 mm O.D.(insulation : 13 mm)	40	Rmt
63	Providing and fixing of PVC Class V (10 Kg/Sq.cm. grade) drain water piping of suitable size complete with fittings, support as per specification and insulated with 6 mm thick closed cell elastomeric nitrile rubber insulation etc as required. Cost to include necessary wall chasing etc. as per site conditions.		
(a)	25mm dia.	180	Rmt
(b)	32mm dia.	125	Rmt
(c)	40mm dia.	120	Rmt
64	Supply, installation, balancing and commissioning of on factory fabricated GSS sheet metal rectangular ducting complete with neoprene rubber gaskets, elbows, vanes, hangers, supports etc. as per approved drawings and specifications of suitable sheet thickness complete as required as per IS:655.		
a)	24 Gauge	100	Sqm
65	Supply, installation, testing and commissioning of closed cell Nitrile rubber insulation of following thickness applied with Proper adhesive and sealed with 50 mm wide BOPP Tape on all longitudinal/ transverse joints complete as per specifications.		
	9 mm thick on ducts in conditioned space	70	Sqm
66	Supply, installation, testing and commissioning of 32 kg/m3 density fiberglass insulation in the form of 25 mm thk fibre glass roll finished with Tissue paper and 28 gauge perforated Aluminum sheet with nuts, bolts complete as per specifications.		
	25 mm thickness acoustic lining	30	Sqm
67	Supply, Installation, Testing and Balancing of Powder coated extruded aluminum construction Linear Grilles as per approved drawings and specifications. Quoted price shall be without volume control damper at the location of air collar	3	Sqm
68	Supply, Installation, Testing and Balancing of GI collar dampers for supply air collars as per approved drawings and specifications.	1	Sqm
69	Providing and fixing Fire retardant non porous double layer flexible canvass connection between each indoor unit and duct as per approved drawings and specifications.	12	Nos.
	POWER & CONTROL CABLING		
70	Supplying, laying, testing & commissioning of following sizes of PVC Copper insulated FR flexible wire for communication between indoor, outdoor and centralized controller etc. in pvc conduit complete as required.		
a)	3 x 1.5 Sq. mm	1380	Rmt
(D)	TOTAL AMOUNT OF HVAC WORK		

(E)	**ESTIMATE FOR LIFT WORK**		
71	Design, manufacture , supply ,installation ,testing and commissioning of 15 passanger (Gear Less Machine Room Less) lift, with travel speed 1.5 MPS serving different floors in the lift shaft including automatic rescue device lift well pressurization as per detailed specification/drawing enclosed and as under:	Each	2
	technical specification		
	Quantity 1 (One) unit(s) Assembled Product Passenger Elevator Capacity 15 persons, 1020 kg Speed 1 m/s Stops & Openings 7 Stops, 7 Openings Floor designations G,1,2,3,4,5,6 Machine type & Location Synergy1000 MRL – Gearless machine located in the shaft on top of the guiderails Control Simplex Collective Selective Control Drive ACVVVF Power supply 415 volts, 3 phase, 50Hz, AC Hoist way dimensions 1800mm wide x 3000mm deep Car travel 22200mm Overhead 4200mm Pit depth 1600mm Car dimensions 1100 mm wide x 2200mm deep x 2200mm high Door opening 800mm wide x 2000mm high Car door 2 panel automatic center opening door with ACVF drive in Hairline Stainless Steel finish Landing door (Group1) 2 panel automatic center opening door in Hairline Stainless Steel finish on 3 floors Car design Grace - All car walls in Stainless steel Hairline finish Car suspended ceiling Hairline Stainless Steel finish with Round LED for car lighting Car flooring 20mm recess provided for granite/marble flooring. Handrail Round handrail in Stainless steel finish provided on rear wall of car Car operating panel Half height - surface mounted Landing operating panel Individual landing operating panel for each elevator		
	1. Alarm button in car operating panel with battery back-up 2. Automatic operation for car fan 3. Adjustable door open time 4. Anti-nuisance (empty car) 5. Anti-nuisance (car call cancellation at direction reversal) 6. Blower fan in car for ventilation 7. Braille on push buttons 8. Car call cancellation by double pressing floor button in car operation panel 9. Door open and door close buttons in car operating panel 10. Door closing retries 11. Door nudging 12. Emergency light 13. Full load by-pass 14. Home landing 15. Infra-red screen for car door 16. Intercom 17. Jammed landing operating panel call button by-pass 18. Motor overheat protection 19. Overload function with audio-visual indication in car operating panel 20. Phase failure and phase reversal protection 21. Automatic rescue device in case of power failure 22. Attendant control 23. Red dot matrix scrolling display in car operating panel 24. Red dot matrix scrolling display in landing operating panel on All Floors 25. Fireman control		
	scope of work		
1	Supply of materials/components/parts of elevators/escalators of Product containing features as listed under Technical Specifications - Annexure 1		
2	Installation, testing and commissioning of elevators/ escalators at site as listed under Technical Specifications- Annexure 1		

3	Material transportation, marine/ inland Insurance		
4	Unloading of material at site		
5	Supply and erection of suitable scaffolding (as per approved GAD) inside elevator shaft/escalator pit for entire installation period and dismantling/removal of the same after completion of Works. Note: If in company's' scope, scaffolding shall be used for elevator installation works only and not for shaft preparation works etc. Also, the company may use scaffoldless method for installation works, at its own discretion.		
6	Provision of minor builders' works (details as per GAD)		
	The rates shall be inclusive GST ,Contracter's profit and of all labour, men & material.The price shall remain valid for complete material /components shipment and completion of installation,testing and commissioning works of elevators , material and components.item to be completed in all respect as per drawing & instructions from Project in charge/Architect.		
(E)	TOTAL OF LIFT WORK		
(F)	**ESTIMATE FOR LANDSCAPE WORK**		
72.1	Supplying and stacking at site dump manure from approved source, including carriage upto 5 km lead complete (manure measured in stacks will be reduced by 8% for payment) : Screened through sieve of I.S. designation 4.75 mm	cum	11.59
72.2	Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20% : one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately)	CUM	707
72.3	Cutting of designer hedge/edge removing of cut materials, cleaning, hoeing of hedge/edge bed watering manure and applying insecticides and fungicides etc.(excluding the cost of material which shall be supplied by the department) and as per direction of officer in charge.	Per Sqm/ YEAR	707.00
72.4	Edging with bricks laid dry length wise, including required excavation,refilling, consolidating with hand packing and spreading surplus earth neatly within a lead of 50 m : 2.19.1 Common burnt clay F.P.S (non modular) bricks of Class designation 7.5	meter	342.00
72.5	Providing and fixing M.S. flat iron tree guard 60 cm dia and 2 m high, above ground consisting 4 nos 25 x 6 mm, 2.25 m long and 8 nos 25 x 3 mm 2 m long verticals M.S. flats, riveted to 3 nos 25 x 6 mm M.S. flat iron rings in two halves, fixing together at site with required six numbers of 8 mm dia and 30 mm long bolts, including painting two coats with synthetic enamel paint of approved brand and manufacture over a coat of primer. One name plate of 1 mm thick M.S. sheet of size 250x100 mm shall be welded to the tree guard near the middle height and lettered CPWD / PWD/ any other approved name. The tree guard shall be suitably fixed to the ground by embedding four legs of tree guard in pits of suitable dia and to a depth of 25 cm, refilling the pits with soil and ramming, complete in all respect as per satisfaction and direction of Officer-in-charge.	Each	150.00

72.6	Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any, with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately): Holes 90 cm dia, and 90 cm deep.	each	100.00
72.7	Complete maintenance of trees (Out side garden features), jobs like making of basin at regular interval i/c watering, weeding, pruning & application of fertilizer etc, (excluding the cost of material which shall be supplied by the department and other T & P material/articles shall be provided by the contractor) and as per direction of officer in charge.: Trees for 250 no/(up to 4 & up to 3 year Slow & Fast Per Plant/ growing group).	PER PLANT /YEAR	100.00
72.8	Plantation of Trees, Shrubs, and Hedge at site i/c watering and removal of unserveiceable material's as per direction of officer in charge (excluding cast of plant & water): Shrubs Plant	each	105
72.9	Complete maintenance of shrubs (Out side garden features), jobs like making of basin at regular interval i/c watering, weeding, pruning & application of fertilizer etc, (excluding the cost of material which shall be supplied by / the department) and as per direction of officer in charge.	PER PLANT /YEAR	105
72.10	Providing & laying Selection no. 1 grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with required tools wooden and than rolling the surface with light roller make the surface smoothen and light watering the same maintenance for 30 days or more till the grass establish properly,as per direction of officer in charge.	sqm	450
	GROUND COVERS		
73.1	Providing and stacking of Aspidistra, having 10 to 15 leaves well developed with fresh & healthy in 25 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	500
73.2	Providing and stacking of Chlorophytum (Green), full of leafy suckers in 15 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	300
73.3	Providing and stacking of Daniella variegated, with 3 to 4 variegated leaves in 20 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	500
73.4	Providing and stacking of Duranta Golden, having ht.15 to 20 cm bushty shape with fresh and healthy leaves in 15 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	1500
73.5	Providing and stacking of Ipomea (Golden leaves),with fresh and healthy leaves in 15 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	600
73.6	Providing and stacking of Iresine herbstii, of height 20-25 cm. full of branches well developed in 15 cm size of Earthen Pot/Plastic Pot & as per direction of the officer-in-charge.	EACH	1200
73.7	(FLOWERS) Providing and stacking of winter seasonal seedling/cutting at site of work well developed and healthy free from disease in per tray and each tray having 100 Nos plants as per direction of the officer-in-charge.		
a	Antirrhinum dwarf	PER TRAY	10
b	Chrysanthemum double	PER TRAY	5
c	Gazania hybrid	PER TRAY	15
d	Salvia	PER TRAY	10

74.1	(FLOWERS) Providing and stacking of summer & rainy seasonal seedling at site of work well developed and healthy free from disease in per tray and each tray having 100 Nos plants as per direction of the officer-in-charge.		
a	Cosmos hybrid	PER TRAY	5
b	Vinca Hybrid	PER TRAY	5
75	Preparation of mounds of various size and shape by available excavated / supplied earth in layers not exceeding 20 cm in depth, breaking clods, watering of each layer, dressing etc., lead upto 50 meter and lift upto 1.5 m complete as per direction of Officer-in-charge.	CUM	69.45
76	Complete maintenance of the entire garden features having as per yard stick in the garden area i.e. lawn trees, shrubs, herbs, edge, flower beds, foliages, creepers etc. including hoeing,weeding, pruning, replacement of plants, gap filling, watering, mowing of lawn, grass cutting by lawn mover and brush cutter, removal of garden waste, applying insecticide, pesticide & fertilizers(whenever required) top dressing of lawn with good earth and manure and maintenance of other garden related works as directed by office-in-charge (Cost of Good Earth, Manure, Fertilizer, Insecticide, Pesticide will be provided by the Department & lawn mover and brush cutter with fuel and other T & P material/articles shall be provided by the contractor.) and as per direction of officer in charge. Permanent office accommodation.(1Mali for 1.25Acre)	per YEAR /per sqm	658.00
77	Maintenance of Potted Plants at Nursery in Earthen pot including resetting/ displaying at Nursery, inculding watering, weeding, hoeing, colouring, transplanting the damaged pots and disposal of generated garbage at specified place as per direction of officer-in-charge. (Note:-Good earth, manure, fertilizer, insecticide & pesticide will be provided by the/ department) (Earthen pot 3000 nos)	per pot/YEAR	128
78	Providing and Displaying Cyclamen hybrid variety fresh & healthy in full bloom well developed in 25 cm Earthen Pot/Plastic Pot and as per direction of the officer-in-charge.	nos.	15
79	Providing and Displaying Geranium double variety having 30 cm ht., in different colour well developed with fresh & healthy foliage (3 in one) well bloomed in 25 cm Earthen Pot/Plastic Pot and as per direction of the officer-in-charge.	nos.	15
80	Providing and Displaying Poinsettia dwarf multi head, having upto 30 cm ht., with 3 to 4 branches with fully different colored top with fresh & healthy foliage well developed in 20 cm Earthen Pot/Plastic Pot and as per direction of the officer-in-charge.	nos.	10
81	Providing and Displaying Tulip Dutch hybrid variety (3 in one) in each pot in full bloom fresh & bright in different colour well developed in 25 cm Earthen Pot/Plastic Pot and as per direction of the officer-in-charge.	nos.	10
82	concrete of nominal mix 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 6 mm nominal size), reinforced with 7 Nos (3 nos horizontal & 4 nos vertical " U " shape) M.S. wires of 3.5 mm dia as per design, including required form work, finishing with cement punning on exposed surface, curing for specified period and stacking in required rows & height, all complete as per direction of Officer-in-charge.: POT-Top inside dia 30 cm, outer bottom dia 20 cm, total height 30 cm with wall thickness of 25.4 mm	EACH	50
	TREES		
83.1	Providing and stacking of Cassia javanica of height 120-150 cm. in big poly bags of size 25 cm as per direction of the officer-in-charge.	EACH	20
83.2	Providing and stacking of Delonix regia (Gulmohar) of height 150-165 cm. in big poly bags of size 25 cm as per direction of the officer-in-charge.	EACH	25

83.3	Providing and stacking of Ficus infectoria (Pilkhan) of height 150-165 cm. in big polybag of size 25 cm as per direction of the officer-in-charge.	EACH	10
83.4	Providing and stacking of Fishtail palm of ht. 210-240 cm bottom girth 25- 30 cm well developed in big size HDPE bags as per direction of the officer-in-charge.	EACH	10
83.5	Providing and stacking of Grevillea robusta (Silver Oak) of height 150-165 cm. in big poly bags of size 25 cm as per direction of the officer-in-charge.	EACH	20
83.6	Providing and stacking of Lagerstroemia flosreginae of height 150-165 cm.in big poly bag of size 25 cm as per direction of the officer-in-charge.	EACH	15
	SHURBS		
84.1	Providing and stacking of Bauhinia acuminata height 60-75 cm. in earthen pots of size 20 cm as per direction of the officer-in-charge.	EACH	20
84.2	Providing and stacking of Chandni dwarf of height 15-20 cm., well branched in earthen pots of size 20 cm as per direction of the officer-in-charge. As per direction of the officer-in-charge.	EACH	30
84.3	Providing and stacking of Ficus blackii (F.vivion) of height 45-60 cm. with 6- 8 branches healthy foliage in earthen pots of size 25 cm as per direction of the officer-in-charge.	EACH	25
84.4	Providing and stacking of Largerstroemia indica of height 45-60 cm. in polybag of size 20 cm as per direction of the officer-in-charge.	EACH	30
(F)	TOTAL COST OF LANDSCAPE WORK		
(G)	**ESTIMATE OF STP**		
85/86	**SEWAGE TREATMENT PLANT**	NOS	1
	Per hour capacity 0.02 cum.		
	Peak Flow 0.5 cum.		
	PH 6- 8.5		
	Total Suspended Solids 180-300 mg/lit.		
	BOD (27c) 250-1400 mg / lit.		
	COD 600- 2800 mg/lit		
	Oil & Grease 15 mg/ lit.		
	Treated Sewage Characteristics.		
	PH 7 - 8.		
	Total Suspended Solids Less than 5 mg/lit.		
	BOD3 (27 c) Less than 30 mg /lit.		
	COD Less than 50 mg / lit		
	Oil & Grease Less than 5mg /lit.		
85.1	**SCREEN CHAMBER**	NOS	1
	Designing Erection testing and commissioning of screen chambers at the inlet of equalization tank to trap all the floating material Type of Screen Angled with MS flat with size 5mm x10mm vertical.		
	Spacing 10 mm.		
	Cleaning and lifting : Manual		
85.2	**OIL AND GREASE TRAP**	NOS	1
	To separate floating oil and grease . oil trap with following size is designed .		
	Design Load :0.5 cum		
	Tank will be provided with hanging baffle at both the sides, MOC :RCC		

85.3	**EQUALISATION TANK**	NOS	1
	Total Volume 2.0 cum		
	Minimum retention time volume should be 6 hrs. i.e. 2 cum We have considered 5 cum as we will be using the same tank for biological activity which will help to reduce the BOD at a faster rate Board . MOC : RCC		
85.4	**RAW EFFLUENT TRANSFER PUMP**	NOS	2
	Two no, pumps are designed for transferring raw sewage to aeration tank .		
	Total flow 5.0 cum.		
	Per Hr flow 0.6 cum		
	Designed pump with capacity 0.4 cum /hr with part will be again recycled to equalization tank as per the plant requirement . MOC: CI		
	Available head positive Selected Pump are + Displacement pump (Self Priming Pumps)		
85.5	**AERATION TANK**	NOS	1
	Total Flow 5 cum		
	Per Hr flow 0.4 cum		
	Designed MLSS 3500		
	Volume of Aeration Tank		
	Retention time 24 hrs .		
	Aeration tank Volume considering aeration with MLSS in the equalization tank is 24 cum		
	MLSS 3000 to 3500 ppm		
	MOC : MSFRP		
85.6	**TWIN LOBE BLOWER**	NOS	2
	Noise Level 90 DB		
	Theoretical air requirement considering Aeration		
	Volume and BOD load is 10cum/Hr.		
	Our blowers are designed for 10 cum/Hr		
	At 4 mtr Head		
	MOC : CI		
85.7	**TUBE SEPRATER SECONDERY**	NOS	1
	The overflow will be transferred to secondary clarifier for the separation of clear water and biomass .		
	Total flow 5cum		
	Per Hr flow 1.0CUM		
	This surface area is divided in two lamella with PVC tube separator MOC : R.C.C		
85.8	**FILTER FEED TANK**	NOS	1
	The overflow from Secondary clarifier will be transferred to Filter feed tank for the further tertiary Treatment . Required Volume 2 cum,		
85.9	**SLUDGE RECYCLE PUMP**	NOS	2
	Two no , recycling pump will be provided for sludge Recirculation and for sludge wasting . Capacity 0.6cum /day 12 Head .		
	Type SP type non clog		
	MOC : CI		
	Pumps will be provided with common inlet and deliver line with valve arrangement. Pumps will be provided with common foundation base frame of MS structure .		

85.10	**FILTER FEED PUMP**	NOS	2
	Capacity 0.6cum /Hr		
	Pressure 3.5 kg		
	Type Mono block Horizontal		
	MOC CI casing CI body Bronze Impellor , SS Shaft		
	And sleeve.		
	Piping UPVC 1 inch		
	Pumps will be provided with common inlet and deliver line with valve arrangement. Pumps will be provided with common foundation base frame of MS structure.		
85.11	**COAGULATION DOSING**	NOS	2
	Dosing pump are designed for the online dosing of alum & Hypo chloride Type E dose Metering Pump .		
	Dosing Tank 100liters.		
	Capacity 0-6 liters/ hr		
85.12	**PRESSURE SAND FILTER**	NOS	1
	Providing fixing testing and commissioning of vertical FRP pressure filter Filter will be provided with Different type graded sand . Complete with initial charge of filter Multiport Valves and inlet /outlet pressure gauge . Test Pressure : 4 Kg/cm2,		
	Capacity : 0.6 lph		
	Total height : 1.5 M		
	DIA : 0.3 M		
	MOC : FRP		
	ACTIVATED CARBON FILTER		
	Providing fixing testing and commissioning of vertical FRP initial charge of filter Multiport Valves and inlet /outlet pressure gauge .		
	Test Pressure : 4 Kg/cm2,		
	Capacity : 0.6lph		
	Total height : 1.5 M		
	DIA : 0.3 M		
	MOC : FRP		
85.13	**PIPING AND VALVES**	1 LOT	
	As per detailed engineering .		
85.14	Panel Board and Cabling. As per detailed engineering.	1 LOT	
86	Supplying ,installation testing and commissioning of STP of appropriate technology including Civil works(except plant room)Tertiary Treatment ETC. For Building /campus	Per thousand Ltr.	1 no of capacity 5000 Ltrs
	per day for plant size upto 5 KLD		
	5 Cum per day Sewage treatment plant		

(G)	TOTAL FOR STP WORK Add cost index as on date 01.04.2019 @123%		123%
(H)	**ESTIMATE FOR SOLAR POWER PLANT**		
87	**Solar photo Voltaic Power Generation System**		
	Supplying, installation testing and commissioning ofgrid interactive roof top solarphoto voltaic power generation system including spaceframe(40 KWH)	Each set	1 Set
	40 KWp On Grid Solar Power Plant consisting of following with complete installation at your site:		
	• 40 KW On Grid Solar Inverter -01No		
	• 320-360W (24V) "MNRE approved" Solar PV Panels -40KWp		
	• Standard Roof Top GI Structure - As per requirement		
	• Cables, Wires and connectors - As per requirement		
	• Other Electrical accessories - As per requirement		
	• Earthing Work - As per requirement		
	1) Solar PV Module:		
a	The solar photovoltaic modules will be used Poly/Multi crystalline, Thin film PV technology modules.		
b	The capacity of each Solar Modules should be equal to or greater than 300Wp. Solar Modules to be used have to be framed only. At locations where there is constraint of space, it should be considered higher efficiency modules only.		
c	Module would be PID Free and of positive Tolerance only.		
d	Modules would have an efficiency of not less than 16% and the fill factor should be above 75%.		
e	Minimum dimension of the SPV module shall be preferred.		
f	Each SPV Module would have IEC/BIS test certificate from any recognized IEC accredited or MNRE approved laboratory.		
g	The SPV modules would confirm to the minimum technical specification laid down by MNRE that can be referred on the MNRE website.		
h	The PV Modules shall be tested for Salt Mist Corrosion Test as per MNRE requirement.		
	PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years		
87.1	**Inverter:**		
	The Inverter/s used would be robust, intelligent On-grid inverters of reputed manufacturer/makes. The inverter/s must conform to the IEC 61683 and IEC 60068-2, IEC 62116, IEC 61727. The typical specifications required are as under:		
	All inverters should be 3 phase, 415V, 50Hz AC output		
	The AC capacity of the Inverter can be minimum of 80% of the connected DC capacity to the inverter.		
	Minimum Start Voltage should be greater than 200V		
	MPPT Range: 200V-800V		
	Maximum Input Voltage: 1000V DC		
	Euro / CEC Efficiency above 97%		
	Frequency: 50Hz +/- 1.5%		
	Power Factor > 0.99		

	THD < 3%		
	Ambient Temperature range: -5 deg C to + 60 deg C		
	Warranty: 5 Years Comprehensive warranty. This warranty from the manufacturer shall be in addition to the scope covered under defects liability period		
	Integrated Ground Fault Protection		
	Anti Islanding Feature		
	Transformer less		
	Over Voltage/ Under Voltage Protection		
	Auto Shut down in case or Over Heat/ Over Temperature		
(H)	TOTAL FOR SOLAR POWER PLANT		
(I)	**COST ESTIMATE FOR RAINWATER HARVESTING PIT WORK**		
87.2	Providing and installation of Rainwater harvesting pit strictly as per sketches, drawings and detailed specification mentioned below. The agency approved by the Engineer-in-charge/ Contractor should have sufficient experience of having executed Rainwater harvesting pits in site. The job shall include maintenance cost and successful working of rainwater harvesting pit minimum period of 10 years. Boring for rain water recharge 635mm dia & depth of 30 Mtr, with 200mm perforated pipe 30 Mtr with SS filter of 3 Mtr at bottom, 6mtr 250mm, 6mtr 300mm pipe & Packing of Perforated Pipe & SS Strainer with 2mm - 4mm Washed Gravel. Making of rainBoring for rain water recharge 635mm dia & depth of 30 Mtr, with 200mm perforated pipe 30 Mtr with SS filter of 3 Mtr at bottom, 6mtr 250mm, 6mtr 300mm pipe & Packing of Perforated Pipe & SS Strainer with 2mm - 4mm Washed Gravel. Making of rain water recharge pit 6 Mtr. depth, upper part of pit will be 1.35 Mtr dia with 2 Mtr. depth, with filtration media of bolder stone 50/70mm-300mm, washed gravels 2/4-150mm, charcoal & activated carbon-150mm, fine sand -150mm, fine sand and gravels2/4-150mm, bolder stone 50/70-300mm. and lower part of pit will be of 1350mm dia with 4 Mtr. depth for water holding. Making of silt trap 1.35 Mtr dia and 2 Mtr. Depth with layer of 50/70 – 500mm bolder with dual outlets and 24”x 150mm SS filter on both of outlets.		
	TOTAL NO. OF RAINWATER HARVESTING PIT	No.	1
	TOTAL OF RAINWATER HARVESTING PIT WORK		
(J)	**Audio -Video Solution at GYM Area, Lounge area, Reception & Dining Area**		
A	Reception Area (Ground Floor & 5th Floor)		
A.1	Supply Installation Testing & Commissioning of 43" LED Monitor, Full HD, HDMI Port, Component Video Inputs, 1 Digital Audio Out, Make: Christi/ Panasonic/ Samsung	Nos	2
B	Lounge Area		
B.1	Supply Installation Testing & Commissioning of 55" LED Monitor, Full HD, 2 HDMI Port,USB, DVI, RS232 & RJ45, Built in speakers, Component video Inputs, 1 Didital Audio Out Make : SAMSUNG/SONY/CHRISTIE	Nos	1
B.2	Supply, Installation, Testing & commissioning of celling Mount Speaker with operation 6 Watts. Make Bosch/ JBL/ Tannoy	No	4
B.3	Supply Installation Testing and Commissioning of 90W Mixer amplifier,70 V / 100 V /8 ohm outputs,4 microphone/line inputs, plus 3 music source inputs Frequency response 50 Hz to 20 kHz (+1/-3 dB @ -10 dB ref. rated output.Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	1
B.4	Supply, installation, testing and commissioning of 2 core multistrand 1.5 sq mm annealed copper conductor speaker cable in existing pipe/ channel I/C connection etc. Make: Krystal/beldon/Bonton	MTR	40

B.5	Supply and Erection of PVC pipe25mm dia ISI marked (Medium) recessed in wall/ceeling etc. including the cost of PVC bends, inspection boxes, iron hooks, cement concrete etc. complete in all respect up to the entire satisfacion of Engineer-in-charge of work Make: CUSTOM	mtr.	50
C	Gym Area		
C.1	Supply Installation Testing & Commissioning of 55" LED Monitor, Full HD, 2 HDMI Port,USB, DVI, RS232 & RJ45, Built in speakers, Component video Inputs, 1 Didital Audio Out Make : SAMSUNG/SONY/CHRISTIE	Nos	1
C.2	Supply Installation Testing and Commissioning of 240W Mixer amplifier,70 V / 100 V /8 ohm outputs,4 microphone/line inputs, plus 3 music source inputs Frequency response 50 Hz to 20 kHz (+1/-3 dB @ -10 dB ref. rated output.Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	1
C.3	Supply Installation Testing and Commissioning of 30 watt or better -wall mount Speaker with woofer & Dome Tweeter-Sound pressure level at rated power / 1 W (1 kHz, 1 m)-105/90 dB (SPL),Rated input voltage 15.5/70/100 V, power Taping 30/15/7.5/3.75 W, Effective frequency range (-10 dB)-100 Hz to 19 kHz, Opening angle at 1 kHz Safety 166° horizontal/140° vertical, EN/UL Water and dust protected IP65 .Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	8
C.4	Supply, installation, testing and commissioning of 2 core multistrand 1.5 sq mm annealed copper conductor speaker cable in existing pipe/ channel I/C connection etc. Make: Krystal/beldon/Bonton	MTR	60
C.5	Supply and Erection of PVC pipe25mm dia ISI marked (Medium) recessed in wall/ceeling etc. including the cost of PVC bends, inspection boxes, iron hooks, cement concrete etc. complete in all respect up to the entire satisfacion of Engineer-in-charge of work Make : CUSTOM	mtr.	50
D	Dining Area		
D.1	Supply Installation Testing & Commissioning of 65" 4K UHD LED, HDMI Port, Component video Inputs, 1 Didital Audio Out, wifi ready, Built in speaker, RS232, Make : SAMSUNG/SONY/CHRISTIE	Nos	1
D.2	Supply Installation Testing and Commissioning of 90W Mixer amplifier,70 V / 100 V /8 ohm outputs,4 microphone/line inputs, plus 3 music source inputs Frequency response 50 Hz to 20 kHz (+1/-3 dB @ -10 dB ref. rated output.Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	1
D.3	Supply, Installation, Testing & commissioning of celling Mount Speaker with operation 6 Watts. Make Bosch/ JBL/ Tannoy	No	6
D.4	Supply, installation, testing and commissioning of 2 core multistrand 1.5 sq mm annealed copper conductor speaker cable in existing pipe/ channel I/C connection etc. .Make: Krystal/beldon/Bonton	MTR	60
D.5	Supply and Erection of PVC pipe 25mm dia ISI marked (Medium) recessed in wall/ceiling etc. including the cost of PVC bends, inspection boxes, iron hooks, cement concrete etc. complete in all respect up to the entire satisfacion of Engineer-in-charge of work Make : CUSTOM	mtr.	50
	TOTAL OF AUDIO VIDEO WORK		
(K)	**Digital Conference system**		
1	Supply Installation Testing and Commissioning of Digital Chairman Unit with fixed microphone with flexible stem can be easily adjusted to suit the user- long 480-500 mm ,Built-in loudspeaker with volume control,Built-in volume control for headphones,Possible-to-speak indication,Request-to-speak indication,GSM immunity,Frequency response 200 Hz to 12.5 kHz,Loudspeaker nominal output 72 dB SPL,Color-coded LED indicator above microphone button for showing the following states: microphone on, request-to-speak, and possible-to-speak Light-ring indicator in head of microphone, cable and accessories as required. Make: Bosch/Toa/Taiden/Marconi/Audio Technica/Sennheiser	Nos	1

2	Supply Installation Testing and Commissioning of Digital Delegate Unit with fixed microphone with flexible stem can be easily adjusted to suit the user- long 480-500 mm ,Built-in loudspeaker with volume control,Built-in volume control for headphones,Possible-to-speak indication,Request-to-speak indication,GSM immunity,Frequency response 200 Hz to 12.5 kHz,Loudspeaker nominal output 72 dB SPL,Color-coded LED indicator above microphone button for showing the following states: microphone on, request-to-speak, and possible-to-speak Light-ring indicator in head of microphone, cable and accessories as required. Make: Bosch/Toa/Taiden/Marconi/Audio Technica/Sennheiser	Nos	19
3	Supply Installation Testing and Commissioning of Digital conference system controller with connection of with 30 Discussion Devices and expandable upto 200 Delegate Units,Built-in MP3 recorder with internal memory and USB recording,Built-in Digital Acoustic Feedback Suppression (DAFS) for ensuring superior speech intelligibility, support for automatic HD camera control,Web browser control for configuration,Built-in monitor loudspeaker,built-in loudspeaker and headphone socket allows for:live monitoring of a meeting , indicators for showing-Open microphone,Mains power on/off,Plus/minus buttons for setting the volume range, RJ45 Ethernet,USB recording LED indicator Make: Bosch/Toa/Taiden/Marconi/Audio Technica/Sennheiser	Nos	1
4	Supply Installation Testing and Commissioning of 15 watt or better -wall mount Speaker with woofer & Dome Tweeter-Sound pressure level at rated power / 1 W (1 kHz, 1 m)-105/90 dB (SPL),Rated input voltage 15.5/70/100 V, power Taping 30/15/7.5/3.75 W, Effective frequency range (-10 dB)-100 Hz to 19 kHz, Opening angle at 1 kHz Safety 166° horizontal/140° vertical, EN/UL Water and dust protected IP65 .Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	6
5	Supply Installation Testing and Commissioning of 240 W Mixer amplifier,70 V / 100 V /8 ohm outputs,Frequency response 50 Hz to 20 kHz. Make: Bosch/Toa/Honeywell/Bose/Klipsch	Nos	1
6	Supply Installation Testing and Commisioning of wireless Lapel Microphone with - 32 preset channels, with compatible groups of eight (8) channels for simultaneous use14 hour battery life from two (2) AA alkaline batteries , Rugged metal transmitters with backlit LCD display and battery gaugeNumber of Channels: 32 Modulation: ± 40 kHz ,Diversity: True Antenna RF Sensitivity: <1.0 µV for 12 dB SINAD,Image Rejection: > 55 dB ,Squelch: Tone Code plus Amplitude,Frequency Response: 80 Hz – 18 kHz ± 2 dB,Balanced Output: 20 dBV (max @ 40 kHz deviation), Unbalanced Output: Adjustable 8 mV to 0.755V RMS,Distortion: < 1.0%, 0.4% typical,Signal-to-Noise Ratio: > 100 dB Make: Electrovoice/Audiotechnica/Sennheiser/Shure	Nos	2
7	Supply Installation Testing and Commisioning of wireless handheld Microphone with - 32 preset channels, with compatible groups of eight (8) channels for simultaneous use14 hour battery life from two (2) AA alkaline batteries , Rugged metal transmitters with backlit LCD display and battery gaugeNumber of Channels: 32 Modulation: ± 40 kHz Diversity: True Antenna RF Sensitivity: <1.0 µV for 12 dB SINAD Image Rejection: > 55 dB Squelch: Tone Code plus Amplitude,Frequency Response: 80 Hz – 18 kHz ± 2 dB Balanced Output: 20 dBV (max @ 40 kHz deviation) Unbalanced Output: Adjustable 8 mV to 0.755V RMS Distortion: < 1.0%, 0.4% Signal-to-Noise Ratio: > 100 dB, Make: Electrovoice /Audiotechnica /Sennheiser /Shure	Nos	2
8	Supply installation testing Commsioning of projector having resolution 1024 x 768 pixels XGA–WUXGA, Brightness: 4,100 lm Light source, Supported video signal; NTSC/PAL/SECAM, 480p/i, 720p, 1080p/i, lifetime: Up to Normal: 5,000 hours, Inputs: 1x HDMI 1.4 / DVI-D / HDBaseT / VGA (D-Sub 15 pin) / RJ 45 Ethernet , Keystone correction range :30 ° x 15 ° (Manual), Operating temperature: 5 -40 °C Make: Panasonic /Sony/christie	Nos	1
9	Supply installation testing Commsioning of projector screen motorized with size 8" x 6" with remote control. MAKE: Suvira/Drapar	Nos	1

10	Supply Installation Testing & Commissioning of 55" LED Monitor, Full HD, HDMI Port, Component video Inputs, 1 Didital Audio Out Make : SAMSUNG/SONY/CHRISTIE	Nos	2
11	Supply Installation Testing and Commissioning of Video Switcher should have 4 HDMI input and 1 HDMI output, Bandwith support up to 2.25Gbps per channel, up to 2.25Gbps, Resloution:Up to UXGA; 1080p, controlled by buttons, RS232, with EDID features, Dual Mode - PC and DVD Modes selectable by input, Power consumption: 100−240V AC, 50/60Hz. Make: Kramer/Extron/Crestron/ATEN	Nos	1
12	Supply Installation Testing and Commisioning of a distribution amplifier for HDMI signals which equalizes the signal and distributes it to identical outputs, should have 1 HDMI input and 4 HDMI out with max data rate 6.75Gbps, with showing LED status, Make: Kramer/Extron/Crestron/ATEN	Nos	1
13	Supply Installation Testing and Commissioning of Popup Box, Pop–Up Table Mount Multi–Connection Solution, Elegant in–table compact solution, CE qualified, 4 Fixed Inputs — 15–pin HD, HDMI, 3.5mm & Ethernet. PORTS - HDMI connector, Ethernet RJ–45 connector, 15–pin HD connector, 3.5mm mini jack, Make: Kramer/ Extron/ Crestron/ ATEN	Nos	4
14	Supply installation testing Commsioning of 5 Meter HDMI male to HDMI male cable for input. Make: Kramer/Extron/Crestron/Aten/MX	Nos	2
15	Supply installation testing Commsioning of 20 Meter HDMI male to HDMI male cable for input. Make: Kramer/Extron/Crestron/Aten/MX	Nos	7
16	Supply, installation, testing and commissioning of 2 core multistrand 1.5 sq mm annealed copper conductor speaker cable in existing pipe/ channel I/C connection etc. .Make: Krystal/ beldon/ Bonton	Mtr	60
17	Supply and Erection of PVC pipe25mm dia ISI marked (Medium) recessed in wall/ceeling etc. including the cost of PVC bends, inspection boxes, iron hooks, cement concrete etc. complete in all respect up to the entire satisfacion of Engineer-in-charge of work Make : CUSTOM	Mtr	50
18	Supply,Installation,Testing and Commisioning of 17U rack for switch Mounting with Fan and power strip,PDU,Hardware Mounting Kit (Make : Comrack/APW/Netrack/Perfect Rack)	Nos	1
	TOTAL OF CONFERENCE		

Note:

Need for EPC contract:

The various departments and undertakings of the Central Government as well as the State Governments have hitherto been undertaking construction projects through the conventional item rate contracts where the Government provides the detailed design as well as the estimates of quantities for different items of work (Bill of Quantities). Payments to the Contractor are made on the basis of measurements of the work done in respect of each item. Experience in Government and NHIDCL has shown that item rate contracts are prone to excessive time and cost overruns, besides recurrent disputes involving large claims. The reasons for their poor performance include inadequate project preparation and estimation coupled with allocation of several construction risks to the Government. For these reasons, the item rate mode of contracting has long been discarded in the developed countries as well by the private sector in India. The structure currently in vogue is in the nature of turnkey contracts where the responsibility for design, procurement and construction is assigned to the Contractor. Such contracts are typically known as EPC contracts. With this in view it has been taken up as an EPC project. Items and Engineering details worked out till now are a good refrence guide to the prospective bidders for working deligently in detailed Engineering and planning optimally within costs and times. In general, CPWD specifications manuals and procedures or best construction practices to achieve optimum effiecency should be followed.

Annex – I

(Schedule-B)

Description of the Project

1. The scope of work shall also include Civil work for stilt + 6 storied building. Services i/c Water Supply, Sanitary, Sewerage, Storm water drainage PH work i/c Plumbing, STP Plant etc. Lift work i/c 2 Nos. of 15 passengers lifts etc. Interior work i/c Ceiling, partitions, panelling, wall covering and miscellaneous items etc. Electrical works i/c external electrification, transformer, cable earthing etc. Miscellaneous work i/c HVAC work, CCTV, Fire detection & PA System and Music System, Air Conditioning work etc. Fire-Fighting works etc. including Wet Riser System, pumps, panels etc. Boundary wall work etc. i/c Boundary wall, Road works & Parking etc. Horticulture work i/c planting of lawn, trees, shrubs etc.

1.1 Maintenance during defect liability period including & preparation of all detailed working drawings, obtaining approval from all local authorities, electrical inspector, water, sewer, drainage, electricity connection from local bodies, permission / approval for tree replantation etc. to be executed as integral part of the project. As NHIDCL aims at getting IGBC 3-Star rating for the building, prospective bidders are required to provide adequate documentation & all other requirements relevant to enable NHIDCL in achieving these objectives as referred above. The following are the salient features of the Works:

a. Foundations & other works like underground water tank.
b. Super structure.
c. Water proofing treatment works.
d. UPVC door and windows, Aluminium partition etc.
e. GRC Wall cladding work, White Sandstone façade work, Structural glazing work and Aluminium composite panelling work,
f. Lifts.
g. Internal and External Water supply, Sewerage, Storm water drainage.
h. Infrastructure Development i.e. Roads, Parking, Pathways etc.
i. Electrical Installation (Internal & External).
j. Fire Fighting System.
k. HT & LT Installation, Substation, DG Sets.
l. HVAC & BMS.
m. Entry/Exit gates with Security cabins, Compound walls.
n. Fire Alarm, PA, CCTV, EPABX/Telephone, LAN Systems etc. PART -I 13.
o. STP.
p. Solar PV& Solar Street Light.
q. Signage.
r. Landscape & Horticulture Works, Hard Landscaping in Courtyards, Avenues & roundabouts etc.
s. Air conditioning work.

1.2 The successful bidder will complete the contract works in 18 months period commencing on 10th day of issue of Letter to proceed or the date of handing over of the site whichever is later. Throughout these bidding documents, the terms “bid “and “tender “and their derivatives (bidder/tenderer, bid/tender, bidding/tendering etc.) are synonymous.

1.3 Detailed scope of work is as per BOQ mentioned in Schedule - B for the subject work.

1.4 Total Site area – 3965 sqm. (Approx.)

1.5 The temporary connections of water supply and electricity shall be arranged and made available by the EPC Contractor himself and the charges during the execution period till completion of the project shall also be borne by the EPC Contractor himself.

Annex – II

(Schedule-B)

Tender Drawings

Uploaded separately on NHIDCL website.

Schedule - C

(See Clause 2.1)

Project Facilities

As per Schedule – B and Schedule – D.

Schedule - D

Specifications and Standards

TECHNICAL SPECIFICATIONS GREEN BUILDING – IGBC COMPLIANCE, ENVIRONMENT HEALTH AND SAFETY POLICY

A. TECHNICAL SPECIFICATIONS GREEN BUILDING – IGBC COMPLIANCE

1. INTRODUCTION

INDIAN GREEN BUILDING COUNCIL (IGBC)

India is witnessing tremendous growth in infrastructure and construction development. The construction industry in India is one of the largest economic activities and is growing at an average rate of 9.5% as compared to the global average of 5%. As the sector is growing rapidly, preserving the environment poses a host of challenges. To enable the construction industry environmentally sensitive, CII Sohrabji Godrej Green Business Centre has established the Indian Green Building Council (IGBC). IGBC, is a consensus driven not-for-profit Council, represents the building industry, consisting of more than 1,923 committed members. The Council encourages, builders, developers, owners, architects and Project architect/EIC to design & construct green buildings, thereby enhancing the economic and environmental performance of buildings.

The Green Building Movement in India has been spearheaded by IGBC since 2001, by creating awareness amongst the stakeholders. Thus far, the Council has been instrumental in enabling 2.23 Billion sq.ft of green buildings in the country. The Council's activities have enabled a market transformation with regard to green building materials and technologies. IGBC continuously works to provide tools that facilitate the adoption of green building practices in India. The development of IGBC Green New Buildings rating system® is another important step in this direction.

In order to obtain minimum Gold rating of IGBC on the basis of IGBC Green New Building Criteria is attached to the tender.

Note: Bidders are advised to go through the gold ratings requirement in the attachment in order to make themselves familiar with the IGBC guidelines before making the bids. The party in order to obtain IGBC rating shall work under the guidance of Project Architect / EIC. The statutory payment will be in the scope of NHIDCL however the party shall deploy experience manpower in order to obtain the ratings.

The green concepts and techniques in the building sector can help address national issues like water efficiency, energy efficiency, reduction in fossil fuel use for commuting, handling of consumer waste and conserving natural resources. Most importantly, these concepts can enhance occupant health, productivity and well-being.

Against this background, the Indian Green Building Council (IGBC) has launched 'IGBC Green New Buildings rating system® to address the national priorities. This rating programme is a tool which enables the designer to apply green concepts and reduce environmental impacts that are measurable. The rating programme covers methodologies to cover diverse climatic zones and changing lifestyles.

IGBC has set up the Green New Buildings Core Committee under the leadership of Ar. Raghavendran, to develop the rating programme. This committee comprised of key stakeholders, including architects, builders,

consultants, developers, owners, institutions, manufacturers and industry representatives. The committee, with a diverse background and knowledge has enriched the rating system, both in its content and process.

2. Benefits of Green New Buildings

Green New buildings can have tremendous benefits, both tangible and intangible. The most tangible benefits are the reduction in water and energy consumption right from day one of occupancy. The energy savings could range from 20 - 30 % and water savings around 30 - 50%. The intangible benefits of green new buildings include enhanced air quality, excellent day lighting, health & well-being of the occupants, safety benefits and conservation of scarce national resources.

3. National Priorities Addressed in the Rating System

The IGBC Green New Buildings rating system addresses the most important national priorities which include water conservation, handling waste, energy efficiency, reduced use of fossil fuels, lesser dependence on usage of virgin materials and health & well-being of occupants. The rating system requires the application of National standards and codes such as the NBC, ECBC, MoEF guidelines, CPCB guidelines, and several others. The overarching objective is to be better than the national standards so as to create new benchmarks.

- Water Conservation:

  Most of the Asian countries are water stressed and in countries like India, the water table has reduced drastically over the last decade. IGBC Green New Buildings rating system encourages use of water in a self-sustainable manner through reduce, recycle and reuse strategies. By adopting this rating programme, green new buildings can save potable water to an extent of 30 - 50%.

- Handling of Consumer Waste:

  Handling of waste in buildings is extremely difficult as most of the waste generated is not segregated at source and has a high probability of going to landfills. This continues to be a challenge to the municipalities which needs to be addressed. The rating system intends to address this by encouraging buildings to segregate the building waste.

- Energy Efficiency:

  The building sector is a large consumer of electrical energy. Through IGBC Green New Buildings rating system, buildings can reduce energy consumption through energy efficient

  - building envelope, lighting, air conditioning systems, etc., The energy savings that can be realised by adopting this rating programme can be to the tune of 20 - 30%.

- Reduced Use of Fossil Fuels:

  Fossil fuel is a slowly depleting resource, the world over. The use of fossil fuel for transportation has been a major source of pollution. The rating system encourages the use of alternate fuel vehicles for transportation.

- Reduced Dependency on Virgin Materials:

The rating system encourages projects to use recycled & reused material and discourages the use of virgin materials, thereby, addressing environmental impacts associated with extraction and processing of scare natural resources.

❖ Health and Well-being of Occupants:

Health and well-being of occupants are the most important aspect of IGBC Green New Buildings rating system. The rating system ensures adequate ventilation, daylight and occupant well-being facilities which are essential in a building. The rating system also recognises measures to minimise indoor air pollutants.

4. IGBC Green New Buildings Rating System®

IGBC has set up the Green New Buildings Core Committee to develop the rating programme. This committee comprised of key stakeholders, including architects, builders, consultants, developers, owners, institutions, manufacturers and industry representatives. The committee, with a diverse background and knowledge has enriched the rating system, both in its content and process.

a. Features

IGBC Green New Buildings rating system® is a voluntary and consensus-based programme. The rating system has been developed based on materials and technologies that are presently available. The objective of IGBC Green New Buildings rating system is to facilitate a holistic approach to create environment friendly buildings, through architectural design, water efficiency, effective handling of waste, energy efficiency, sustainable buildings, and focus on occupant comfort & well-being.

The rating system evaluates certain mandatory requirements & credit points using a prescriptive approach and others on a performance-based approach. The rating system is evolved so as to be comprehensive and at the same time user-friendly. The programme is fundamentally designed to address national priorities and quality of life for occupants.

Some of the unique aspects addressed in this rating system are as follows:

- Recognition for architectural excellence through integrated design approach.
- Recognition for passive architectural features.
- Structural design optimization with regard to steel and cement. This is a developmental credit. Projects are encouraged to attempt this credit, so as to help IGBC in developing baselines for future use.
- Water use reduction for construction. This is also a developmental credit.
- Based on the feedback from green building proponents, use of certified green products will be encouraged. IGBC has launched a new initiative to certify green products to transform markets. Products would be evaluated right from extraction to disposal.
- Handholding from IGBC Counsellors will now be available for the projects.
- A site visit and audit are proposed before award of the rating.
- Projects are encouraged to report energy and water consumption data on an annual basis, to facilitate research in this area.

b. Scope

IGBC Green New Buildings rating system® is designed primarily for new buildings, both for air-conditioned and non-air-conditioned buildings. New Buildings include (but are not limited to)

offices, IT parks, banks, shopping malls, hotels, hospitals, airports, stadiums, convention centres, educational institutions (colleges, universities), libraries, museums, etc., Building types such as residential, factory buildings, schools, integrated townships will be covered under other IGBC rating programmes.

IGBC Green New Buildings rating system is broadly classified into two types:

1) **Owner-occupied buildings** are those wherein 51% or more of the building's built-up area is occupied by the owner.
2) **Tenant-occupied buildings** are those wherein 51% or more of the building's built-up area is occupied by the tenants.

Based on the scope of work, projects can choose any of the above options.

c. The Future of IGBC Green New Buildings Rating System

Many new green building materials, equipment and technologies are being introduced in the market. With continuous up-gradation and introduction of new green technologies and products, it is important that the rating programme also keeps pace with current standards and technologies.

Therefore, the rating programme will undergo periodic revisions to incorporate the latest advancement and changes. It is important to note that project teams applying for IGBC Green New Buildings rating system® should register their projects with the latest version of the rating system. During the course of implementation, projects have an option to transit to the latest version of the rating system.

IGBC will highlight new developments on its website (www.igbc.in).

5. Overview and Process

IGBC Green New Buildings rating system® addresses green features under the following categories:

- Sustainable Architecture and Design
- Site Selection and Planning
- Water Conservation
- Energy Efficiency
- Building Materials and Resources
- Indoor Environmental Quality
- Innovation and Development

The guidelines detailed under each mandatory requirement & credit enables the design and construction of new buildings of all sizes and types (as defined in scope). Different levels of green building certification are awarded based on the total credits earned. However, every green new building should meet certain mandatory requirements, which are non-negotiable.

The various levels of rating awarded are as below:

Certification Level	Recognition
Certified	Good Practices
Silver	Best Practices
Gold	Outstanding Performance
Platinum	National Excellence
Super Platinum	Global Leadership

a) When to use IGBC Green New Buildings Rating System ®

IGBC Green New Buildings rating system® is designed primarily for New Buildings (owner-occupied and tenant-occupied).

The project team can evaluate all the possible points to apply under the rating system using a suitable checklist (Owner-occupied buildings and Tenant-occupied buildings). The project can apply for IGBC Green New Buildings rating system® certification, if the project can meet all mandatory requirements and achieve the minimum required points.

b) Registration

Organisations interested in registering their projects under IGBC Green New Buildings rating system Certification are advised to first register on IGBC website (www.igbc.in) under 'IGBC Green New Buildings Rating System' tab. The website includes information on registration fee for IGBC member companies as well as non-members.

Registration is the first step which helps establish initial contact with IGBC and provides access to the required documents, templates, important communications and along with other necessary information.

IGBC website provides all important details on IGBC Green New Buildings rating system® registration & certification - process, schedule and fee.

c) Certification

To achieve the IGBC Green New Buildings rating, the project must satisfy all the mandatory requirements and the minimum number of credit points.

The project team is expected to provide supporting documents at preliminary and final stage of submission, for all the mandatory requirements and the credits attempted.

The project needs to submit the following:

1. General information about project, including
    a. Project brief stating project type, different type of spaces, occupancy, number of floors, area statement, etc.,
    b. General drawings (in PDF format only):

i. Master/ Site plan
ii. Parking plans
iii. Floor plans
iv. Elevations
v. Sections

c. Photographs / Rendered images

2. Filled-in templates

3. Narratives and supporting documentation such as drawings, calculations (in excel sheets), declarations / contract documents, purchase invoices, manufacturer cut-sheets / letters/ material test reports, etc., for each mandatory requirement and credit.

The project documentation is submitted in two phases - Preliminary submittal and Final submittal:

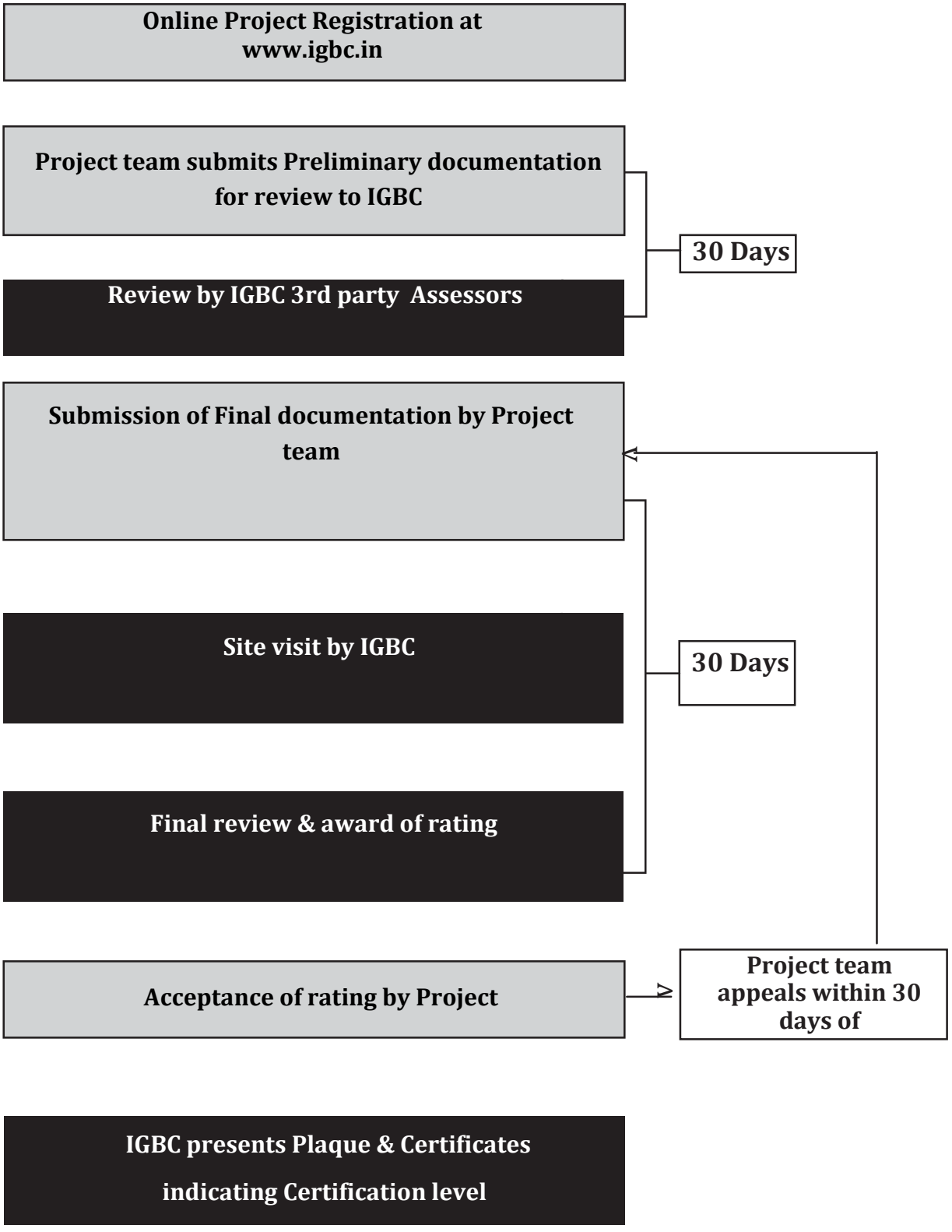
- Preliminary phase involves submission of all documents, which shall include the mandatory requirements and the minimum number of credits. After the preliminary submission, review is done by third party assessors and review comments would be provided within 30 days.
- The next phase involves submission of clarifications to preliminary review queries and final submittal. This review will also be provided within 30 days, after which the rating is awarded.

It is important to note that the mandatory requirements and credits earned at the preliminary review are only considered as expected. These mandatory requirements and credits are not awarded until the final documents are submitted, along with additional documents showing implementation of design features. If there are changes in any 'expected credits' after preliminary review, these changes need to be documented and resubmitted during the final review.

The threshold criteria for certification levels are as under:

Certification Level	Owner-occupied Buildings	Tenant-occupied Buildings	Recognition
Certified	50 – 59	50 – 59	Good Practices
Silver	60 – 69	60 – 69	Best Practices
Gold	70 – 79	70 – 79	Outstanding Performance
Platinum	80 – 89	80 – 89	National Excellence
Super Platinum	90 - 100	90 - 100	Global Leadership

IGBC will recognise Green New Buildings that achieve one of the rating levels with a formal letter of certification and a mountable plaque.


Online Project Registration at www.igbc.in
Project team submits Preliminary documentation for review to IGBC
Review by IGBC 3rd party Assessors
30 Days
Submission of Final documentation by Project team
Site visit by IGBC
Final review & award of rating
30 Days
Acceptance of rating by Project
Project team appeals within 30 days of
IGBC presents Plaque & Certificates indicating Certification level

d) Precertification

Projects (Tenant - occupied Buildings) by developers can register for Precertification. This is an option provided for projects aspiring to get precertified at the design stage. Precertification also gives the developer a unique advantage to market the project to potential buyers.

The documentation submitted for precertification must detail the project design features which will be implemented. The rating awarded under precertification is based on the project's intention to conform to the requirements of IGBC Green New Buildings rating system®. It is important to note that the precertification rating awarded need not necessarily correspond to the final rating.

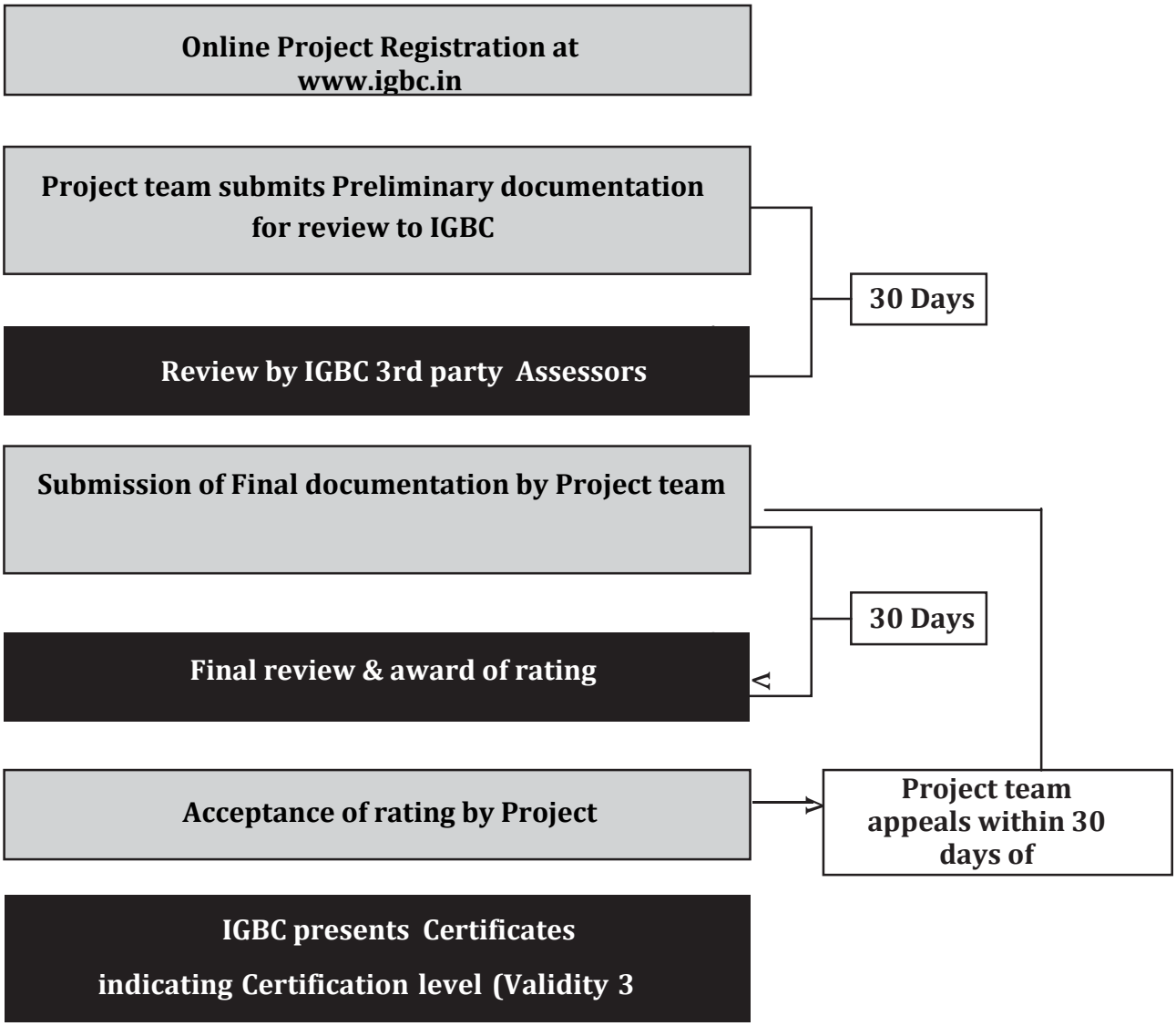
Pre-certified projects are required to provide the status of the project to IGBC, in relation to the rating, once in every six months until the award of the final rating.

Those projects which seek precertification need to submit the following documentation:

1. General information about project, including
    a. Project brief stating project type, different type of spaces, occupancy, number of floors, area statement, etc.,
    b. General drawings (in PDF format only):
        1. Master/ Site plan
        2. Parking plans
        3. Floor plans
        4. Elevations
        5. Sections
    c. Photographs/ Rendered views
2. Filled-in templates
3. Narratives and supporting documentation such as conceptual drawings, estimate / tentative calculations (in excel sheets), declarations from the owner, etc., for each of the mandatory requirement and credit

IGBC would take 30 days to review the first set of precertification documents. On receiving the clarifications posed in the first review, IGBC would take another 30 days to award the precertification.

A certificate and a letter are provided to projects on precertification.



The Precertification is valid for 3 years from the date of award, after which projects are Projects by developers can register for Precertification. This is an option provided for projects required to apply for the full certification (or) submit construction progress reports once in six months to get an extension certificate for Precertification rating.

Note :

- Projects (Owner-occupid Buildings) applying for MoEF clearance can apply for Provisional Certification. The Provisional Certification process will be same as Precertification process.

e) Credit Interpretation Ruling (CIR)

In some instances, there is a possibility that the design team may encounter certain challenges in applying or interpreting a mandatory requirement or a credit. It can also happen in cases where the project can opt to achieve the same intent through a different compliance route.

To address this, IGBC uses the process of Credit Interpretation Ruling (CIR) to ensure that interpretations are consistent and applicable to other projects as well.

The following are the steps to be followed in case the project team encounters any difficulty:

- ❖ Refer the Abridged Reference Guide for description of the credit intent and compliance options.
- ❖ Review the intent of the mandatory requirement / credit and self-evaluate whether the project satisfies the intent.
- ❖ Review the Credit Interpretation Ruling web page for previous CIRs on the relevant mandatory requirement or credit. All projects registered under IGBC Green New Buildings rating system will have access to this page.
- ❖ If a similar CIR has not been addressed or does not answer the question sufficiently, submit a credit interpretation request. Only registered projects are eligible to post credit interpretation request. Two CIRs are answered without levying any fee, and for any CIR beyond the first two CIRs, a fee is levied.

f) Appeal

In rare cases, mandatory requirements / credits get denied due to misinterpretation of the intent. On receipt of the final review and if the project team feels that sufficient grounds exist to appeal a credit denied in the final review, the project has an option to appeal to IGBC for reassessment of denying mandatory requirements / credits. The documentation of the mandatory requirements / credits seeking appeal may be resubmitted to IGBC along with necessary fees. IGBC will take 30 days to review such documentation. If an appeal is pursued, please note that a different review team will be assessing the appeal documentation. The following documentation should be submitted:

1. General information about project, including
    a. Project brief stating project type, different type of spaces, occupancy, number of floors, area statement, etc.,
    b. General drawings (in PDF format only):
        i. Master/ Site plan
        ii. Parking plans
        iii. Floor plans
        iv. Elevations
        v. Sections
    c. Photographs / Rendered views
2. Filled-in templates for respective mandatory requirement / credit.
3. Resubmittal and appeal submittal documentation for only those mandatory requirements / credits that the project is appealing for. Also, include a narrative for each appealed mandatory requirement / credit to describe how the documents address the reviewers comments and concerns.

g) Fee

Registration, Precertification / Provisional Certification, Certification and CIR fee details are available on the IGBC website (www.igbc.in) or can be obtained from IGBC (igbc@cii.in).

h) Updates and Addenda

As the rating system continues to improve and evolve, updates, addenda and errata to the abridged reference guide will be made available through IGBC website. The additions thereof will be suitably incorporated in the next version of the rating system.

IGBC Green New Buildings Rating System Checklist		**Points Available**	
		Owner-occupied Buildings	**Tenant-occupied Buildings**
Modules		**100**	**100**
Sustainable Architecture and Design		**5**	**5**
SA Credit 1	Integrated Design Approach	1	1
SA Credit 2	Site Preservation	2	2
SA Credit 3	Passive Architecture	2	2
Site Selection and Planning		**14**	**14**
SSP Mandatory Requirement 1	Local Building Regulations	Required	Required
SSP Mandatory Requirement 2	Soil Erosion Control	Required	Required
SSP Credit 1	Basic Amenities	1	1
SSP Credit 2	Proximity to Public Transport	1	1
SSP Credit 3	Low-emitting Vehicles	1	1
SSP Credit 4	Natural Topography or Vegetation	2	2
SSP Credit 5	Preservation or Transplantation of Trees	1	1
SSP Credit 6	Heat Island Reduction, Non-roof	2	2
SSP Credit 7	Heat Island Reduction, Roof	2	2
SSP Credit 8	Outdoor Light Pollution Reduction	1	1
SSP Credit 9	Universal Design	1	1
SSP Credit 10	Basic Facilities for Construction Workforce	1	1
SSP Credit 11	Green Building Guidelines	1	1
Water Conservation		**18**	**19**
WC Mandatory Requirement 1	Rainwater Harvesting, Roof & Non-roof	Required	Required
WC Mandatory Requirement 2	Water Efficient Plumbing Fixtures	Required	Required
WC Credit 1	Landscape Design	2	2
WC Credit 2	Management of Irrigation Systems	1	1
WC Credit 3	Rainwater Harvesting, Roof & Non-roof	4	4
WC Credit 4	Water Efficient Plumbing Fixtures	5	5
WC Credit 5	Wastewater Treatment and Reuse	5	5
WC Credit 6	Water Metering	1	2

Modules		Points Available	
		Owner-occupied Buildings	**Tenant-occupied Buildings**
Energy Efficiency		**28**	**28**
EE Mandatory Requirement 1	Ozone Depleting Substances	Required	Required
EE Mandatory Requirement 2	Minimum Energy Efficiency	Required	Required
EE Mandatory Requirement 3	Commissioning Plan for Building Equipment & Systems	Required	Required
EE Credit 1	Eco-friendly Refrigerants	1	1
EE Credit 2	Enhanced Energy Efficiency	15	15
EE Credit 3	On-site Renewable Energy	6	6
EE Credit 4	Off-site Renewable Energy	2	2
EE Credit 5	Commissioning, Post-installation of Equipment & Systems	2	2
EE Credit 6	Energy Metering and Management	2	2
Building Materials and Resources		**16**	**16**
BMR Mandatory Requirement 1	Segregation of Waste, Post-occupancy	Required	Required
BMR Credit 1	Sustainable Building Materials	8	8
BMR Credit 2	Organic Waste Management, Post-occupancy	2	2
BMR Credit 3	Handling of Waste Materials, During Construction	1	1
BMR Credit 4	Use of Certified Green Building Materials, Products & Equipment	5	5
Indoor Environmental Quality		**12**	**11**
IEQ Mandatory Requirement 1	Minimum Fresh Air Ventilation	Required	Required
IEQ Mandatory Requirement 2	Tobacco Smoke Control	Required	Required
IEQ Credit 1	CO_2 Monitoring	1	1
IEQ Credit 2	Day lighting	2	2
IEQ Credit 3	Outdoor Views	1	1
IEQ Credit 4	Minimize Indoor and Outdoor Pollutants	1	1
IEQ Credit 5	Low-emitting Materials	3	3
IEQ Credit 6	Occupant Well-being Facilities	1	-
IEQ Credit 7	Indoor Air Quality Testing, After Construction and Before Occupancy	2	2
IEQ Credit 8	Indoor Air Quality Management, During Construction	1	1
Innovation and Development		**7**	**7**
ID Credit 1	Innovation in Design Process	4	4
ID Credit 2	Optimization in Structural Design	1	1
ID Credit 3	Waste Water Reuse, During Construction	1	1
ID Credit 4	IGBC Accredited Professional	1	1

The threshold criteria for certification levels are as under:

Certification Level	Owner-occupied Buildings	Tenant-occupied Buildings	Recognition
Certified	50 - 59	50 - 59	Good Practices
Silver	60 - 69	60 - 69	Best Practices
Gold	70 - 79	70 - 79	Outstanding Performance
Platinum	80 - 89	80 - 89	National Excellence
Super Platinum	90 - 100	90 - 100	Global Leadership

B. TECHNICAL SPECIFICATIONS ENVIRONMENT HEALTH AND SAFETY POLICY

1.0 SCOPE:

This specification established the Environment, Health and Safety (EHS) management requirement to be complied with by the Contractors during construction.
Requirements stipulated in this specification shall supplement the requirements of EHS Management given in relevant Act (s) / legislations. General Terms and Conditions of Contract (GTC), Special terms and Conditions of Contract (STC) and Job Specifications. Where different documents stipulate different requirements, the most stringent shall be adopted.

2.0 REFERENCES

This document should be read in conjunction with following:

- General Terms and Conditions of Contract (GTC)
- Special Terms and Conditions of Contract (STC)
- Job Specifications

3.0 REQUIREMENTS OF ENVIRONMENT, HEALTH & SAFETY (EHS) MANAGEMENT SYSTEM TO BE COMPLIED BY BIDDERS

3.1 MANAGEMENT RESPONSIBILITY

3.1.1 The Contractor should h a v e a documented EHS policy to cover commitment of their organization to ensure health, safety and environment aspects in their line of operations.

3.1.2 The EHS management system of the Contractor shall cover the EHS requirements including but not limited to what is specified under Para 1.0 and para 2.0 above.

3.1.3 Contractor shall be fully responsible for planning and implementing EHS requirements. Contractor as a minimum requirement shall designate / deploy the following to co-ordinate the above:

No. of workers deployed	
Up to 250	- Designate one safety supervisor
Above 250 & up to 500	- Deploy one qualified and experienced Safety Engineer / officer
Above 500	- One additional safety (for every 500 or less) engineer/officer as above.

Contractor shall indemnify & hold harmless Project Architect/EIC & either representatives free from any and all liabilities arising out of non - fulfillments of EHS requirements.

3.1.4 The Contractor shall ensure that the Environment, Health & Safety (EHS)requirements are clearly understood & faithfully implemented at all levels at site.

3.1.5 The Contractor shall promote a n d develop consciousness for Safety, Health and Environment among all personnel working for the Contractor. Regular awareness, program site meetings shall be arranged on EHS activities to cover hazards involved in various operations during construction.

3.1.6 Arrange suitable first aid m e a s u r e s such as First Aid Box, trained personnel to give First Aid, Stand by Ambulance or Vehicle and install fire protection measures such as: adequate number of steel buckets with sand and adequate fire extinguishers to the satisfaction of Project Architect/EIC.

3.1.7 The Contractor shall evolve a comprehensive planned and documented system for implementation and monitoring of the EHS requirements. This shall be submitted to CMPDIL/ Owner for approval. The monitoring for implementation s h a l l be done by regular inspections and compliance to the observations thereof. The Contractor shall get similar EHS requirements implemented at his sub- contractor(s) work site/office. However, compliance of EHS requirements shall be the sole responsibility of the Contractor. Any review / approval by Project Architect/EIC shall not absolve contractor of his responsibility / liability in relation to all EHS requirements.

3.1.8 Non-Conformance on EHS by Contractor (including his Sub-contractors) as brought out during review/audit by Project Architect/EIC representatives shall be resolved forthwith by Contractor. Compliance report shall be provided to Project Architect/EIC.

3.1.9 The Contractor shall ensure participation of his Resident Engineer / Site-in-Charge in the Safety Committee / EHS Committees meetings arranged by Project Architect/EIC. The compliance of any observations shall be arranged urgently. He shall assist Project Architect/EIC to achieve the targets set by them on EHS during the project implementation.

3.1.10 The Contractor shall adhere consistently to all provisions of EHS requirements. In case of non-compliance or continuous failure in implementation of any of EHS provisions; Project Architect/EIC may impose stoppage of work without any Cost & Time implication to Owner and/or impose a suitable penalty for non-compliance with a notice of suitable period, **up to a cumulative limit of 1.0% (one percent) of Contract Value with a maximum limit of Rs. 10 lakhs**. This penalty shall be in addition to all other penalties specified elsewh ere in the contract. The decision of imposing stoppage work, its extent & monitory penalty shall rest with Project Architect/EIC & binding on the Contractor.

3.1.11 All fatal accidents and other personnel accidents shall be investigated by a team of Contractor's senior personnel for root cause & recommend corrective and preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to Project Architect/EIC. Project Architect/EIC shall have the liberty to independently investigate such occurrences and Contractor shall extend all necessary help and co-operation in this regard.

3.2 HOUSE KEEPING

3.2.1 Contractor shall ensure that a high degree of housekeeping is maintained and shall ensure inter alia the followings wherever applicable:

a. All surplus earth and debris are removed/disposed off from the working areas to identified location(s).

b. Unused/Surplus Cables, Steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).

c. All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from work place to identified location(s).

d. Roads shall be kept clear and materials like: pipes, steel, sand boulders, concrete, chips and bricks etc. shall not be allowed on the roads to obstruct free movement of men & machineries.

e. Fabricated steel structural, pipes & piping materials shall be stacked properly for erection.

f. Water logging on roads shall not be allowed.

g. No parking of trucks / trolleys, cranes and trailers etc. shall b e allowed on roads which may obstruct the traffic movement.

h. Utmost care shall be taken to ensure over all cleanliness and proper up keep of the working areas.

i. Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the premises.

j. Only properly designed steel scaffolding materials to be used for working at heights more than 3.0M. Double scaffolding using wooden ballis maybe allowed for working at height less than 3.0M

3.3 ENVIRONMENT, HEALTH AND SAFETY

3.3.1 The Contractor shall provide safe means of access to any working place including provisions of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen, and, Project Architect/EIC. Contractor shall ensure deployment of appropriate equipment and appliances for adequate safety and health of the workmen and protection of surrounding areas.

3.3.2 The Contractor shall ensure that all their staff and workers including their sub- contractor(s) shall wear Safety Helmet and Safety shoes. Contractor shall also ensure use of safety belt, protective goggles, gloves etc. by the personnel as per job requirements. All these gadgets shall conform to relevant IS specifications or equivalent.

3.3.3 Contractor shall ensure that a proper Safety Net System shall be used at appropriate locations. The safety net shall be located not more than 30 feet (9.0 metres) below the working surface at site to arrest or to reduce the consequences of a possible fall of persons working at different heights.

3.3.4 Contractor shall ensure that flash back arrester shall be used while using Gas Cylinders at site. Cylinders shall be mounted ontrolleys.

3.3.5 The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health for driving of vehicles, handling and erection of materials and equipment's. All lifting equipment's shall be tested certified for its capacity before use. Adequate and suitable lighting at every work place and approach there to, shall be provided by the Contractor before starting the actual operations at night.

3.3.6 Hazardous and/or toxic materials such as solvent coating, or thinners shall be stored in appropriate containers.

3.3.7 All hazardous materials shall be labelled with the name of the materials, the hazards associated with its use and necessary precautions to be taken.

3.3.8 Contractor shall ensure that during the performance of the work, all hazards to be health of personnel, have been identified, assessed and eliminated.

3.3.9 Chemical spills shall be contained & cleaned up immediately to prevent further contamination.

3.3.10 All personnel exposed to physical agents such as ionizing radiation, ultraviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with the type of exposure involved.

3.3.11 Where contact or exposure of hazardous materials could exceed limits or could otherwise have harmful affects, appropriate personal protective equipment's such as gloves, goggles, aprons, c hemical resistant clothing and respirator shall be used.

- A Crèche where 10 or more female workers are having children below the age of 6 years.
- Reasonable Canteen facilities are made available at appropriate location depending upon site conditions.

3.3.13 Suitable facilities for toilet, drinking water, proper lighting shall be provided at site and labour camps, commensurate with applicable Laws /Legislation.

3.3.14 Contractor shall ensure storage and utilization methodology of materials that are not detrimental to the environment. Where required Contractor shall ensure that only the environment friendly materials are selected.

3.3.15 All persons deployed at site shall be knowledgeable of and comply with the environmental laws, rules & regulations relating to the hazardous materials substances and wastes. Contractor shall not dump, release or otherwise discharge or dispose off any such materials without the express authorization of Project Architect/EIC.

4.0 DETAILS OF EHS MANAGEMENT SYSTEM BY CONTRACTOR

4.1 On Award of Contract

The Contractor shall prior to start of work submit his Safety Health and Environment Manual or procedure and EHS Plans for approval by Project Architect/EIC. The Contractor shall participate in the pre-start meeting with Project Architect/EIC to finalize EHS Plans including the following:

- Job procedure to be followed by Contractor for activities covering. Handling of equipment, Scaffolding, Electric Installation, describing the risks involved, actions to be taken and methodology for monitoring each activity.

- Project Architect/EIC review / audit requirement.
- Organization structure along with responsibility and authority records / reports etc. on EHS activities.

4.2 During job execution

4.2.1 Implement approved Environment, Health & Safety management procedure including but not limited to as brought out under para 3.0. Contractor shall also ensure to:

- arrange workmen compensation insurance, registration under ESI Act, third party liability insurance etc., as applicable.
- arrange all HSE permits before start of activities (as applicable) like hot work, confined space, work at heights, storage of chemical / explosive materials and its use and implement all precautions mentioned therein.
- submit timely the completed checklist on EHS activities, Monthly EHS report, accident reports, investigation reports etc. as per Project Architect/EIC requirements. Compliance of instructions on EHS shall be done by Contractor and informed urgently to Project Architect/EIC.
- ensure that Resident Engineer / Site-in-Charge of the Contractor shall attend all the Safety Committee / EHS meetings arranged by Project Architect/EIC. Only in case of his absence from site that a second senior most person shall be nominated by him in advance and communicated to Project Architect/EIC.
- display at site office and work locations caution boards, list of hospitals, emergency services available.
- provide posters, banners for safe working to promote safety consciousness.
- carryout audits /inspection at subcontractor works as per approved EHS document and submit the reports for Project Architect/EIC review.
- assist in EHS audits by Project Architect/EIC, and submit compliance report.
- generate & submit HSE records / report as per EHS Plan.
- appraise Project Architect/EIC on EHS activity

Annex – I

(Schedule-D)

Specifications and Standards for Construction

A. TECHNICAL SPECIFICATION OF CIVIL WORKS:

1.0 GENERAL:

1.1 The work shall in general conform to the **Latest CPWD Specifications** (corrected up to the last date of submission/uploading of bid) as mentioned in General Conditions of Contract (GCC). Work under this Contract shall consist of furnishing all labour, materials, equipment, tools & plants and appliances necessary and required.

1.2 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 of 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.

1.3 Regarding testing of civil & electrical & other materials, the testing of materials shall be conducted in Govt. Laboratory/ Govt. Engineering Colleges/ IITs/ NITs or from the laboratory approved by Engineer-in-charge. The charges of testing of materials in approved laboratory shall be borne by the Contractor.

1.4 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.

1.5 The Contractor shall comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 Constructional practices and safety- 2016, National Building code of India, Bureau of Indian Standards. A copy of all pertinent regulations and notices concerning accidents, injury and first-aid shall be prominently exhibited at the work site. Depending upon the scope & nature of work, a person qualified in first-aid shall be available at work site to render and direct first-aid to causalities. A telephone may be provided to first-aid assistant with telephone numbers of the hospitals displayed. Complete reports of all accidents and action taken thereon shall be forwarded to the competent authorities.

1.6 Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water ponding on all sunken slabs using cement and sand mortar.

1.7 **Approved Makes**:

Specification/brands names of materials to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market and/or Contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document.

1.8 **Method Statement:**

The Contractor shall submit a 'Methods statement' for each important activity for the approval of the Engineer-in-charge soon after the award of work to him. The 'Methods statement' is a statement by which the construction procedures for any activity of construction is formulated and stated in chronological order. The 'Methods statement', should have a description of the item with elaborate procedures in steps to implement the same, the specifications of the materials involved, their testing and acceptance criteria, equipment to be used, Precautions to be taken, etc.

1.9 The work shall be carried out in accordance with the Design Basis Report, Architectural drawings and structural drawings (proof checked/vetted by the Contractor) and approved by the Engineer-in-Charge. The Technical Specifications are to be read with and in general conforming to the Latest CPWD Specifications.

1.10 The Contractor shall procure the required materials in advance so that there is sufficient time to testing of the materials and clearance 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.

2.0 **For Detailed Specification of DSR items of Civil works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD specification 2009 VOLUME I AND VOLUME II** (corrected up to the last date of submission/uploading of bid)

3.0 GLASS REINFORCEMENT CONCRETE (GRC) WALL CLADDING TILES.

3.1 MATERIAL:

3.1.1 GRC Wall cladding tiles is a highly refined architectural precast concrete building stone made by a special process to simulate natural stone. Because of its versatility of form, color and texture, GRC Wall cladding tiles offers a superior, yet cost effective, ornamentation medium.

3.1.2 The thickness of the tiles should range between 12 to 18 mm (depending on the texture of the tile), allowing variance of ±2 mm in accordance with IS: 1237-1980.

3.1.3 The composition of tiles should be '43' Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by 'BAYFERROX (Germany)' or equivalent.

3.1.4 The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz, super plasticizers and integrated water proofing agents and others.

3.1.5 The tiles should be produced with high vibration technology and should have compressive strength equivalent to M-40 Grade@ 28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs. immersion method, less than 8%.

3.1.6 Stone shall be of the type as specified in the item. It shall be hard, sound durable and tough free from cracks, decay and weathering and defects like cavities cracks, flaws, holes, veins, patches of soft or loose materials etc. Thickness of stone shall be as specified.

3.1.7 Before starting with the installation procedure, Contractor first need to calculate the area where he wants to clad. Contractor can instruct to the labour to calculate by simply measuring its length and breadth and then multiplying it. This would help him get an estimated amount of material for the cladding.

3.2 SUBMITTAL :

3.2.1 Product Data: Manufacturer's (as per approved make) standard specifications, and descriptive literature for main products and any accessory items, including:

1. Spec-Data product information sheets. (GRC Wall cladding tiles GRC Wall Cladding Tiles, Pattern: Unibrick country Brick, Size: 7.5" x 2.25) or as per Project Architect.
2. Color charts - Copper Red, or approved by Project Architect.
3. Building code evaluation reports.
4. Blank warranty forms.

3.2.2 Samples: Color boards prepared with actual stone veneer style specified or selected for this Project; show joints, color variations, and textures expected in finished installation.

3.3 SCAFFOLDING

As specified in 7.4.11. of **CPWD Specification 2009 Volume I** (corrected up to the last date of submission/uploading of bid).

3.4 SURFACE PREPARATION:

This is the most crucial part the whole procedure as it would ensure the bonding that the adhesive/ mortar will have the wall because if the bond between the adhesive/ mortar and wall is not intact than the cladding can plunge off the wall. So, the procedure for surface preparation is as follows-

3.4.1 Plastered wall to be rough finished for mechanical ponding, wet cladding can be initiated directly on wall.

3.4.2 If your wall is painted remove the layer using grinders than cut grooves into wall using an angle grinder, horizontally as well as vertically to create keys, for mechanical bonding.

3.5 INSTRUCTION

3.5.1 Ensure that the surface is not friable and that all laitance, dust is removed. Do not wet the surface before cladding commences.

3.5.2 Mortar mix must be applied to the surface to a minimum bed thickness of 10mm or as per manufacturer instruction.

3.5.3 Spread only enough mortar/adhesive for each individual piece. Should a thin film (skin) appear on the surface of the adhesive, re-agitate with trowel before bedded.

3.5.4 Press the dry Natural stone cladding firmly into wet mortar with a twisting action. Product must be bedded with the aid of a Rubber mallet.

3.5.5 Lift and replace random cladding to ensure that 100% contact is being achieved between the cladding and mortar (no voids behind cladding).

3.5.6 Back buttering of Natural stone cladding is recommended where the back of the cladding product surface is irregular or when cladding in awkward locations.

3.6 INSTALLATION PROCEDURE

The tiles should be applied on a rough plaster of cement mortar 1:3 (1 cement: 3 coarse sand) and the fixing of tiles should be done by 'GRC Wall cladding tiles' tile adhesive or equivalent as per manufacturer's laying instruction.

4.0 UPVC WINDOWS AND VENTILATORS:

4.1 GENERAL:

All type of UPVC Door and Window are as per SOQ. Detailed specification of UPVC Door and Window for size and material can be as per manufacturer (in approved make) approved by Engineer -in-charge /Project Architect.

4.2 MATERIAL: As specified in 9.18.0 of **CPWD Specification 2009 Volume I** (corrected up to the last date of submission/uploading of bid).

4.3 TEST: As specified in 9.19.4 of **CPWD Specification 2009 Volume I** (corrected up to the last date of submission/uploading of bid).

4.4 SPECIFICATION FOR TYPES AND SIZES OF UPVC WINDOWS AND VENTILATORS TO BE INSTALLED AS PER SOQ ITEM:

4.4.1 UPVC (un-plasticized polyvinyl chloride) sliding windows size 2400w x 2070h (53.48 sq. Ft.) 41201-03000, Slider Screen-: Track + Screen, Super Screen Sash type, White Handle Colour, Grooved SL Alumi Rail, Patio sliding Handle, SS 430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.2 UPVC (un-plasticized polyvinyl chloride) sliding windows size 1200w x 2070h (26.74 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000,Slider O/F : 41201-01000, White Sash Colour, Slider Sash : 41201-03000, Slider Screen-: Track + Screen, Super Screen Sas type, White Handle Colour,: Grooved SL Alumi Rail, Patio sliding Handle,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.3 UPVC (un-plasticized polyvinyl chloride) sliding windows size 600w x 2070h (13.37 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, Cement T- Sash : 41101-13000, ,White Handle Colour, Casement Handle - Espag, SH Friction hinge type, SS Friction Hinge,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.4 UPVC (un-plasticized polyvinyl chloride) sliding windows size 900w x 2070h (20.05 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, Cement T- Sash : 41101-13000, ,White Handle Colour, Casement Handle - Espag, SH Friction hinge type, SS Friction Hinge,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.5 UPVC (un-plasticized polyvinyl chloride) sliding windows size 750w x 2070h (16.71sqft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Slider Series ,Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, Slider O/F -41201-01000,White Sash Colour, Slide Sash : 41201-03000, Slider Track + Screen, Super Screen Sas Type, White Handle Colour, Grooved shape SL Alumi rail, Patio Sliding handle,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.6 Providing and fixing UPVC (un-plasticized polyvinyl chloride) ventilator size 900w x 900h (8.72sqft) complete in all respect with specification of SY01 Combination System, Combination System,

6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys, Tilt/Turn F, White colour, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame, White frame colour, Window O/F -41101-11000, White Bead Colour all complete as per drawing.

4.4.7 UPVC (un-plasticized polyvinyl chloride) ventilator size 600w x 600h (3.88sqft) complete in all respect with specification of SY01 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys, Tilt/Turn F, White colour, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame, White frame colour, Window O/F -41101-11000, White Bead Colour all complete as per drawing.

4.5 FIXING:

Fixing of window and ventilators shall be done as per manufacturer's fixing instruction. All corner joints shall be homogeneously fusion heat welded in accordance with the instructions of the profile Systems supplier. The resulting joints shall be finished by the grooving/knifing method. Solvent welded joints shall not be allowed.

4.6 MEASUREMENT:

The Measurement shall be done by simply counting the number of UPVC window and ventilators as per Manufacturer criteria or contract.

4.7 RATE:

The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be inclusive.

4.6 GLAZING:

All glazing shall be internally beaded. The windows shall be constructed in such a manner that the glazing or deglazing can take place without the removal of the sash or frame.

5.0 FULLY AUTOMATIC SLIDING DOOR

5.1 GENERAL:

Automatic Sliding glass door operator 4150 mm, compliant with future European standards and produced according to the guidelines for power-operated windows, doors and gates, BGR 232, the UVV and the VDE regulations.

5.2 TESTING:

TÜV design tested, tested according to the low voltage guidelines, fulfils DIN 18650 standards, for framed glass door application with 12mm toughed glass for 2 Nos. sliding door panels and 2 Nos. fixed panels, both sliding Operator & Frame Finish should be Silver Anodized E6/C0, with operator dimensions (H x D) : 100 x 180 mm and of length as required to suit the opening size given below.

5.3 SPECIFICATION/FEATURES:

The track profile should be separate from the main profile for enabling reduction in vibration insulation. Microprocessor-controlled control unit, Self-learning, with adjustable parameters for opening and closing speed, hold-open time and opening and closing force, reversing when obstruction is encountered, Class of protection IP 20. Activators- 6 Safe Combinations Radars with Motion & Presence Detection (02 Nos.), Light barrier comprising of receiver and transmitter - 01 Pair, with Electro-mechanical locking, Program Switch with Key. Max Panel Weight Carrying Capacity of 2 X 100 Kgs. tem shall have constant power supply 230V+ 5%, 50Hz, AC. The requirement in total is as mentioned, wall connecting profiles be used on top of over panel and on all sides to fixed panels only. The above work should complete in all respect as per approved drawings and to the satisfaction of Architect /Engineer-in-Charge.

5.4 INSTALLATION:

The installation for automatic sliding door opener has a lot of procedures, and each process should be carefully done under the supervision of Engineer-in-charge, Company which deal with this type of work or Project Architect. For electrical supply he may contact to Contractor as it is under Contractor scope.

5.5 PRECAUTION:

After the installation is completed, close the door, check the door moving leaf active area without obstructions, sensor area without active person. Then switch the power. When the first time the power on, the door will slowly movement to record the door route.

5.4 MEASUREMENT AND RATE:

The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be inclusive.

6.0 GLASS DOOR

6.1 GENERAL:

6.1.1 Glass Door (Single Leaf) size of 2100 mm x 1050mm of 10mm toughened glass with Slim line 45mm frames clip in profiles all around the door with complete assembly.

6.1.2 DP45 Door Profile frame of size 45X50mm with seals with Junior Office Hinges (3nos) & Studio Gala Locks (1no) & Studio Gala lever handles in aluminum silver (EV1) finish , Euro profile cylinder and TS 89 Door closer with slide channel (as per EN 1154) and saddle plate for fixing on the Glass door and necessary seals to be provided all around the door frames.

6.1.3 The slim line profiles shall be suitable for Glass thickness of 10mm.

6.1.4 The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system. All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.

6.2 PRECAUTION BEFORE INSTALLATION:

6.2.1 All installation materials used have been checked for compatibility.
6.2.2 Correct orientation of system has been identified. Inswing or Outswing.
6.2.3 Sill condition is understood and necessary weep system is in place where standard Doors sill is not being applied.
6.2.4 Frame has been sealed and joined at all points indicated in instructions
6.2.5 Opening checked for correct dimensions.
6.2.6 Frame is installed at correct depth within the opening
6.2.7 Frame has been installed square, level and plumb
6.2.8 Plastic shims were utilized under sill when required
6.2.9 Jambs were shimmed to prevent rolling
6.2.10 Shims were applied between head track and header. Only as recommended in instructions
6.2.11 Installation holes prepared correctly
6.2.12 Sealant was applied to sill installation holes prior to inserting screws & top of screw heads once applied
6.2.13 Correct fastener placement has been followed as directed by manufacturer

6.2.14 Proper operation and adjustment has been achieved Frame has been checked for level, square and plumb. All horizontal and vertical adjustments have been made so that proper reveals are present and product is operating as designed. Weep holes have been checked and free of obstruction and debris. All trash has been discarded. All hardware has been installed correctly and checked for proper operation. Product has been closed and locked and recommended to not be used as thoroughfare by other trades. Product is protected from damage. Final inspection of weather proofing and operation has been performed. Job has been turned over to contractor or Site engineer with approval.

6.3 INSTALLATION: Product was installed as directed by the Manufacturer approved by the Engineer-in-charge.

7.0 FULL HEIGHT GLASS PARTITION/ FULL HEIGHT PARTITION/ LOW HEIGHT PARTITION

7.1 GENERAL:

Furnish and install glass partitions. Provide all labor, materials, tools, equipment, and services for glass partitions in accordance with provisions of contract documents.

7.1 FULL HEIGHT GLASS PARTITON:

Glass partition of 10 mm Toughened Glass using slim line System-45 Frames clip in profile to a height of maximum 3m or as per drawing. The Fixed glass to be fixed using BP45 Profiles at Top & Bottom & fixed frame cleat. The profile size to be 45x25MM to be fixed on to the floor/ ceiling as per the architect design. H Junction profile to be used at all Glass to Glass vertical joints, 90 Deg L Junction Profiles and T Junction profiles necessary as per design. In case of Glass overall panel MP45 & BP45 Over panel Profile to be used. The clip in profiles shall be suitable for Glass thickness of 10 mm. The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system.

All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.

7.2 FULL HEIGHT PARTITION

7.2.1 GENERAL:

69 mm thick of approved make drywall partition system/approved equivalent, which include "Approved make Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51mm Floor and Ceiling track profile, 0.5 mm thick, having two equal flanges of 32mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610 mm; Vertical G.I studs of size 51mm, 0.5mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610 mm centers.

9 mm Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either side of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame.

7.2.2 JOINTING AND FINISHING:

Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with Everest compound of standard. make with Self-adhesive Fiber glass mesh tape. The rate shall be inclusive of providing & finishing 2 coats of top paint and labour for cutouts for light fixtures grills, diffusers etc.

7.3 LOW HEIGHT PARTITION

7.3.1 GENERAL:

69 mm thick X1350 mm height , approved make drywall partition system/ approved equivalent, which include "Approved make Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51 mm Floor and Ceiling track profile, 0.5mm thick, having two equal flanges of 32 mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610 mm; Vertical G.I studs of size 51 mm, 0.5 mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610 mm centers.

9 mm approved make Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either side of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame.

7.3.2 JOINTING AND FINISHING:

Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with Everest compound of std. make with Self-adhesive Fiber glass mesh tape. The rate shall be inclusive of 2 coats of top paint and labour for cutouts for electrical, telephone, computer conduits etc.

7.4 INSTRUCTION:

7.4.1 Product was tested, installed as directed by the Manufacturer approved by the Engineer-in-charge.

7.4.2 The product shall be gone through quality assurance. Glass shall be clear tempered per ASTM C1048-97b.

7.4.3 Proper storage of partitions before installation and continued protection during and after installation will be the responsibility of the Contractor.

7.4.4 The submitting manufacturer guarantees the proposed substituted product complies with the product specified and as detailed on the drawings.

7.4.5 The complete installation of the glass wall system shall be by an authorized factory-trained installer and be in strict accordance with the approved drawings and manufacturer's standard printed specifications, instructions, and recommendations.

7.4.6 Cleaning: All track and panel surfaces shall be wiped clean and free of handprints, grease, and soil.

7.4.7 Warranty: Track, carriers, and horizontal rails shall be guaranteed for one year against defects in material and workmanship. The glass is not included in this warranty.

7.4.8 Cartoning and other installation debris shall be removed to on-site waste collection area, provided by others.

7.4.9 Tolerance: ±10 mm in height and width.

7.4.10 Specification of partition, installation process all depends on manufacturer's as per approved make.

8.0 LAMINATE WALL PANEL

8.1 GENERAL

8.1.1 Pre-manufactured panel system including mounting hardware and specified accessories.

8.1.2 Submittal of Product Data: Manufacturer's Safety Data Sheets (MSDS) on each product to be used, including:

a) Preparation instructions and recommendations.
b) Storage and handling requirements and recommendations.
c) Installation methods.

8.1.3 Manufacturer's Drawings: Manufacturer's drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with adjacent work.

8.1.4 Selection Samples: For each finish product specified, one complete set of color samples representing manufacturer's standard range of available colors and patterns.

8.1.5 Quality assurance: Firm experienced in successful production of wall systems similar to that indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.

8.1.6 Installer Qualifications: Demonstrate successful experience in installing architectural woodwork similar in type and quality to those required for this project.

8.1.7 Provide prefinished decorative laminates where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

8.2 PREPARATION

8.2.1 Panels must be acclimated to ambient temperature and humidity conditions in accordance with manufacturer's specifications prior to installation.

8.2.2 Clean surfaces thoroughly prior to installation.

8.2.3 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

8.3 MATERIAL

8.3.1 1MM THK LAMINATE FINISH (selected as per approved make):

1 mm thk selected laminate of approved colour & approved make, glued with approved phenol formaldehyde based adhesive or approved equivalent overlaying on substrate without any gap/air bubbles pressed uniformly to line level and plumb, item complete with all edge lipping with water based PU TW lipping mounted flush to surface as per detailed drawings and Architects recommendations: all accessories, fixing implements , men material and lift upto 6 Mtr. Finished complete with all necessary masking with avg. min 10mm wide masking tape before applying polish to edge lipping and getting mock up approved by Engineer in charge/ Architect. Item to include protecting finished item by avg. 20 microns thk polythene sheet till handover of facility complete.

8.3.2 UNICOLOUR LAMINATE (selected as per approved make):

unicolor decorative laminate with homogeneous same color of decorative surface and core layers as per 438:3 -2005, FSC & Green Guard. Item to be completed in all respects as per drawings and instructions from Project in charge.

8.3.3 1-(B)) MR+ (MAR RESISTANT) TUFF GLOSS LAMINATES (selected as per approved make):
(Mar Resistant) Tuff Gloss Laminates 1mm thickness, conforming to IS 2046:1995, 3to 4 times more resistant than normal Gloss Laminate, gloss meter reading is over 110 at 60-degree angle reading as per ASTM D6037-96. Item to be completed in all respects as per drawings and instructions from Project in charge.

8.4 INSTALLATION

8.4.1 Install in accordance with manufacturer's instructions.

8.4.2 The laminate sheet shall be fixed using approved quality adhesive recommended by the manufacturer and applied strictly in accordance to their instruction/specifications.

8.4.3 The adhesive shall be applied in a thin layer and while still tacky, it shall be spread evenly with steel in both directions to Project.

8.4.4 Assume full contact with the adhesive / Fevicol / SR. A constant and even pressure is applied for not less than 24 hours to ensure good bonding of the surface to the board. The laminate surface shall be cleaned as recommended by the manufacturer of all stains/ adhesive marks etc.

8.5 PROTECTION

1. Protect installed products until completion of project.
2. Touch-up, repair or replace damaged products before Substantial Completion.

9.0 MDF EXTERIOR GRADE PLAIN PARTICLE BOARD

9.1 GENERAL:

MDF is the short term for medium density fibre board. Alum, wax, resin or other additive introduced to the agglomerate for MDF prior to forming, primarily to increase water resistance. Any suitable type of synthetic resin adhesive may be used for the purpose of bonding to comply with physical and mechanical requirements.

9.2 TESTING OF SAMPLES

9.2.1 Preparation and Conditioning of Test Specimens: All the test specimens shall be prepared and conditioned before testing in accordance with the procedure given in IS 2380 (Part 1).

9.3 QUALITY ASSURANCE

MDF shall conform to the requirement of quality and performance as specified in standard of manufacturer.

9.4 MATERIAL:

MDF Exterior grade plain particle board of approved makes: Plain Exterior Grade MDF Boards of 9.75mm thickness, Exterior grade wood base (Grade-I), Melamine Bonded, Stamped IS 12406. All accessories, screws, fixing implements, labors, material and all lifts. Item to be completed in all respects as per drawings and instructions from Engineer in charge.

10.0 PLYWOOD

10.1 MATERIAL:

Partition skinning with avg 12 mm thk BWP Grade Plyboard IS 710 BWP grade on over Al. skeletal frame/wooden frame , as approved by Architect. Plywood shall be 12mm thick, non-decorative, factory made as per IS:710 and should be ISI marked and be made of non-coniferous timber red hard wood with moisture contents not more than 12% and dimension as given in IS code. The panel comprising of plywood should be 9 ply construction and cross bend and panel core shall be glued by hot pressed with Quadra process, while the thickness of face veneer (Okume/Gurjan) shall not be less than 0.5mm. all core shall fully confirm to the requirement specified in the IS code. All timber used should be well seasoned and chemically treated. Adhesive used shall be phenol formaldehyde synthetic resin BWP type specified in IS:848-1974. All dimensions shall be finished dimension and manufacturers test certificate for test specified

in IS:710 shall be rendered." Item shall be complete in all respect.

11.0 FALSE CEILING

11.1 GI METAL LAY IN BLACK GROOVE CEILING :

Providing & Fixing of GI Metal Suspended Ceiling System - Approved make In Perf. With fleece 600x600x0.5mm (MICROLOOK) EDGE TILES in global white colour to be laid on Black Groove 15mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 38mm. The tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%, NRC 0.7.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories supplied by Hilti consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanized steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.

11.2 BAFFLE CLOSED

Providing & fixing Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x 25 x 3600mm in Wood grain finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing in multiples of 25mm. Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps.

INSTALLATION OF U-GRID :

The U profile to be suspended at every 1200mm on-center using 6mm threaded rod from the structural soffit using U-profile hanger. U-profile splice to be used to join more than one U profiles of length 3.75M. 1st U-Grid Channel must be no more than 400mm from the perimeter.

INSTALLATION OF BAFFLES :

Locate the slot for Baffle Hangers in slot of Baffle section at 1200mm centers. Hangers are inserted into the slot, then rotated 90° and fixed into position by tightening the grub screw. Baffle to be lifted into position and hangers engage over lip of U-Grid Channel. Each Hanger to be secured into position by inserting the Locking Clip.

Baffles blades to be connected at ends with Baffle Joiner, which are inserted into the top and bottom slots of the Baffle closed profile for alignment only. The bottom Joiner to be located first and fastened on one side only. The top Joiner to be fitted then and secured with grub screws on one side. Then the two Baffle sections shall be joined and the top Joiner is screw fastened on the 2nd Baffle profile.
End Caps to be located by pushing the End Cap tongues into Baffle slots.

11.3 CELLIO OPEN CELL 100MM X 100MM 'LAY-IN' ALUMINIUM CEILING WITH 15mm GRID

Providing and fixing in true horizontal level Cello Open cell Aluminum lay-in ceiling tiles with border panels forming flush-tegular edge of size 600mmx600mmx38mm having Fire Performance CLASS 0/Class 1 (BS 476). The tile of 'Global white' color with cell size 100mm X 100mm shall be laid on white painted Suprafine XL15mm profile grid system comprising Main runners (3000mm), 1200mm and 600mm cross tees with 15mm white flanges and 38mm web height.

The grid should be of "Approved" make with 15mm wide T - section flanges color white having rotary stitching on all T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of 100 Kgs. Suspension system is to be of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit by approved hangers at 1200mm maximum centre & not more than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long cross tees centrally between the 1200 mm cross tees. Installation to be carried out by Trained Installation team & Installation should be carried out as per recommended procedure. Perimeter trim to be wall angles, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanized steel of size 26 x 26 x 25 x 1.2mm with a Galvanized Thickness of 80gsm, A pre Straightened Hanger wire of dia – 2.65 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344- 413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

11.4 SOUNDSCAPE BLADE 400X1200X40MM

Providing and Fixing Approved SoundScapes – Blades which are 40 mm thick, pre-formed fiberglass blades with sizes of 200X1200mm, 200mmX1600mm, 400X1200mm, 400X1600mm,400X1800mm, 500mm X 1200mm and 500X1600mm with Dura brite finish on all sides and edges, Acoustical performance of 0.65 NRC in standard White color with Light reflectance 87%, or in the color specified by the Architect (Light Ivory, Pale Green, Pastel blue, Traffic Grey, Pale Brown) and Fire Performance Class B – s1, d0 as per En 13501-1.

INSTALLATION WITH U-PROFILE HANGER:

The U-profile of size 20mmX30mmX3750mm to be suspended based on the on-centre distance between the factory fitted spiral hooks on the blades. The on-centre distance between the factory fitted spiral anchors is length of the blade – 600mm. U profile to be suspended using 6mm threaded rod from the structural soffit no further than 450mm from each wall. U- Profile splice to be used to join longer lengths more than 3.75M.

U- Profile hanger kit comprising of Blade hanger and snap hooks to be used to suspend the Blades to the U –profile. Blade hanger to be locked on the U-profile using the Locking clips on the square slots with on center spacing in multiples of 50mm. Snap hooks to be fixed on the blade hanger. Soundscapes Blades to be installed on the snap hook by inserting the factory fitted spiral hooks into the snap hooks on both sides.

Blade connector kit comprising of bottom connector and top connector to be used to join two blades side by side.

Installation to be according to the instructions provided by manufacturer.

11.5 SOUNDSCAPE SHAPES - ACOUSTICAL CLOUDS (INDIVIDUAL SUSPENSION)

Providing and Fixing Approved Soundscape - Acoustical clouds which are 30 mm thick, flat glass fibre panels with Humidity Resistance RH 90% & Recycled Content of minimum 30%, come in various shape options like Square and in standard Traffic White colour with LR 90% or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown). or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown). The size and sound absorption details are as below: Square 1200x1200mm 2.48. The back of each panel to have embedded square frame bracket system of 610x610mm in which provisions are already made

for integration of installation system for suspension of individual or grouped panels.

INSTALLATION:

The panels to be suspended individually using the Soundscape Deck hanging kit. Each kit to consist of gripper structure anchors, aircraft cables and bottom end cable adjusters. Each panel to be suspended using the aircraft cables which are suspended from the soffit using the gripper structure anchors and its other end passing through the bottom end cable adjuster which are screwed in the 4 corners of the frame bracket system. The height & level of the panels can be adjusted using the bottom end cable adjusters.

11.6 G. I LAY-IN PLAIN

Providing & Fixing of GI Metal Suspended Ceiling System GI Lay In Plain Fleece 600x600x0.5mm (regular) EDGE TILES in global white colour to be laid on 24mm normal Grid 24 mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 32mm. The tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%.

INSTALLATION: To comprise main runner spaced at 1200 mm centers securely fixed to the structural soffit at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450 mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600 mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories supplied by Approved make consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanized steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.

11.7 WOODWORKS GRILLE WITH DOWEL MADE OF NATURAL BAMBOO WITH 24 MM PRELUDE 43 BLACK SYSTEM

Providing & fixing of woodworks grille with dowel made of natural bamboo with 24mm prelude 43 black exposed grid. The Woodworks (WW) Grille panel of nominal size 57x300x2400mm comprising 6 blades of 57x16x2376mm with on center spacing of 50mm fixed thru dowel of dia-12mm x 300mm with on center spacing of 300mm and additional end dowels at 150mm from both the edges. Ledger of 6.5x24x2400mm to be used for covering face of wall angle. WW Grille should comply with ASTM-E84: Class A and have Relative Humidity of RH70. The panels are UV coated to Natural or Carbonized shades. Optional: Open edges may be covered using “Edge Caps” of 66x19x2400mm and “Blade Junction” of 66x38x2400mm to be used along the connection of two WW Grille Panels.

The grid should be of “Approved” make Prelude 43 with 24mm wide T - section flanges Black powder coating having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 43mm for the main runner & the Cross Tees and with a load carrying capacity of 20 Kgs/M2. Black dowel clips of spring steel to be used for fixing panel to suspension system.

INSTALLATION: To comprise main runner spaced at 1200 mm centers securely fixed to the structural soffit using Approved suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200 mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600 mm require independent support. 600 x 600mm module to be formed by fitting 600 mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 19x19x3000mm, secured to walls at 450 mm maximum centers.

11.8 PORTLAND MAPLE CEILING APPROVED EQUIVALENT WOODWORKS 600X600X18MM MICROLOOK EDGE TILES IN RG3003 (RG3) PERFORATION WITH 15mm SUPRAFINE 43 EXPOSED GRID" SYSTEM:

Providing & Fixing of Wooden finished Suspended Ceiling System with Woodworks Microlook edge tiles with 15mm Suprafine 43 exposed grid. The Tile in RG3003 (RG3) perforations having hole diameter as 3mm and open area as 3% with approved laminate finish with 0.7mm matching PVC edge banding and having an NRC of 0.42, Humidity Resistance (RH) of 70% in module size of 600mm x 600mm x 18mm and density of 725 Kgs/M3. The tile shall be laid on Superfine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs. The T Sections have a Galvanizing of 90 grams per M2 and need to be installed with Suspension system of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be approved brand wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers. approved brand SUSPENSION SYSTEM accessories manufactured and supplied by approved brand World Industries consisting of M6 Anchor Fasteners with hanger hole, pre-Straightened Hanger wire of dia – 2.5 mm of 1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).

11.9 PLAIN PORTLAND MAPLE CEILING APPROVED EQUIVALENT CAT NO. RG 10077 WOODWORKS 600X600X18MM MICROLOOK EDGE TILES IN PLAIN WITH 15MM SUPRAFINE 43 EXPOSED GRID SYSTEM:

Providing & Fixing of Wooden finished Suspended Ceiling System with Woodworks Micro look edge tiles with 15mm Suprafine 43 exposed grid. The Tile in Plain with approved laminate finish with 0.7mm matching PVC edge banding, would have Humidity Resistance (RH) of 70% in module size of 600x600x18mm and density of 725 Kgs/M3. The tile shall be laid on approved brand Suprafine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs.. The T Sections have a Galvanizing of 90 grams per M2 and need to be installed with Suspension system of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with hanger hole, pre-Straightened Hanger wire of dia – 2.5 mm of 1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).

12.0 ARTIFICIAL GREEN WALL (VERTICAL WALL GARDEN)

12.1 GENERAL:

Providing testing and commissioning of Artificial boxwood matt is a matt prepared with synthetic PVC leaves made to look like actual plant for vertical applications both in indoors & outdoors. The main reason for usage of this matt is maintenance-Artificial matt stands up to heavy use and requires no irrigation and trimming and no sunlight but only requires periodic cleaning if used in interiors.

Since major cities across globe are turning into concrete jungles with very less space for greenery, so artificial green matt in different leave patterns which almost look real is best solution to create a soothing green effect without any maintenance.
For exterior applications UV matt are recommended for long life
Application is done using rubber adhesive or by simply hanging matt on walls with screws giving a long-lasting installation.

Further artificial flowers or bushes to be added in matt to give more natural look as per requirement. TechArtz Global is major importer of this material from Germany & China to India. The Rate shall be inclusive of providing and fixing SS Fastener of 10mmdia. and 100mm Long (IS code) duly Fixed the ply to Wall.

13.0 FLOORING

13.1 TEXTURE LAMINATE WOODEN FLOORING:

Providing and laying of 8mm thick AC5 grade textured laminated wooden flooring (as/ EN 13329), including 100mm high skirting with 0.2mm thick direct laminate on top of specially developed substrate core of planks size 1288mm x196mm having smart lock tongue and grove construction with edges dully impregnated to secure long lasting joints secure together confirm to EN 13329. the approved décor planks to be placed on a 0.2 mm thick alkali resistant polyethylene foam (density 3920-935kg/m3) with a 1.5mm thick extruded polyethylene foam (density 30-32 kg/m3) on top to secure the floating floor to resist any moisture movement from the sub floor on top to secure the floating installation. the skirting is to be secured with the help of matching wall based ,60mm high, with t-profile &reducer/ beading. the installation at site has to be done by company trained and approved installers. all complete as per instructions from engineer-in-charge. (the item includes skirting &all necessary profiles, beading etc. complete in all respect).

13.2 VINYL FLOORING

Sports flooring of Vinyl flooring Polaris consists of following specifications for Badminton court, General performance sports flooring, shock absorption, vertical deformation, vertical ball behavior, resistance of rolling load, resistance to wear ,specular gloss having overall thickness 6.5mm weight 4200 g/sqm sheet size 1.5m width & 10m length shall all be conforming to BS EN 14904.

14.0 PAINTING/FINISHING WORK

14.1 LUSTRE PAINT

Providing and applying on all exposed surfaces of beams, ceiling & walls etc. 3 coats of Lustre paint of approved make and shade as per manufacturer specification with a brush or roller after levelling the surface to a smooth finish with the help of putties etc. & having base coats of approved primer before applying three coats of paint. Rate to include additional coat of paints in any required to get smooth and uniform finish. Rate to include scrapping & sand papering for wall, beam & ceiling surfaces. Rate quoted by the contractor shall include necessary cleaning, preparation of surface, centering, scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and provision of suitable platform with railing all around the scaffolding. Only pipe scaffolding is permitted. Scaffolding is mandatory for any height above 1.2 m from floor level. (included in structural glazing item) actual area shall be measured.

14.2 SPECIAL EFFECT PAINT(TEXTURE)

Providing & Applying smooth stone wall finishing system manufactured by spectrum/ UltraTech, comprises of a 2 component system 25kg dry material and 5ltr binder made up of pure / specially selected quartz, mineral aggregates inorganic pigment, the material contain pure acrylic co polymer in emulsion including anti cracking, ant rusting, antifoaming, bactericides, U.V resistant and broad spectrum fungicides, to be sprayed to the surface by mean of customized spray gun of 3 HP, with the applied thickness of coating being between 1.5mm to 2.0 mm , as per applied on a cured ,dry , smooth, level plaster without keying as per the shades/ combination approved, by the approved applicator, of manufacturer , all complete inclusive of primer on the base.

14.3 CONCRETE PROTECTIVE PAINT (TILE GUARD CLEAR)

Providing and application of concrete protective paint, including initial coat of priming coat by spray or brush by diluting with water in ratio as specified by manufacturer, followed by two neat coats of finishing without any dilution. Application shall be as recommended by Manufacturer. Dry Film thickness of one priming coat and two finishing coats shall be 225-250 microns. The datasheet of the concrete protective paint shall be submitted and approved by architect beginning of work. Concrete protective paint of approved make on all ceilings/ RCC extension of approved shade including supply of all materials tools as per direction of engineer in charge. Rate quoted by the contractor shall include necessary centering, provision of suitable platform with railing all around the scaffolding, cleaning of paint stains, curing etc. complete. Flash point IS101/1987 Part 1, Sec 6: NA. Drying time: Surface dry time 30 minutes.

14.4 WALLPAPER

Providing and applying select approved Wall paper of approved make and shade on all surfaces & at all heights including scaffolding, preparing the surface by brushing and brooming down, etc. complete. The dry/wet cleaning of floors etc. after wall paper is to be carried out. Item to include getting mock-up for approved by Architect/Engineer in charge, all approved gluing as per detailed specifications and approval, all accessories, men material and all lifts, protecting finished surface with min. 20 microns thk polythene sheet till facility handover, finished cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge.

14.5 ARTWORKS ON WALLS

Providing & installation work in special area panel size 6.0 x 2.4 m made out of modular acrylic sheet panel of 1.2x 2.4 each of 12mm thick of approved color and make to shape as per approved design pattern with computerized numerically controlled (CNC)-router cutting machine upto the min size of 10-25 mm width. Basic price of acrylic sheet with cutting of 600 /sq. ft. Item inclusive of single unit sample & all softcopies of artworks approval by architect all installation. & cleaning men & material & all fixing implements complete with all lift up to 20 mts including protecting exhibits from damage till handover with all necessary approved protective aids. The art work will be sourced from reputed professionals depending upon the quality of the work within the basic rate as per approval from EIC/Architect.

15.0 ROLLER BLINDS:

15.1 Providing & fixing of Roller Blinds Approved make Non-Blackout, Blind Shade, Color Decided as per site Color matching to be decided by site engineer-in-charge.

16.0 SHELTER GUARD

16.1 Providing and applying two coats of WPM 310, single component tough UV stable acrylic based highly elastomeric waterproof facade membrane, ensure that the coating is applied evenly at the recommended coverage rates. (3.2 Sqm per ltr per coat). apply the first coat of WPM310 over dried coat of primer and allow it to dry. apply the second coat of WPM310 in opposite direction to the first coat. Time gap of minimum 4 hours between the first and second coat should be maintained strictly. including grinding all sharp edges of the substrate to make them flush with the surface, cleaning the substrate to make them free from all contaminants, treating the cracks and construction joints, etc. and complete as per manufacturer's

specification. Membrane must confirm specific gravity: approx. 1.3 g/cm3; characteristics of cured membrane- water vapour transmission (ASTM E96) at 1.0 mm: 21.9 g/sqm/24hrs; tensile strength: AS 1145 - after 28 days dry: 2.1 Mpa, after 14 days UV exposure: 3.0 Mpa, after 2500 Hrs QVA: 5.9 Mpa; Elongation at break AS 1145 - after 28 days dry: 460%, after 14 days UV exposure: 315%, after 2500 Hrs QUV: 180%. Application temperature: 10 Deg C to 35 Deg C; Service temperature: 0 to 60 Deg C; VOC content: 100g/L.

B. TECHNICAL SPECIFICATION OF PUBLIC HEALTH WORKS:

1.0 For Detailed Specification of DSR items of Public health works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD specification 2009 VOLUME I AND VOLUME II (corrected up to the last date of submission/uploading of bid) i.e. in Sub-head No. 17, 18, 19, 23.

2.0 For Nonscheduled item mentioned in SOQ shall be installed as per manufacturer's direction approved by the Engineer-in-charge.

3.0 Specification/brands names of fixtures to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market and/or Contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document.

C. TECHNICAL SPECIFICATION OF ELECTRICAL WORKS:

1.0 INTERNAL ELECTRICAL WORKS

For Detailed Specification of DSR items of Internal Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part 1 (Internal) 2013 (corrected up to the last date of submission/uploading of bid).

2.0 EXTERNAL ELECTRICAL WORKS

For Detailed Specification of D.G. Set of Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part VII (D.G SET) 2013. (corrected up to the last date of submission/uploading of bid).

For Detailed Specification of Substation of Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part IV (SUBSTATION) 2013. (corrected up to the last date of submission/uploading of bid).

2.1 DG SET (SOUND PROOF DG SETS OF 125 KVA)

"Supply ,installation ,testing and commissioning of 125 KVA water cooled silent DG set comprising of water cooled Diesel Engine developing 156 BHP @ 1500 RPM & 125 KVA alternator rated at three Phase , 415 Volts , 50 Hz: 0.8 P.F. @ 1500 RPM Both mounted , and aligned on a common MS base Frame Complete with MS Fuel tank , Standard AMF Control Panel , Residential Exhaust Silencer , AVM Pads fitted on base frame , 1 nos. 12 Volts DC Battery ,Battery Leads , 1st fill of lube oil all housed in sound proof Acoustic Enclosure as per specification attached as per satisfaction of engineer in-charge.
Note: The Agency Will provide first filling of full tank Diesel with supply of DG set"

2.2 DG AMF PANEL

Supply, installation, testing and commissioning of DG, cubical type, totally enclosed, free standing type, dust, damp and vermin proof made up of 14/16 SWG CRCA sheet, complete with busbars, M.V. Danger notice plate, inter connections with suitable capacities aluminum leads / solid aluminum strips / rods ,power coats painted and having incoming and outgoing switchgear as mentioned below and complete as

required.

1. All relays to operate at 240 V single phase, 50HZ, AC supply through UPS
2. Panel should be suitable for manual and automatic operation (AMF) and shall be complete as required.

One no.250 A auto change over switch for changeover state electricity board power and DG set power including by pass facility as approved by the engineer – in-charge.
1 no. MCCB as per following details specifications 250 AMP. 415 V, 4 pole MCCB with Microprocessor realest and variable current settings 0.8 to 1.0) with earth fault release "ON" LED indicating Lamp and 2A control SP MCB Extended rotary operating mechanism Digital energy meter with one set of suitable CTs, CT sorting link Digital Ampere Meter of suitable range with suitable set of CTs and ASS
Digital Volt meter with VSS and HRC fuse Digital multi-function meter to show, KWH, KVAH, P.P and frequency meter one set of suitable CTs, CT shorting links.

2.3 PROTECTION AND AMF COMPONENTS FOR ABOVE MENTION DG SET

Over voltage relay, Under voltage relay, Battery charger (with trickle and boost charging).
Digital voltmeter and ammeter. 8 window Alarm annuciator with separate hooter , accept ,reset and push button Hooter, Engine cranking relay, Main supply voltage monitor, alternator voltmeter monitor and engine starting relays, Auxiliary relays, Timer, Push button and control fuse, Phase sequence relays

2.4 ENCLOSURE:

Fabrication, PVC sleeving, Control/power wiring and necessary electrical / mechanical interlocking etc. any other item required for proper functioning of the system complete as required
Providing and fixing oil tank of suitable capacity complete with suitable M.S Fabricated ,M.S stand oil level indicator gauge tank and stand duly painted complete with float switches etc. including its connections to the fuel tank of the DG set complete as required
The silencer should be minimum 20'-0" long nothing extra shall be paid
125KVA DG set with AMF panel mentioned as above Model No: 6BTAA5.9G13

2.5 EARTHING OF DG SET:

Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No for DG body earthing)
Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No. For DG Neutral earthing)
Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.
Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.
Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.
Providing & laying in position cement concrete 1:3:6 (1Cement:2Coarse sand: 6 graded stone aggregate 20mm nominal size) in foundation of DG sets etc including form work etc as required. (1No DG set+1No CSS 2X6x5X.6Mtr)

2.6 400KVA, 11KV SUB-STN

Providing and fixing of FIRE EXTINGUISHER ABC Powder type (stored pressure)as per is :15683 complete with all accessories as per manufactures specification.ISI Mark complete in all respect. 4 kg capacity.
Providing and fixing of FIRE EXTINGUISHER CO2 type as per is: 15683 complete with all accessories as per manufactures specification.ISI Mark complete in all respect. 4.5 kg capacity

2.7 PCC POLES

Supply and erection of pre-stressed cement concrete pole of suitable length with a given planting depth confirming to IS1678-1978 below ground level in excavated pit of suitable dimensions complete in all respect as per satisfaction of engineer in charge.
PCC pole overall length 11metre planting depth 1.83 meter, top dimensions 152.4mmx 203.2mm bottom dimensions 152.4mmx368.3mm load capacity 363Kg and wt 1146Kg.
ACSR- Supply and sagging of al conductor steel reinforced (ACSR) on pole including binding with insulators.

2.8 GO SWITCH 200A & POLE ACCESSORIES

Supply & erection of 11KV 400-800A GO switch confirming to ISI specifications. The item includes supply and erection of operating pipe and handle arrangement of MS flat 50mmX6mm and channels 75mmx40mm sheet. The GO switch is to be fitted with locking arrangement so as it locks upward on “ON" position and locks downward in "OFF" position. The entire GO switch assembly/unit should be properly earthed and the job is to be completed as approved by engineer-in-charge.
ACSR DOG conductor (100sq mm) Size (6/4.5Al+1/4.5GI)
Supply and Erection of MS angle iron size 50mm x 50mmx 6mm thick with cutting, bending and necessary holes as desired by Engineer-in-charge at site.
Supply and erection of MS channel iron size 100mmx50mmx6mm thick with cutting, bending and necessary holes as desired by engineer in charge
Supply and erection of MS flat size 50mmx5mm thick with cutting, bending and necessary holes as desired by engineer in charge

2.9 XLPE INSULATED HT ARMOURED CABLES

Supply & laying of Circular Aluminum conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade to be laid 1 m below ground level including excavation, sand cushioning, covering with sand & bricks and back filling the trench etc., of the required size:-
Circular Aluminum conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade 70sq.mm (Three Core)

2.10 EARTHING OF SUB- STATION.

Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No for Transformer body earthing)
Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(Neutral Earthing)
Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.
Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.
Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.
Supply and making outdoor cable termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3X70Sq mm XLPE A conductor cable of 11 KV grade as required.
Supply & Erection of galvanized D iron clamps complete with shakle insulator (100mmx110mm) GI bolts, Nuts and washers, coach screws etc as required.

Supply & erection of shackle insulators (Medium). The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.

Supply & erection of galvanized stay sets for 11KV over head lines complete with 19/20mm dia 1.8mtr long GI stay rod, anchor plate of size 45cmx45cmx7.7mm thick, thimbles, stay clamps, turn buckle) 20mmx600mm), 7/4,00 mm dia GI Stay wire and 11 KV strain insulator etc in cement concrete 1:3:6 (1 cement: 3 Coarse sand : 6 graded stone aggregate 40mm nominal size) foundation including excavation and backfilling as required.

Supply & erection of 11KV pin insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.

Supply & erection of 11KV Disc insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.

Supply & erection of 11KV Lightning Arrestors suitable for 3 wire, 11KV overhead lines with rated voltage 9KV(rms) with nominal discharge current rating 5KA and complete with galvanized clamping arrangement G.I. bolts nuts washers etc etc as required confirming to ISI specifications. .A separate earth to be provided to lightning arrestor complete as approved by engineer in charge.

2.11 500 KVA Package Sub-Station

2.11.1 HT Switchgear

HT 11kV Compact switchgear (Type DV) consisting of One No. direct cable compartment and one No. fixed manual vacuum Circuit Breaker in SF6 stainless steel enclosure with series trip, self powered microprocessor based Over current & Earth Fault (IDMTL + Inst.) relay protection .Interconnection between HT and Transformer shall be using 1C x 3 x 95.sq.mm Al. unarmored XLPE (E) Cable.

2.11.2 Transformer

400/500 KVA,11KV/433V,DYn11, ONAN OIL/DRY TYPE, hermetically sealed transformer with corrugated wall design & top bushings for HT & LT with off load tap switch of rating+5 to -5% @2.5% on HT side of transformer.

2.11.3 LT PANEL

LT Indoor panel 433V with Aluminum Busbars, Fabrication using 1.5/2 MM CRCA sheet steel , Ingress protection IP4X , complete with internal wiring.

2.11.4 INCOMER cum OUTGOING

400A, 250A & 200A (1No. Each) 433V, 4P, 50Hz, 36KA,Fixed Manual MCCB with thermal base release as incomer cum outgoing.

2.11.5 Outdoor Enclosure

Outdoor type enclosure having modular construction of Galvanized Sheet Steel. The Enclosure shall have IP54 degree of protection for HT & LT switchgear compartment & IP23 degree of protection for Transformer compartment. The enclosure exterior shall be painted with polyurethane paint (color Light Gray & D.A.Gray). Each compartment will be provided with the door and pad locking arrangement. The Compartment illumination lamp with door operated switch shall be provided for each compartment

2.11.6 Interconnection & Earthing

Interconnection between HT switchgear & Transformer using 1Cx3x95Sq.mm XLPE Single core cable & Interconnection between Transformer & LT switchgear using Busbars. Internal earthing connections by GI strips.

2.11.7 HT Panel/Transformer/LT Panel must be of same make.

Package Sub-Station is outdoor plinth mounted type. Civil work for package substation is not in our scope. The Foundation details will be furnished.
Package Sub-station will be complete with the internal interconnections & earthing. Accessories required for the external connections of HT & LT cables like termination kits, lugs, glands etc & extending of earth bar to earth pits is not included in our scope.

D. TECHNICAL SPECIFICATION OF FIRE FIGHTING WORKS:

1.0 SPECIFICATIONS FOR FIRE HYDRANT & SPRINKLER SYSTEM.

1. *General.*

1.1. Work under this subhead is time-bound and has t be completed within the time limit set in the tender. Work shall be executed in accordance with an agreed schedule which shall be submitted by the tenderers along with offer and agreed to by owners.

1.2 *Scope of work.*

The scope of work in this subhead shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely do all work relating to the supply, installation, testing & commissioning of Fire Fighting System as described herein after and shown on the drawings. The scope of work in general shall include the following.

i) Fire Fighting Pumps & Accessories and related electrical works.
ii) External & Internal Fire Hydrant System.
iii) Sprinkler system in entire building.
iv) Hand Appliances.

Without restricting to the generality of the foregoing, the work shall include the following: A Hydrant System covering the entire complex and consisting of the following:

(v) Three number of Pump – One number Main electric end suction pump of 2280 LPM at 60 M head, one number a Diesel Standby split casing Pump for Hydrant System of 2280 LPM at 60 M head and Jockey Pump for System pressurization of 180 LPM at 60 M. head.

(vi) Other piping system ancillaries such as Suction and Delivery Headers, Air Vessel, Pressure Gauges, Pressure Switches, Pump Panel etc. as required.

(vii) External Hydrant Ring Main of 150mm dia with single headed Yard Hydrants, RRL Hoses, Branch Pipes etc. all housed in a Hose Box.

(viii) Internal Hydrant system where required with single headed landing valves on each floor accompanied by 1 number swinging type Hose Reel, 2 numbers RRL Hoses, 1 number of Branch Pipe etc. all housed in the niche. Bidder shall provide front frame with shutter for niche.

(ix) Sprinkler system for entire building.

(x) Hand appliance as per Bill of Quantities.

(xi) To obtain the approval of the relevant drawings before actual installation at site and to get the complete installation inspected and passed by the concerned authorities, as may be necessary as per local bye-laws. (any fee payable to the local bodies.

1.3 *Contractor's Experience.*

1.3.1 Contractors shall engaged specialist agency only for this work of Fire Fighting systems.

1.3.2 The selected specialist agency must have sufficient experience in the execution of turnkey projects as specified.

1.3.3 Contractor must submit with the tender a list of similar jobs carried out by him as required along with the name of works, name and address of clients, year of execution, capacity of plant and value of work.

1.4 *Technical Information.*

1.4.1 Contractor shall submit along with the tender copies of detailed specifications, cuts, leaflets and other technical literature of equipment and accessories offered by him.

1.4.2. Contractor's attention is specially invited to the special conditions and other clauses in the agreement which required the contractor to: -

a. Submit detailed shop drawings.
b. Use material of specific makes and brands
c. Obtain all approvals from Fire Fighting authorities.
d. Execute the entire work on a turn-key basis so as to provide a totally operating plant.

1.5 *Exclusions.*

1.5.1. Work under the contract does not include the following work.

1.5.2 Electrical cable up to incoming motor control centre.

1.6. *Site Accessibility.*

1.6.1 The equipments are to be located in pump house located within the Service block.

1.6.2 The equipment must be carried from the goods receiving station to the site in an extremely careful manner to prevent damage to the equipment building or existing services.

1.6.3 Contractor must visit the site and familiarize himself with above problems to ensure that the equipment offered by him are of dimensions that they can be carried and planed in position without any difficulty.

1.7 *Approvals.*

The contractor shall prepare all submission drawings and obtain all approvals of fire fighting works from fire fighting authorizes.

1.8 *System Description.*

1.8.1 The Hydrant System shall comprise of AC motor driven pump set, standby diesel pump set, jockey pump set for pressurization and fire booster pump with all required accessories including valves, special

fittings, instrumentation, control panels and any other components required to complete the system in all respects.

1.8.2 The Hydrant System shall be semi automatic in action and shall be laid covering the entire area externally and all the floors internally with independent piping system for Sprinkler System, a separate piping system shall be installed.

1.8.3 The Hydrant System shall be kept pressurized at all times. The proposed Hockey Pump shall take care of the leakages the system, pipe lines and valve glands.

1.8.4 The pressure in the hydrant pipe work shall be kept constant at 6 Kg/cm^2. In the event of fire when any of the hydrant valve in the network is opened, the resultant fall in header pressure shall start the AC motor driven fire pump through pressure switches automatically. There shall be one Diesel Engine Driven pump as standby for both hydrant system. In case of failure of electricity or failure of Electric Pump to start on demand, the standby Diesel Pump shall automatically take over.

1.8.5 However, shutting down of the pump set shall be manual except for the Jockey Pump which shall start and stop automatically through pressure switches. In addition to auto start arrangements, the main pump shall also have an over-riding manual starting facility by push bottom arrangement.

1.8.6 The ping for the hydrant system in the yard shall be laid in soil 1 Metre deep or in rectangular trench. The pipe laid in soil shall be protected as specified.

1.8.7 The yard hydrants shall be placed at a regular spacing of 45m centre to centre. The following accessories are proposed near each yard hydrant.

i) One no. gunmetal single headed hydrant vales.
ii) Two nos. RRL Hoses of size 63mm dia x15m long.
iii) One nos. gunmetal Branch pipe.

Gun metal hydrant valve, RRL hose and gunmetal branch pipe will be accommodated in a aluminium hose box mounted on brick pedestals.

1.8.8. The Internal Hydrant System (Wet Risers) shall be provided at points as indicated on the drawing on each floor.

1.8.9. The hydrant point shall be directly tapped from the Riser pipes, and shall be furnished with required accessories such as –

i) One no. gunmetal single headed hydrant valves.
ii) Two nos. RRL Hoses of size 63mm dia x 15m long.
iii) One no. first aid Dunlop hose reel full swinging type 20mm dia x 30m long.
iv) One nos, gunmetal Branch pipe.

The hydrant risers shall be terminated with air release vale at the highest points to release the trapped air in the pipe work. At each tapping from the Riser a Orifice Plate shall be located in the lower floors to reduce the pressure.

An overhead tank 20000 litres capacity will be connected to the fire hydrant system.

1.8.10 Sprinkler system shall be distributed entire building so as to cover 12-12 sq.m area with one sprinkler

Sprinkler risers shall be provided with instantaneous control valve with alarm gang.

An overhead tank of 20000 litres capacity with makeup line will be connected to sprinkler riser at basement (overhead tank is excluded from scope of work)

A suitable drainage arrangement with bye-ass valve shall be provided to facilitate maintenance f sprinkler pipe work

1.8.11 To compensate for slight losses of pressure in the system and to provide an air cushion for counteracting pressure surges/water hammer in the underground pipe work Air Vessels shall be furnished in the pump room ear fire pumps. The air vessel shall be normally partly full of water and the remaining being filled with air which shall be under compression when the system is in normal operation.

1.8.12 The entire Wet Riser and external Hydrant Ring Main System shall be fed from the water supply (Static Water Tank) and pump room to be provided by the others.

1.9 *GENERAL SPECIFICATIONS.*

1.9.1 **Pipes and Fittings**.

Pipes for Wet Riser system shall be of GI pipe (Heavy Duty).Pipes upto 150mm dia shall be GI and conform to IS-1239. Pipes with dia 200mm and above (6mm thick) shall be MS and form to IS-3589. All pipes shall be I.S.I. marked. Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

1.9.2 *Jointing*

Joint for black steel pipes and fittings shall e metal-to-metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between C.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with C.I. or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

Note : Joints for pipes and fittings upto 50mm diameter shall be threaded joints using Teflon Tape or equivalent bonding tape on the threads. Joints for pipe and fittings above 50mm diameter shall be welded joints.

1.9.3 *Pipe Protection.*

a) All pipes in underground masonry trenches/service tunnels, above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

b) Pipes in wall chases shall be protected from corrosion by 2 coats of bituminous paints.

c) Protection of Underground pipes.

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general as per IS:10221-1982.

It specified in Bill of Quantities, the proprietary pipe production system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

1.9.4 *Installation of Pipes.*

All pipes shall be adequately supported from ceiling or walls by structural clamps fabricated from M.S.

structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time of slab casting or provide suitable anchor fasteners.

The pipe supports or hangers shall be designed to withstand combined weight of pipe, pipes fittings, fluid in pipe and insulation. Pipe supports shall be of steel and coated with rust preventing paint and finished with two coats enamel paint. The maximum spacing for pipes supports shall be as below :

Pipe (MM)	*Spacing (MTR)*	*Size of support*
Up to 25	2.0	6 mm
32 to 65	2.4	8 mm
75 to 125	2.7	10 mm
150 & above	3.0	12 mm

Pipes supports shall be spaced at maximum interval of 1.5 mtrs. on either side of heavy fittings and valves. Wherever piping passes through walls, pipes sleeves of diameter larger than that of piping shall be provided. Pipe sleeves shall be of steel or cast iron pipe.

The underground piping shall be supported with cement concrete blocks of suitable size and strength provided at an interval of 2.5 metres. The pipes shall be laid at 1 metre Depth (top of the pipe) and trench excavated for sufficient width. The rate of pipes shall include the scope of excavation / refilling the trench. 1:2:4 concrete thrust blocks are also to be provided at turning of pipe. The cost of installation includes concrete pedestals etc. as required and to be included in the item rate.

1.9.5 *Orifice Flanges.*

Contractor shall provide orifice flanges fabricated from 6mm thick stainless steel plates on the branch lines feeding different zones/floors so as to allow required flor of water at a pressure of 3.5 kg/sq.cm. for each hydrants and 2 bar at 1800 LPM at installation valve for sprinkler system. The contractor shall design the orifices to ensure the required pressure.

1.9.6 *Air Vessel and Air Release Valve.*

Air vessel on top of wet riser piping shall be fabricated of at least 8mm thick steel to withstand the pressure, with dished ends and supporting legs. This shall be of 250mm dia and 1m high. This shall be complete with necessary flange connection to the wet riser piping and air release valve with necessary piping to meet the functional requirement of the system. The air vessel shall be of continuous welded construction and galvanized to be IS:4736 – 1968. This shall be tested for twice the working pressure.

1.9.7 *Valves & Other Accessories.*

1.9.7.1 General

Each valve body shall be marked with cast or stamped lettering giving the following information's:

a) The manufacturer's name or trade mark.
b) The size of the valve
c) The guaranteed working pressure.

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50mm.

For 65mm dia and above these shall be butterfly valves.

1.9.8. **Full Way Ball Valve**.

The valves shall be of full bore type and of quality approved by the Project Architect / EIC. The body and ball shall be of copper alloy and stem seat shall be of Teflon.

1.9.9 *Butterfly Valves.*

Butterfly valves shall be of centric disc construction with single piece body of Cast Iron with disc of aluminium bronze with nitrile seat. Shaft shall be stainless steel with Teflon bearing butterfly valve shall conform to PN 1.6 rating and shall be provided with suitable matching flanges compatible with PIN 1.6 rating of valves.

1.9.10 *Non-Return Valves.*

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

1.9.11 *Drain Valve.*

Drain Valves are to be provided at all low points in the system for draining the water. These shall be 40mm dia full way ball valve fixed on 40mm dia black steel pipe.

1.9.12 *Pressure Switches.*

Pressure switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.

1.10 *External Fire Hydrants.*

Yard Hydrant valves shall be single headed as per IS:5290. The valve shall be complete with hand wheel, quick coupling connection spring loaded type and gun metal blank cap. The Yard Hydrant shall be laid on 150mm dia Hydrant Ring Main, branched off to 80mm dia and Stand Post of 80mm dia.

1.11 *Internal Landing Valves.*

The internal landing valves shall be double-headed made of gun metal and conforming to IS:5290. It shall be complete with hand-wheel, quick coupling connection spring loaded type and blank cap.

1.12 *Hose pipes, Branch Pipes and Nozzles.*

Hose Pipe : Hose pipe shall be rubber lines woven jacketed and 63mm in diameter. They shall conform to type-2 (Reinforced rubber lined) of IS:639-1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends to match with the landing valve or with another run hose pipe or with Branch pipe. The couplings shall be of instantaneous spring lock type.

Branch Pipe : Branch pipe shall be of gunmetal 63mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle : The nozzle shall be of copper or gunmetal, 20mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe, the inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

End couplings, branch pipes, and nozzles shall conform to IS:903-1985, two hoses of 15 mtr. Lengths with couplings shall be provided with each external (yard) hydrant. One nozzle and one branch pipe with coupling shall be provided with each yard hydrant.

1.13 *External Fire Hose Cabinet.*

The external fire hose cabinet to accommodate the hose pipes, branch pipe nozzle and the hydrant outlets shall be fabricated from 1.5m sheet steel. This shall be lockable and provided with centre opening glazed doors.

The support for hose cabinet shall be of brick work up to a height of 0.5m above ground level. The depth of footing for this support shall be minimum 50cm below ground level, resting on levelling course of minimum 10cm of PCC (1:5:6). The brick work shall be plastered in cement mortar (1:6). The hose cabinet shall be painted red and stove enamelled.

1.14 *Internal Fire Hose Cabinet.*

Each internal fire hydrant valve shall be housed in a nitch of size indicated on drawings. Each internal fire hose Cabinet shall hold double headed hydrant,4 Hoses and 2 Branch pipes and 1 no. Dunlop hose reel mounted on a drum.

A) The cabinet shutters & frames shall be fabricated from boxed steel sections and MS pate 2mm thick.

B) The front glass of shutters shall be 5.0mm thick clear glass and shall be held by means of rubber. Locking arrangement shall also be made with one number of mortice lock of approved make. A separate Key Box of 16mm thick MS sheet with glass facing shall be provided.

C) The Shutter shall be given a powder coat finish in post office red colour.

1.15 *Hose Reel.*

The hose reel shall be directly tapped from the riser through a 25mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The Hose Reel shall be swinging type (180 degrees) and the entire Drum, Reel etc. shall be as per IS:884. The rubber tubing shall be of approved quality and the nozzle shall be 6mm dia shut off type.

1.16 *Brigade inlet Connections.*

One set of 4 ways collecting head Fire Brigade connection shall be provided at the location indicated in the drawing.

The inlet to the riser shall be with 150mm dia sluice valve and non-return valve. The scope shall include providing necessary reducers, tees bends and special fittings as required. Necessary enclosure mad of 2mm thick sheet metal with support shall be provided, as in the case of hose cabinets.

1.17 *AUXILIARY PUMPING EQUIPMENT.*

1.17.1 **Scope.**

This section covers the details or requirements of the auxiliary equipment necessary for the operation of the fire pumps and the wet-riser system.

1.17.2 *Drive*

The pump shall be directly driven from the electric motor. Flexible coupling and coupling guard shall be provided.

1.17.3 *Capacity.*

The discharge and head of the jockey pump shall be as mentioned in Bill of Quantities.

Jockey pump shall be Horizontal /Vertical mono-block / coupled type. The pump casing shall be of cast iron and parts like impeller, sleeve, wearing ring etc. shall be of non- corrosive metal like bronze, brass or gunmetal. The shaft shall be of stainless steel.

Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of the dust or water. The pump casing shall be designed to withstand 1.5 time the working pressure.

1.17.4 *Motor.*

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz, system. The motor shall be totally enclosed fan cooled type confirming to protection clause IP 21 of IS 4691. The class of insulation shall be B, synchronous speed shall be 3000 RPM/1500 RPM. The motor shall conform IS 325-1978 and rated for continuous duty.

1.17.5 *Motor Starter.*

The motor starter shall be automatic star delta type with overload trip, but without under voltage / no volt trip. Starter shall conform to IS 1822-1967**.**

1.18 *MAIN ELECTRIC FIRE PUMP.*

1.18.1 **Scope**

This section covers the details of requirements of the motor, starter and pump for the electrically operated firm pump.

1.18.2 *General.*

The electric fire pump shall be suitable for automatic operation complete with necessary electric motor and automatic starting gear, suitable for operation on 415 volts, 3 phase, 50 Hz A/C system,. Both the motor and the pump shall be assembled on a common base plate of fabricated MS channel type or cast iron type.

1.18.3 *Drive*

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided.

1.18.4 *Fire Pump (Electrical)*

The fire pump shall be horizontal end suction centrifugal type. It shall have a capacity to deliver 2280 LPM as specified, developing adequate head so as to ensure a minimum pressure of 3 kg. per sq.cm at the highest and the farthest outlet. The delivery pressure at pump outlet shall be not less than 6 kg. per sq.cm. in any case.

The pump shall be capable of giving a discharge of not less that 150 percent of the rated discharge, at a head of not less than 65 percent of the rated head. The shut off head shall be within 120 percent of rate head.

The pump casing shall be of cast iron to grade FG 200 to IS:210 and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze / brass / gunmetal. This shaft shall be of stainless steel.

Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

The pump shall be provided with a plat indicating the suction lift delivery head, discharge speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

1.18.5 *Motor*

The motor shall be squirrel cage A/C induction type suitable for operation on 415 volts 3 phase 50 Hz system. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 21 vide IS-4691.The class of insulation shall be B. The motor shall be rated to continuous duty as per relevant IS and shall have a horsepower rating necessary to drive the pump at 150 percent of its rated discharge.

1.18.6 *Motor Starter.*

The motor starter shall be automatic star Delta type conforming to IS:1822-1967. The starter shall not incorporate under voltage or overload trip or single-phase preventor. The starter assembly shall be suitably integrated in the power control panel for the wet riser system.

Each pump shall be provided with vibration isolating pads of appropriate size.

1.19 *DIESEL FIRE PUMP.*

1.19.1 **Scope**

This section covers the details or requirements of the stand by fire pump operated by a diesel engine.

1.19.2 *General*

The diesel pump set shall be suitable for automatic operation complete with necessary automatic starting gear, for starting on wet battery system and shall be complete with all accessories. Both engine and pump shall be assembled on a common bed place, fabricated with mild steel channel.

1.19.3 *Drive*

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided. The speed shall be 1500/1800 RPM.

1.19.4 *Fire Pump (Diesel)*

The fire pump shall be horizontal split casing centrifugal type. It shall have the capacity to deliver 2280 LPM as specified. Developing adequate head so as to ensure a minimum pressure of 3 kg. per sq.cm. at the highest and the farthest outlet. The delivery pressure at the pump outlet shall be not less than 7 kg per sq.cm. in any case. The pump shall be capable of giving a discharge of not less than 150% of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of the rated head. The shaft shall be of stainless steel. The pump shall be provided with mechanical seal. The pump casing shall be designed to withstand 1.5 times the working pressure.

Bearing of pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

1.19.5 *Diesel Engine*

Engine Rating :-

The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or

combustion chamber (for example, by wicks, cartridge, heater plugs etc.) The engine shall be multi cylinder /vertical, 4-stroke cycle, water-cooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump, Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and after correction for altitude, ambient, temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum UP required to drive the pump at its duty point. It shall also be capable of driving the pump at 150% of the rated discharge at 65% of the rated head. The engine shall be capable for continuous non-stop operation for 8 hours. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run.

The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform ton B.S. 649/IS 160/IS 10002, all amended up to date.

1.19.6 *Cooling System.*

The engine cooling system shall be radiator water cooled system. The radiator assembly shall be mounted on the common base plate. The radiator fan shall be driven by the engine as its auxiliary with a multiple fan belt. When half the belt brake remaining belts must be capable of driving the fan. Cooling water shall be circulated by means of an auxiliary pump of suitable capacity driven by the engine in a closed circuit.

1.19.7 *Fuel System.*

The fuel shall be gravity fed from the engine fuel tank to the engine driven pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself suitably wall mounted on brackets. The fuel filter shall be suitably located to permit easy servicing.

The engine fuel tank shall be welded steel construction (3mm thick) and of capacity sufficient to make the engine to run on full load for at least 8 hours. The tank shall be complete with necessary supports, level indicator (protected against mechanical injury), inlet, outlet, over flow connections drain plug and piping to the engine fuel tank. The outlet should be so located as to avoid entry of any sediment into the fuel line of the engine. A semi rotary hand pump filling the engine fuel tank together with hose pipe 5 mtr. Long with a foot-valve etc. shall also form part of the scope of work.

1.19.8 *Lubricating Oil System.*

Forced feed Lubricating Oil system shall be employed for positive lubrication. Necessary Lubricating Oil filters shall be provided and located suitably for convenient servicing.

1.19.9 *Starting System.*

The starting system shall comprise of necessary battery / batteries, starter motor of adequate capacity and axle type gear to match with the toothed ring fly wheel. Suitable metallic relay to protect starting motor from excessively long cranking runs shall be included within the scope of the work. The metallic relay protection shall be integrated with engine protection system.

The capacity of the battery shall be suitable for meeting the needs of the starting system but not less than 180 AH.

The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression.

The scope shall cover all cabling, terminals, initial charging etc.

1.19.10 *Exhaust System.*

The exhaust system shall be complete with silencer suitable for indoor installation, and silencer piping including bends and accessories needed. The exhaust pipe shall protrude outside the pump room. The

total backpressure shall not exceed the engine manufacturer's recommendations. The exhaust piping shall be suitably supported and the pipe used shall be of medium class MS pipe.

1.19.11 *Engine Shut Down Mechanism.*

This shall be manually operated and shall return automatically to the starting position after use.

1.19.12 *Governing System.*

The engine shall be provided with an adjustable governor to control the engine speed with 5% of its rated under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.

1.19.13 *Engine Instrumentation.*

Engine instrumentation shall include the following :

a) Lubricating Oil Pressure Gauge.
b) Lubricating Oil temperature gauge
c) Water temperature gauge.
d) Water pressure gauge
e) Tachometer
f) Hour meter
g) Starting key

The instrument panel shall be suitably mounted on the engine.

1.19.14 *Pipe Work :*

The piping for exhaust outlet as well as fuel piping between fuel tank and the engine shall be with Medium class M.S.

1.19.15 *Anti Vibration Mounting.*

Suitable vibration mounting duly approved by engineer-in-charge shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated in the report, which will be submitted to engineer-in-charge before installation.

1.19.16 *Battery Charger.*

Necessary float and boost charger shall be incorporated in the control section of the power and control panel to keep the battery under trickle condition. Ammeter to indicate the state of charge of the batteries shall be provided.

1.20 *POWER AND CONTROL PANEL AND OTHER CONTROL COMPENENTS.*

1.20.1 **Scope**

This section covers the detailed requirements of the power and the control panel for the wet riser system, and also for the various control components in the system.

1.20.2 *Power and Control Panel.*

1.20.2.1 Constructional Requirements General Features.

The power and control panel shall be totally enclosed, free standing floor mounted cubic type, fabricated out

of sheet steel not less than 2mm thick. Where necessary, additional stiffening shall be provided by angle iron frame work. General construction shall be of compartmentalization and sectionalisation such as mains incomes, electric fire pump, diesel fire pump, pressurization pump, and control, so that there is no mix up of power and control wiring and connections in the same sections as far as possible. The panel shall also have the space for cable allays. The space for cable alleys shall be at least 200m wide to the entire depth of panel. The panel shall be front operated type with all connections accessible from the front. Front doors shall be hinged type. Back doors shall be hinged type or removable type for inspection. The door hinges shall be of concealed type. The doors for bus bar chamber shall be of removable type with the help of bolts. The doors shall be provided with quick fixing doors knobs with indication. The general arrangement of the panel shall be got approved before fabrication the cubicle construction shall be to IP 21 as per IS:2147.

1.20.2.2 Cable entries and gland plates.

All cable entries shall be through gland plates which are removable and sectionalized. Where heavy cable are brought in and terminated, suitable clamps shall be incorporated to relieve the stress on the glands due to the weight of the cable. Cable entries may be from top or bottom depending on the equipment layout and cable scheme as approved.

1.20.2.3 Bus bar and Connections.

The Bus bar shall be air insulated, and of aluminium of high conductivity electrolytic quality (grade E 91 E to IS:5082) and a adequate cross section. Current density shall not exceed 1.3 amps. Per sq.cm. All connections to individual circuits from the bus bars shall preferably be with solid connections. The bus bars and the connections shall be suitable covered with PVC sleeves or in an approved manner. Bus bar shall be suitably supported using non-hygroscopic insulated supports. High tensile bolts and spring washers shall be provided at bus bar joints.

1.20.2.4 Earthing Arrangement.

CI strip 24mm x 5mm shall be run at the rate of the board 2 nos., earth terminals shall be provided at the ends of the GI strip for connection to earth system.

1.20.2.5 Terminal Blocks and Small Wiring.

Terminal blocks shall be heavy duty type and generally not less than 15 amps 250V grade up to 100V, and 600V grade for the rest of the functions. They shall be easily accessible for maintenance. All control wiring inside the panel shall be with PVC insulated copper conductor of 2.5 sq.mm size and 600V grade conforming to IS:694- 1977. Suitable colour-coding may be adopted. Wiring harness shall be nearly formed and run preferably function wise, and as far as possible segregated voltage wise, Identification ferrules shall be used at both ends of the wires.

1.20.2.6 Instruments and Lamps.

All indication lamps and instruments shall be flush mounted type in front of the panel. The voltmeter and ammeter shall of size 100mm nominal (dial size) conforming to clause 1.5 of IS 1248 for accuracy.

Current transformers shall be provided with ammeters.

Indicating lamps to indicate the availability of electric supply shall be provided at the incoming section. Necessary indicating lamps for alarm indication and battery charging shall be provided in the respective sections.

All indicating lamps and meter shall be protected with HRC cartridge type fuses.

1.20.2.7 Labels

All internal components shall be provided with suitable identification labels. Suitably engraved labels shall be fixed at the panel for all switches, instrument push bottons, indicating lamps etc.

1.20.2.8 Painting.

The entire panel shall be given a primer coat of red lead after degreasing and phosphating treatment and two coat of final paint or approved shade before assembly of various items.

1.20.3 *Equipment Requirements.*

1.20.3.1 General

The power and control panel shall comprises individual section for the various equipment's of the system and controls, in a combined cubicle type design. All switches MCCB. MCBS and fuse/fuses switch unit shall be conforming to relevant IS.

1.20.3.2 Incomer Section & Outgoing Section.

(A) **Incomer section** :

1 no. 300 amps TPMCCB unit complete. One set of 96 mm square Ammeter (0- 400 Amps) complete with selector switch and CTS. One set of 96mm square Voltmeter (0-500 V) complete with control fuses and selector switch. One set of phase indicating lights with control fuses. One set of 4 strips of 300 Amps aluminium busbars.

(B) *Outgoing Feeder.*

(i) One number of 250 A,ps TP MCCB unit complete, SP Preventer, ML 4 type contractor forstar delta starting, start an stop push bottons, auto-manual switch, Ammeter with CTS, A S S , phase indicating lights. Auxillary Contractors for interlocking / sequence of operation, control terminals complete in all respect with interconnections for Hydrant Pump and sprinkler pump.

(ii) Two numbers of 63 Amps rated TP MCCB unit complete, ML 1.5 type contractor D O L starting with overload relay, start and stop button. Ammeter, CTS and selector switch, hase indicating lights, Auxiliary contacts for interlocking / sequence of operation, control terminals complete in all respect for Jockey Pump & fire booster pump.

(C) Control wiring from pressure switches of different settings in Hydrant and Jockey Pumps, for sequence of operation shall be included to complete the system.

(D) Colour code with ferrule marking shall also be make.

(E) The wiring shall be PVC insulated and PVC armoured aluminium conductor cable of 650 /100 volts grade conforming to IS 1554 as required from Fire Pump Board to motor and cable of suitable size.

1.20.3.3 Electric Fire Pump Section.

This section shall incorporate the following facilities.

a) MCCB
b) Control system components ad equipment such as relays, contractors, timers etc. for automatic operation.

c) Starter Unit , Current Transformer and ammeter.
d) Indication lamps, their fuses, terminal block, push bottons, control and selector switches etc. are as required.
e) Pump look out devices due to faults or abnormalities as specified in operating sequence.
f) Visual/audio alarms, indications and communications facility as specified in operating sequence.
g) Necessary inter-connection and control wiring etc.

1.20.3.4 Engine Section.

The engine section shall incorporate the following facilities**:-**

i) Control system components and equipment such as relays, contractors, timers etc. for automatic operation.

ii) Instruments, indicator lamps, fuses terminal blocks, push buttons, control and selector switches etc. as are required.

iii) Engine shut down and block out devices due to faults or abnormalities as specified.

iv) Visual/audio alarms and indications as specified.

v) Inter-connection and control wiring etc.

1.20.3.5 Auxiliary Pump Section.

The auxiliary pump section for Jockey pump shall incorporate the following:

a) TP&N MCBS

b) Control system components such as relays, times, contractors etc. as are necessary for functional requirements.

c) Starter unit, current transformer and ammeter.

d) Indication lamps, fuses, terminal blocks, push buttons selector, switch etc. as required.

e) Inter-connections and control wirings etc.

1.20.3.6 *Control Section.*

This section shall incorporate the following –

a) Control components integrating the various sections, so as to satisfy the functional requirements.

b) Battery charger unit with boost / float chare facility with voltmeter, capable of independently charging 2 sets of batteries at a time.

c) Visual / audio alarms, not covered in individual sections.

d) Lamps healthy test facility.

e) Instruments, indicating lamps, pushbuttons, fuse terminal blocks etc. as are required.

f) Test facility to simulate operation of hydrants.

1.20.4 *Other Control Components*

1.20.4.1 **Pressure Switches**.

Pressure switches shall be provided for switching on and off the pressurization pump at present pressures and also for switching off the fire pump at present pressure. Being the main component for initiating the signal for the operation of the pumps, the pressure settings shall be totally reliable, sturdy in construction and of long life. The pressure settings shall be adjustable.

1.20.4.2 Power Supply for Controls.

In order to ensure that the control systems remains co-operational at all times the control system shall be designed for 24 VDC operation fed from the battery. This shall be independent of the starting battery for the engine i.e. battery shall remain trickle charged at all times from the separate battery charger at the control system.

1.21 *Electrical Work and Earthing.*

Scope.

This section covers the detailed requirements of electrical works including earthing, for the materials installation.

Electric power supply shall be terminated in the incoking switch gear of the power and control panel by the Department. All further connections to the various components of the system shall be the responsibility of the contractor, for a complete and working system, satisfying all the functional requirements.

The scope shall particularly include the following :

Power and Control Panel(s) as given in relevant section.

All inter-connections with multi-core armoured copper cables of size suitable between various control units and control panel(s)

All power cable connections with multi-core armoured aluminium cables of size as specified in BOQ, between panels, motors etc.

Necessary earthing with 2 Nos. G.I. plate electrodes and loop earthing.

The work shall be carried out conforming to CPWD General Specifications for Electrical works Part-I (Internal) amended up to date and Part-II (External) amended upto date.

1.22 *Sprinkler System.*

1.22.1 **Sprinkler Heads**.

Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be approved make and type.

1.22.2 *Types*

1.22.2.1 Conventional Pattern.

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling side of wall extra. The sprinklers shall suitable for erection in upright position or pendant position.

A. *Side Wall Sprinklers.*

These shall be designed for installation along with the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

1.22.2.2 Construction

i) **Bulb** – Bulb shall be made of corrosion-free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.

ii) **Valve assembly –** Water passage of the sprinkler shall be controlling assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.

iii) **Yoke :** The yoke shall be made of high quality gunmetal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti corrosive treatment if the same is to used in corrosive conditions.

iv) **Deflector :** The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

a. *Colour Code.*

The following colour code shall be adopted for classification of sprinkler according to nomination temperature ratings.

b. *Sprinkler Temperature Rating.*

c. Size of Sprinklers Orifices.

The sprinklers shall be of 15mm nominal bore size.

1.22.2.3. **Pipes and Fittings**

Pipes for sprinkler system shall be of black steel conforming to I.S. 1239 (Heavy class).

Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

1.22.2.4 Jointing.

Joint for black steel pipes and fittings shall be metal to metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between G.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with G.I. or M.S. flanges with appropriate number of bolts. Flanged joint shall be made with 3mm thick insertion rubber gasket.

1.22.2.5 Pipes Protection.

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

Pipes in chase or buried underground shall be painted with two coats of hot bitumen.

1.22.2.6 Pipe Supports

All pipes shall be adequately supported from ceiling or walls from structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time f slab casting or anchor fastener later.

1.22.2.7 Valves

Sluice vales of sizes 80mm and above shall be double flanged cast iron conforming to I.S.780. Check valve shall be of cast iron double flanged conforming to I.S.5312.

Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20 kg/sq.cm. Pressure. Valves shall conform to I.S. 778.

A. Air Valves

25mm dia screwed inlet cast iron single acting air valves on all high points in the system or as shown on drawings.

B. Drain Valves

50mm dia black steel pipe conforming to I.S.1239 medium class with 50mm gunmetal full way valve for draining and water in the system in low pockets.

1.22.2.8 Installation Control valve.

Installation control valves shall comprise of the following :

a) One-man stop valve of full way pattern with gunmetal pointer to indicate where open/shut.

b) One automatic alarm valve fitted with handle & cover.

c) One hydraulic alarm motor and going for sounding a continuous alarm upon out-break of fire. One combined waste and testing valve including 5 mtr. Of tubing and fittings.

d) Alarm stops valve.

e) Strainer

f) Drain plug.

g) Padlock and strap

h) Wall box for installation of valve.

1.22.2.9 *Pressure Gauges.*

Burden type pressure gauges conforming to IS/BS specifications shall be provided at the following locations.

a) Just above alarm valve.

b) Just below alarm valve, on the installation stop valve.

c) One pressure gauge on delivery side of each pump.

d) Required number of pressure gauges on pressure tank.

Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve. In case of basement and other areas where the pipe work is below the installation drain valve / auxiliary valves of the following sizes shall be provided.

a) 20 mm dia valve for pipes up to 50mm dia.

b) 25 mm dia valves for 65mm dia pipe.

c) 32 mm dia valves for pipes larger than 65mm dia.

Piping shall be screwed type upto 50mm diameter, Welding of joints will be allowed for pipes of above 50mm dia.

1.22.2.10 The entire piping shall be pressure tested by hydrostatic method upto a pressure of 1.5 times the working pressure. The piping shall be slowly charged with water so that all the air is expelled from the piping by providing a 25mm inlet with a stop cock. The piping shall be allowed to stand full of water for a period of 2 hours and then the piping shall be put under pressure by means of manually operated test pump or by a power driven test pump. The pressure gauges used for testing shall be accurate and shall preferably the calibrated before the testing shall be rectified to the entire satisfaction of the Engineer-in-charge. The system may be tested in sections/parts as the work of erection of piping proceeds. The piping shall with stand 1.5 times the working pressure for at least 2 hours.

1.23 *Operating Sequence for the Fire Fighting System.*

1.23.1 The operating pressure in the mains is to be maintained at 6.0 kg/cm^2.

1.23.2 The jockey pup shall start automatically the moment pressure drops to 5.5 kg/cm^2 because any leakage or minor draw-off from the system and stop when the pressure reaches 5.5 kg/cm^2 again.

1.23.3 In case, after the start of Jockey pump, the pressure still keeps on falling, the main fire pump shall start at 5.0 kg/cm^2 by triggering of the pressure switch. Jockey pump shall stop when main pump starts.

1.23.4 In the event of electrical or mechanical failure of main fire pump (hydrant) to start, the diesel engine driven pump shall cut in when the pressure in the mains fall down to 4.5 kg/cm^2. The main electric pump shall then be locked out.

1.23.5 In the event of failure of wet rise system, three will be further drop in pressure and when the pressure reaches to 4.0 kg /cm^2 fire booster pump near overhead tank will start automatically .

1.23.6 If within a preset period the standby pump fails to start or fails to develop adequate pressure, the control system shall shut down the standby pump and lock it out and given an audiovisual indication to that effect at the control panel.

1.23.7 Jockey pump shall be shut down automatically when the fire pump electric or diesel, is operating. Necessary integration or pipe work and controls shall be provided for the purpose. A timer may be employed where necessary to distinguish between slow fall of pressure due to system leaks and sudden fall of pressure due to fire duty by opening of valves and thus prevent parallel start up of both pressurization and fire pumps.

1.23.8 The control panel shall status selection for each of the pumps for :automatic" as well as "manual" operation.

1.23.9 Pumps when under 'manual" status shall be operated manually through relevant push buttons.

1.23.10 The fire pumps once started shall not be stopped automatically.

1.23.11 The fire pumps shall be locked out for operation both for "manual" and "automatic" operations, once the low water controls operates and furnish an audio and visual alarm on the panel the audio alarm can be silenced by accepting the alarm. The visual alarm shall be individual for each equipment. It shall be flashing type and on acceptance remain steady. A reset button shall be provided for each pump for returning the pump for fire duty.

1.23.12 Over load or under voltage/mo volt trip device for electric fire pump shall not be provided in the starter. LED type indication lamps to indicate the availability of power shall be provided.

1.23.13 Once tripped the electric fire pump shall remain locked out for operation irrespective of the positive of its operational status selection switch. Look out indication shall be available on the panel.

1.23.14 Rerun to normal operational availability shall be feasible only by manual re-set of locked out units by operation of appropriate push buttons.

1.23.15 When fire pumps are brought into operation an audible tone from turbine type alarm operated by water flow in the mains shall be provided in indicate the healthiness of the system. The healthy running alarm shall not be silenced till the fire pump is shut down, but the tone may be mellowed by the operation, if required.

1.23.16 Alarm for failure and lock out of any pump shall distinct from "healthy" alarm. Failure alarms shall be loud and can be silenced on acceptance.

1.23.17 Repeat indication of various audio and visual indications on a slave remote panel in fire control room in terminal building shall be available. The slave remote panel shall have indication lamps to show the status of :

a) Power healthy in fire pump room
b) Jockey pump 'ON'
c) Main pump "ON"
d) Fire booster pump "ON"

The slave Remote panel shall also have a hooter, which shall sound in case, any pump is "ON". The slave Remote panel shall have a provision to reset the hooter with the help of a push button.

1.24 *Testing.*

1.24.1 **Testing on Completion of Installation.**

The entire system shall be tested after completion of installation as per the operating sequence specified.

Standard and Codes.

1.	IS-1648-1961	Code of Practice for fire safety of building (general) Fire fighting equipment and maintenance.
2.	IS-3844-1966	Code of practice for installation of internal fire hydrant in multi-storied building.
3.	IS-2217-1963	Recommendation for providing first aid and fire fighting arrangement in public buildings.
4.	IS-2190-971	Code of practice for selection, Installation and maintenance of portable first fire appliance.
5	IS-3589	Electrically Welded Steel pipes (Medium class)
6.	IS-1239	Mild steel tubes, Tubular and other wrought steel fittings (Medium class)
7.	IS-780	C.I. Double flanges sluice valve.
8.	IS-778	Gun Metal Valve.
9.	IS-909-1965	External fire hydrant (underground)
10.	IS-5290-1969	Internal Landing Valve.
11.	IS-884-1969	First and hose reel.
12.	IS-934-1976	Specification for portable chemical fire Extinguisher soda acid type.
13.	IS-2873-1969	Specification for fire extinguisher for carbon dioxide.
14.	IS-2189 & 2109	Automatic fire alarm system or BSS-3116
15.		National Building Code.

2. For Detailed Specification of Fire Detection and Alarm System (Based on DSR 2019) mentioned in SOQ shall be as per CPWD General Specification for electrical works Part VI (FIRE DETECTION AND ALARM SYSTEM) 2018. (corrected up to the last date of submission/uploading of bid).

3.0 CCTV & PA SYSTEM:

DESIGN CONCEPT & SCOPE OF WORK:

3.1 IP CCTV SURVEILLANCE SYSTEM

3.1.1 DESIGN CONCEPT:

✓ The entire IP surveillance system is designed to control and monitor the different blocks of the CDRI campus. All the corridors shall have IP Fixed dome camera to monitor the connecting corridors

✓ There are three types of cameras shall be installed to monitor the movement of the people as follows:

- IP fixed dome camera indoor type
- IP PTZ camera outdoor type
- IP fixed box camera outdoor type

✓ IP fixed dome camera shall be installed at the entrances and connecting corridors of the main buildings like laboratories, administration block, computer hub, special equipment and lab engineering services, library, auditorium, chemical storage and animal house.

✓ IP PTZ camera shall be mounted on the pole at different locations for outside surveillance purpose.

✓ IP fixed box camera shall be mounted on the pole at all boom-barrier and turnstile locations to monitor the vehicles and pedestrians passing by there.

✓ All cameras shall be true IP camera.

✓ All outdoor cameras shall be in IP-66 housing.

✓ All outdoor items for cameras like JBs, power supply, media convertor etc. shall be in water poof and dust proof housing.

✓ Purchaser's LAN network being laid by third party would be utilized to extend the IP CCTV connectivity to central server

✓ All CCTV cameras shall have connectivity to non- PoE port of purchaser's networking switches on LAN.

✓ UPS Power supply for each camera.

✓ Tentative locations of cameras are indicated in the IP CCTV, ACS, Boom Barriers and Turnstiles layout drawing enclosed with this tender

3.1.2 SCOPE OF WORK:

✓ Supply, installation, testing and commissioning high quality fast-acting IP CCTV surveillance system along with power supply, power distribution and required accessories in different blocks of CDRI campus as indicated in BOQ.

✓ The entire system shall be as per BOQ, drawings and technical specifications enclosed with tender documents.

✓ The price coated by the vendor should include all the expenses incurred in commissioning of all cameras with power supply, accessories and other devices complete with software.

✓ The CCTV surveillance system should consist of IP Fixed dome cameras (indoor type), PTZ & fixed box cameras (outdoor type), software, server, power supply and cables.
✓ Video management software shall offer both video stream management and video stream storage management. Recording frame rate and resolution in respect of individual channel shall be programmable.
✓ The system is presently designed for 45 cameras whereas not limited to the same and scalable upto unlimited cameras if required in the future.
✓ Provide supervisory specialists and technicians at the job to assist in all phases of system installation, start up and commissioning.
✓ Cat 6cable/fiber cable connectivity with all required hardware upto purchaser's networking switches of LAN, locations of networking switches in CDRI campus are indicated in the list. Enclosed with this tender document.
✓ 230 volts AC Power supply distribution from UPS to each location of cameras along with DBs, JBs, cabling work etc. with required accessories.
✓ Power supply unit as required for cameras.
✓ Integrated testing and commissioning of CCTV system on LAN being provided by the third party in CDRI campus.
✓ Training & handing over of all materials, equipment and appliances.
✓ **Any other items/accessories required for installation, testing and commissioning of CCTV system.**
✓ No extra cost shall be paid for miscellaneous items if required to complete the work as per the design concept.

3.1.3 SUBMITTALS: (IP CCTV)

Drawings: The system supplier shall submit all shop drawings, and bill of materials for approval /reference.

a) Drawings shall be submitted in standard sizes as indicated
b) Four complete sets (copies) of submittal drawings shall be provided.
c) Drawings shall be available on CD-ROM.
d) CCTV layout drawing (A1 size)
e) Installation drawing for each item (A3 size)
f) Bill of Materials (A4 size)
g) Cable connectivity drawings and cable schedule. (A3 Size)
h) Power distribution scheme (A3 size)
i) Specifications and data sheet for each item (A4 size)
j) List of software and software licenses, (A4 size).
k) Test certificates, Internal test reports etc.

(i) System Documentation

✓ System configuration diagrams in simplified block format.
✓ Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
✓ Overall system operation and maintenance instructions—including preventive maintenance and troubleshooting instructions.
✓ A list of all functions available and a sample of function block programming that shall be part of delivered system.
✓ Shop drawings of card reader stand, canopy/shed as approved by Project Architect.
✓ Test certificates and internal test reports for each item
✓ Quality Assurance Plan
✓ Operation and maintenance manuals.

(ii) Project Management

✓ The supplier shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.
✓ Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

(5) QUALITY ASSURANCE:

✓ The entire system shall be installed and commissioned from a single vendor to assure reliability and continued service.
✓ The vendor shall be required to train and instruct client's personnel in the correct use, operation and supervision of the system, preferably prior to the handing over of the project.
✓ The supplier shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished.

(6) TESTING:

✓ **Component Testing**: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every component shall be individually tested by the manufacturer prior to shipment.
✓ **Tools, Testing and Calibration Equipment**: The supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.

(7) POWER SUPPLY:

230 V $\pm$ 10 %, 50 Hz $\pm$ 5% shall be made available for UPS input. Bidder's scope shall include complete power distribution for IP CCTV system, Access Control system, Boom Barriers and Turnstiles, including complete cabling work, DBs and required electrical accessories with suitable protection devices from UPS (in bidder's scope) and UPS output to IP CCTV cameras , Access control devices, Boom Barriers and Turnstiles.

E. **TECHNICAL SPECIFICATION OF HVAC WORK**:

1.0 GENERAL:

Intent of these specifications is to define the requirements for design, supply, installation, testing and commissioning of air conditioning system. The contractor's liability shall not be limited to the scope of work mentioned, but shall also extend to achievement of the desired conditioned as per the BASIS OF DESIGN, complete, safe and satisfactorily operating System as approved by the Project Architect / EIC. Any alternations / additions, apparatus, material and labour required in order to achieve the completeness of the A/C system as above shall be deemed to be included in contractor's scope without any extra charge whether the same have been covered or not in the specifications and drawings. However, any changes required in design and installation shall be brought to the notice of the Architect/EIC; and due approval shall be obtained therefore.

The entire work shall be performed in accordance with the terms and conditions and generally as per the scope drawings set forth in the documents and shall comply with the relevant Bureau of Indian Standards Specifications and Good Engineering Practices.

The contractor shall employ a qualified Erection/Project Engineer at site and he shall be assisted by adequate number of skilled supervisors and experienced staff.

Any material supplied by the contractor, if damaged in any way during cartage or execution of work or otherwise shall be made good by the contractor at his own cost.

1.1 SUBMISSION BY THE CONTRACTOR:

The contractor shall submit three complete sets of drawings to the Engineer-in-charge after completion of the work. These drawings must give following information.
Installation drawing of air conditioning plant room.
Refrigerant distribution system layout drawing.
Schematic diagram of various controls used in air conditioning System.
Schematic diagram of electrical installation for air conditioning System, and ferrule drawings.
Detailed maintenance schedule for smooth running of the air conditioning system.
List of spare-parts required for two years satisfactory performance of the system.

1.2 GUARANTEE:

The contractor shall guarantee the installation for a period of 12 months from the date of erection / take-over certificate respective of the date of supply / erection of any equipment. Guarantee shall cover all components of the A/C System, irrespective of the nature of item, any consumable items like refrigerant gas, oil, etc. if the loss of the same is due to reasons attributed to contractor. Any damage or defect that may arise or lie discovered or in any way be connected with the equipment or fittings supplied by him or in the workmanship shall deemed necessary by the Engineer-in-charge. The achievement and maintaining of prescribed conditions throughout the Guarantee period shall be the responsibility of the contractor.
Contractor shall also provide routine preventive maintenance to the system/plant for the trouble-free operation of the system, and remove any faults that may arise during the guarantee period without any cost.

1.3 SCOPE AND STIPULATIONS:

This section relates to describe in general scope of work within this contract and stipulations.
Scope: The scope of work includes design, supply, installation, testing and commissioning of the Air Conditioning system installation for the application mentioned herein above.
The scope of work for the air conditioning system shall be as per the schedule of quantities and scope drawings.
Drawings: The tender drawings which are enclosed herewith shall serve as scope drawings. They indicate the general scheme of the air conditioning system requirement. However, actual location, distance, levels will be governed by actual field conditions, contractor shall check architectural, structural, water supply, drainage, false ceiling, lightning and other services plans to avoid possible installation conflicts. Should drastic changes from original plan be necessary to resolve such conflicts, the contractor shall notify the Architect and secure written approval before the installation is started. Contractor must submit the coordinated shop floor drawings prior to execution of HVAC Works and get the approval of Engineer in charge/Project architect/Project architect
Discrepancies in different plans or between plans and actual promptly be brought to attention of the Engineer in charge/Project architect/Project architect for a decision.
Shop / Working Drawings: The contractor shall submit to the consultant detailed shop/working drawings covering all items of equipment and installation.
Shop / working drawings shall show detailed dimensions of all equipment's, space requirements for access, repair and maintenance for equipment's, frame details, support details, foundation drawings etc. The shop/working drawings shall also contain details that require for A/C equipment's installation, cutouts, openings, framework, and foundations etc. that require for the A/C system.
No fabrication and installation should be put into execution until these drawings are approved by the Project architect.
The contractor shall initially submit in triplicate the drawings prepared by him for checking and verification by the Project architect/EIC. The contractor shall submit adequate copies of final drawings as required by Project architect/EIC on approval.
Codes and Regulations:
The installation shall be in conformity with bye-laws and regulations of local authorities concerned in so far as these become applicable to the installation. The installation shall be in conformity with the relevant Indian Standard Codes and Practices of which reference is made in the particular section of these specifications. Wherever a reference of Indian Standard Specification is made in the particular section of these specifications, wherever a reference of Indian Standard Specification is made in this document, it should

imply to the latest revision of that standard, including such revisions / amendments as may be issued by the Bureau, during the course of the work contract.
Compliance with all the applicable laws/rules pertaining to materials and workers/personnel shall be the liability of contractor.
In case if the drawings and/or specifications require something, which violates the bye-laws and the regulations shall govern the requirement of this installation and the fact shall be brought to the notice of the Project architect/EIC.
Materials & Workmanship: The materials used by the contractor shall be new, free from defects and of the best quality and workmanship and shall be in conformity with the latest and best engineering practice.
Testing/Quality Assurance programme:
(i) All equipment's and space conditions shall be tested to establish equipment ratings and indoor space conditions. The test results shall be furnished to the Engineer in charge/Project architect/Project architect as per the tender. Instruments required for testing shall be furnished by the contractor, all instruments for measuring performance parameter needs to be calibrated and calibration certificates for those instruments to be produced when necessary. Contractor to submit the material test reports to Engineer in charge/Project architect/Project architect. Contractor must submit a hardcopy of Quality assurance programme for material/AC System, with necessary test templates for getting approval from Engineer in charge/Project architect/Project architect. Once approved the same to be used throughout the phase of project. Any material without approval shall not be brought to site.
(ii) After testing and commissioning, all equipment's shall be labelled in an approved manner.
(iii) All equipment shall be guaranteed for the specified ratings with + / - 3% tolerance.
(iv) After all the tests and adjustments have been made, the plant to be put to running test for a period of daily from 9.00 AM to 5.30 PM or 3-7 days continuously. The temperature readings to be taken on hourly basis and the same test to be witnessed by Engineer in charge/Project architect.
(v) Factory test if required by Engineer in charge/Project architect, then the contractor to organize the same, travel/boarding will be borne by Client.
Training : The contractor shall provide free training at site in operation and maintenance of the system supplied by them to the client. The duration of training shall be minimum ten-fifteen days or till the time client is completely conversant with the operation and maintenance of the System.
h. Supervision: The work shall have to be carried in best workman like manner and supervised by competent erection engineers having adequate experience in the similar kind of work.
i. Clean Up At the Work Site: It is contractor's responsibility to keep site clean during the execution, installation, and after the execution of work, from debris, rubbish and wastage of any material used by him.

1.4 SCHEDULE OF QUANTITIES:

The quantities of piping, cabling, etc. mentioned in the tender documents are tentative and are given for tenderer's guidance and to have uniform basis for tendering.
The accompanied tender drawings show the route of refrigerant piping, and equipment layout. Should there be any ambiguity in plans and specifications or obstructions, the same should be brought to the notice of the Project architect/EIC while submitting the tender documents.
The contractor should carry out detailed calculations for estimating the quantities of variable quantity items on approval of drawings. Any increase or reduction in the quantities of variable items shall be payable or deducted at the unit rate for that particular item. Any extra item not covered under the schedule of quantities but needed for the completion of the work shall be first approved by the Project architect/EIC. In case, the estimated quantity exceeds the quantity mentioned in Schedule of Quantities by over 5% written approval from the owner and the Project architect/EIC should be obtained before delivering the item/s, failing which, no claim for increase in final Contract Value may be entertained on this account.

1.5 APPROVAL OF DRAWINGS:

While it will be attempted to accord the technical approval of the contractor's shop/working drawings on an expeditious basis, it will be the responsibility of the contractor to secure from the other related agencies like the Architect, Interior Designer etc. their approval for the scheme of installation as far as the building and interior layouts, aesthetics etc. are concerned.
The approval of the drawing by the Project architect/EIC shall in no way relieve the contractor from the responsibility of providing a complete and satisfactory installation and achieving and maintaining the

stipulated design conditions. Any errors, omissions and shortfalls shall be rectified, and made good free of cost to the owner regardless of the fact that the installation may in the first place have been carried out as per the approved drawings.

1.6 MODE OF MEASUREMENT:

Piping (bare / insulated), cabling, earthling etc. physical measurements and geometrically worked out quantities shall be considered without any additions for bends, reducers, fittings, valves, strainers etc.

1.7 STIPULATED COMPLETION PERIOD:

The entire work including design, manufacture, supply, installation, testing and commissioning is to be completed within the completion period mentioned in the GCC of this Tender Enquiry.

1.8 The Tender Drawings are meant for the purpose of defining the scope and the broad scheme of installation. The Contractor shall, on award of the work, prepare working Drawings based on the Tender Drawings and the final Civil and Interior Drawings; incorporating the actual equipment dimensions, duct sizes, etc.

1.9 The Bidders must check and confirm the adequacy of the installation space for A/C machines vis-à-vis their actual equipment dimensions, piping installation space, etc. shown on the Drawings. Any changes required must be clearly brought to the notice of Project architect/EIC at Tendering stage. No changes shall be possible later. Additional trapdoors if required to be taken approval from Architect.

1.10 Notwithstanding anything indicated in this Document, all the components of the A/C system should be selected, designed and installed in such a manner as to prevent objectionable noise or vibrations being transmitted to the A/C areas.

1.11 On award of the work and from time to time thereafter, area wise priorities and sequence shall be informed to the Contractor, based on which the Contractor should submit break-up of the overall completion time; and strictly adhere to the same.

1.12 The indicated configuration of air conditioners is based on the estimated A/C load to achieve the stipulated inside temperature during peak load conditions (i.e. on a summer afternoon with full occupancy). Notwithstanding anything stated/specified in this Document / Drawings, it is to be clearly understood that it is the responsibility of the contractor to achieve and maintain the stipulated inside temperature and uniformity of conditions in all the air-conditioned areas.

2.0 HEAT LOAD

2.1 The tenderer should work out heat load and air quantity independently and confirm the same in the tenderer's confirmation.

(a) Description of the work to be carried out:
The estimated peak air conditioning requirement of the various areas with occupancy and all other internal loads as listed in the table.
(i) Each floor is having centralized Variable Refrigerant flow Air-conditioning System as per the attached BOQ.

(ii) Each indoor unit (FCU)/Cassettes should have individual Temperature controller and each floor should have one central station to control the FCU/Cassettes 's of entire block.
(iii) Necessary power with Panels and DBs will be provided by Electrical agency at site. However, contractor has to arrange for own construction power.
(iv) It is also proposed to install BMS system as specified in the tender elsewhere. VRV to be compatible with BMS System.
(v) It is proposed to install the air cooled VRV condensers at Terrace. Copper piping interconnecting between indoor and condenser will be through the identified shaft.

2.1 BASIC DESIGN AND DESCRIPTION OF PROPOSED A/C SYSTEM

2.1.1 Basic consideration for estimation

Site : Guwahati.
Latitude : 26.1445° North
Longitude : 91.7362° East
Mean sea level : 49 - 55 meters above Sea level
Area to be air-conditioned
Office areas as detailed in data sheet
Occupancy : As per DBR
Lighting load : As per DBR.
Equipment load : As per DBR.
Fresh air quantity : 10-15 cfm per person or 1.0 air change per hour whichever is higher.
Note: The complete design of air conditioning shall be as per latest codes and specification.

3.0 VARIABLE REFRIGERANT FLOW SYSTEM

3.1 VARIABLE REFRIGERANT FLOW TYPE SYSTEM:

The system shall be Variable Refrigerant Flow type multi-unit air-conditioning system complete with indoor and outdoor units with individual controller for cooling & heating type operations. System shall be BMS compatible; contractor shall be shall be responsible for coordination between BMS and Airconditioning. Supply/ Installation of Modular type VRF Outdoor System, equipped with Efficient Scroll 100% Inverter compressor, Hot & Cold both option, special acrylic precoated heat exchanger, low noise condenser fan, auto check function for connection error, auto address setting of following capacity. Outdoor shall be capable to operate in Ambient conditions (Cooling / Heating) from -5 Deg C to 52 Deg C and from -15 Deg C to 24 Deg C. VRF / VRV must be equipped with Variable Energy Efficiency Regulation device feature which shall be enabling the ODU to perform in #3 Modes (Basic Mode / Turbo Mode and High Efficiency Mode) with varied EER in all three modes.

F. TECHNICAL SPECIFICATION OF LIFT WORK:

1.0 SCOPE OF WORK

These specifications cover the details of 2(Two) nos. 15 persons/1020 kgs. capacity Passenger lifts including suitable Brake release tools to be designed supplied, inspection as may be necessary before dispatch, delivery at site, installation, testing, commissioning and handing over to CDRI and the defects liability for a period of 1 year after completion of all works & handing over to client. Scope of work shall also include AMC (Annual maintenance contract) for 3 years after one year of defect liability period after handing over to client.
These specifications shall be read in conjunction with the General Conditions of Contract, Additional Conditions of Contract.

2.0 GENERAL

The equipment and installation covered by these specifications shall conform to codes of practice in force and highest standards of workmanship and materials. This work shall be done in accordance with the provisions of the Local Lifts Authority rules and shall also conform to requirements of local municipal by laws, and subsequent provisions, as also any state or local Act in force and latest Indian Standard 14665 and all latest applicable BIS, NBC code and 'CPWD General Specifications for Electrical Works (Part III, Lifts & Escalators) 2003'.
The Entire electrical installation shall be done in accordance with the Indian Electricity Act 2003, Indian Electricity Rules 1956 as amended to-date. The Electrical wiring shall strictly comply with IS:732 and latest

applicable BIS and NBC code. The electrical works shall also conform to CPWD General Specification for Electrical Work Part-I (Internal) 1994 and Part-II (External) 1994 as amended up to date.
The Contractor shall follow all Statutory Requirements as well as best trade practices in the manufacture & installation of lifts. The Contractor shall arrange to obtain the statutory approval of the Inspectorate of Lifts as may be required for commissioning of the lifts and handover for operation after satisfactory tests.

3.0 DRAWINGS

Before commencing work, the Contractor shall prepare and submit all drawings for individual lifts in required nos. necessary to show the general arrangement and details of lift installation, electrical etc. These drawings must be approved by the EPI/CDRI before installation and shall become part of the contract.
The Contractor shall, within 3(three) weeks of receipt of a Letter of award of contract, submit 4(four) copies of all working drawings showing pit, hoistway and machine room layouts clearly indicating and specifying all connected structural, electrical and architectural works including imposed structural static / dynamic loads (including breaking load on guides, reaction of buffers on lift pits, reaction on support points in machine room, lift well etc.) and electrical ratings including calculations for selection of kW rating of motor. Within 10 days of receipt of letter of award of contract, the Contractor shall obtain from the EPI/CDRI all the information he needs to prepare his drawings and shall have any interaction with the EPI/CDRI to finalise all parameters and data for design. The Contractor will be responsible for any discrepancies, errors and omissions in the drawings or particulars submitted by him even if these have been approved by the EPI/CDRI. On approval of these drawings (within 2 weeks of submission of full documentation), the Contractor shall submit 8(eight) copies of approved working drawings incorporating corrections / comments, if any, and shall immediately commence work.

On completion of work, the contractor shall supply four sets of CD's and 8 (eight) copies of the detailed wiring diagram, 'As built' drawings and equipment operation & maintenance manuals and original certificates from 'Inspector of Lifts' for all the lifts. Further, a copy of such detailed diagram and a set of instructions for evacuation of passengers in case of breakdown of the lifts shall be framed and installed in the respective machine room by the Contractor.
The Contractor shall carry out all the work strictly in accordance with drawings, details and instructions of EPI/CDRI.

4.0 WORKS TO BE ARRANGED BY EPI/CDRI

The following items shall be provided to the Lift Contractor under instructions of the Department to suit the requirements of the lift Contractor.

i. Hoist-ways, machine rooms and pits of specified dimensions (within normal building tolerances).

ii. Floor, wall and ceiling finishes in hoist-ways, pits and machine rooms; including painting (except painting of equipment and materials supplied by lift Contractor) and waterproofing, as well as doors and windows in machine room.

iii. Cables from main L.T. Panel Board through the hoist-ways terminating in and including individual Main Switches of required rating for 3 phase and single phase supply in Machine Rooms including necessary earthing.

iv. Free 3 phase power supply for group testing and commissioning of lifts after erection is completed.

v. Lighting installation within machine rooms as required by the lift Contractor including 1-phase main switch with ELCB at machine room.

vi The equipment shall be suitable to operate on 415 Volts 3 phase, 4 wires, 50 Hz. A.C. supply with a variation of $\pm$10% in Volts and +5% in frequency respectively. The supply for illumination and single-phase equipment shall be 230 Volts A.C.

vii Lighting installation within hoistways and pits as required by the lift Contractor including 1-phase main switch at machine room.

viii. Ventilation system of machine rooms with minimum 18" heavy duty exhaust fan in each machine room as per the requirement of NBC / BIS codes.

ix. Providing of hoisting beam in the machine room for hoisting of equipment during erection and to facilitate maintenance in future.

5.0 LIFTS CONTRACTOR'S RESPONSIBILITIES : ANCILLARY WORKS

i. All cabling , wiring and earthing from 3 - phase main DB in machine room to Lift Contractor's equipment.

ii. All steel items i.e. machine beam/bases, pedestals/ bearing plate in the machine room, separators wherever required and buffer support channels, vertical iron ladder in lift and structural steel supports and brackets for the installation in etc., to suit the sizes of the hoistways.

iii. Sill tracks including sill supports, supporting protection at all landings.

iv. Screen guards, facia plates and other protection for installation.

v. To carry out minor civil work, such as chipping & making openings in slabs , grouting of foundation bolts in shaft, pit and machine room, modification and making rail bracket, hall buttons indicators and laying of sills in positions. Or any other work required for smooth operation/ commissioning of lifts. All chiseling and cutting of pockets and making good. (All cutting shall be as approved by EPI/CDRI).

vi. Ensuring safety against accidents including barricading all openings and caution signs.

vii. Scaffolding and other Tools & Tackles required for installation in the hoist-way required for erection of lifts.

viii. All other items necessary for satisfactory execution & completion of works, whether specified or not.

ix. Power shall be provided at incoming of main DB for lifts. Main DB in the machine room shall be provided by the lift contractor. From main DB to lifts, cables shall be in the scope of lift contractor. However, lighting for machine room shall be done by others.

x. Trap doors, floor gratings, steps / ladders and openings in machine rooms and ladders for pits as required by the lifts Contractor. Contractor shall furnish the details of these items in the layout drawing for lifts to submitted after award of the job.

xi. Temporary power supply connection(s) for erection work shall be arranged by the lift Contractor.

6.0 SOUND REDUCTION

The Contractor shall provide necessary sound reduction materials, such as rubber pads/ anti vibration pads of proper density to effectively isolate the machine from the machine beams and/or flooring.

Noise level inside cars and in the machine, room shall be maintained at minimum levels as laid down in the relevant codes and in any case not more than specified under PERFORMANCE PARAMETERS.

7.0 TRACTION MACHINE

The machine shall be worm geared traction type with motor (steel worm, bronze gears, steel sheave shaft & Ferro molybdenum sheave), electro-mechanical type of brake and driving sheave mounted in proper alignment on a single heavy cast iron base or steel bedplate.

The worm shaft shall be fitted with roller bearings to take end thrust. The sheave shaft shall also be fitted with roller bearings to ensure proper alignment. All shafts shall be provided with well-designed keys.

Rotating parts shall be statically and dynamically balanced.

The drive sheave shall be designed with machined V-grooves to ensure adequate traction with minimum wear on rope. All sheaves including deflector sheaves, where used, shall conform to I. S. 14665 (Part 4 section 3)

Adequate and dust – proof lubrication shall be provided for all bearings and worm gears.

The brake shall be suitably curved and provided with fire proof friction lining. The operation of brake shall be smooth, gradual and with minimum noise. The brake shall be designed to be of adequate size and

strength to stop and hold the car at rest with rated load. The brake shall be capable of operation automatically by various safety devices, current failure and by the normal stopping of the car. The brake shall be released electrically. It shall also be possible to release the brake manually so as to move the lift car in short stops. Suitable Brake release tools (total 3 nos.) shall be supplied and stored in the machine rooms.

For manual operation of lifts, up & down direction of the movement of the car shall be clearly marked on the motor or traction machine. A warning plate in bold signal red colour to switch off the mains supply before releasing the brake and operating the wheel shall be prominently displayed.

8.0 HOIST MOTOR

The motor shall be suitable for 415 Volts +10% to –20%, 50 Hz. ± 5%, 3 Phase A.C. Supply. The motor must be designed for arduous lift duty, rapid reversals and constantly repeated starts & stops as defined in the relevant codes of practice. All windings must be heavily insulated, adequately impregnated for tropical climate and mechanically strengthened and must be specifically designed to have a high starting torque and low starting current characteristics within the limits acceptable to electricity supply co. requirements and I.E. Rules. The motor shall be designed in such a way as to withstand occasional overloading above its rated capacity and shall have overload protection. The motor shall have good speed regulation under different conditions of load and shall be designed to give a noiseless and vibration-free operation. Insulation shall be class F.

9.0 MOTOR CONTROL AND DRIVE

The lift motor shall be controlled by a variable voltage variable frequency (V.V.V.F.) micro-processor control system which shall control and monitor every aspect of lift operation at all stages of the car motion cycle on real time basis.
The A.C. V.V.V.F. drive system shall control A.C. voltage and frequency concurrently with the hoist motor to regulate the lift's actual performance to match closely the ideal speed pattern, obtain maximum efficiency of operation and provide a very smooth ride.
Frequency shall range fully between zero and rated value.

The Controller shall be provided with a self diagnostic programme to keep downtime to a minimum possible.
The controller shall intelligently adjust door times in response to car calls, hall calls and "Door Open" button operation.
An Inspector's changeover test switch and set of test buttons shall be provided in the controller. Operation of the Inspector's changeover switch shall make both the car and landing buttons inoperative and permit the lift to be operated in either direction from machine room for test purposes by pressing corresponding test buttons in the controller. It shall not, however, interfere with the emergency stop switches inside the car or on the top of the car.

10.0 GUIDES AND FASTENINGS

i. Guide-rails for car and counterweight shall consist of machined mild steel Tee sections, erected plumb, and securely fastened to the lift well framing by heavy steel brackets, suitably spaced, to limit deflection of guide rails to 3 mm under normal working conditions.

ii. The guide-rails shall be of suitable section with ends tongued and grooved, forming matched joint and shall be connected with steel fish plates.

iii. Guide-rails shall cover the full height of the hoistway and pit , such that It shall be not be possible for any of the car or counter weights shoes to run off the guides.

iv. Guides shall be designed to withstand the action of safety gear when stopping a counter weight or fully loaded car.

v. The max. deviation from true plumb and alignment of guide rails shall be 2 mm.

vi. All support framing shall be rigid and shall be designed to restrict displacement of the point of support of brackets to 3 mm under normal working conditions.

vii. The whole guide rail installation, including expansion joints, shall be designed for a smooth ride.

viii. The guide-rails shall be protected during storage and installation with a rust inhibiting coating which shall be cleaned off on completion of installation.

ix. Guide-shoes shall be adjustable type & mounted so as to provide continuous contact with guide rails under all conditions.

Guide shoes shall be provided at top and bottom of each side of car and counterweight and shall be designed for quiet operation.

Additional guide shoes shall be provided on each side of buffer frame in case of oil buffers.

Each lift shall be equipped with roller guides for up and down travel. There shall not be any metal-to-metal contact between Car and rail. Roller shall be mounted on ball bearings to provide quiet operation and excellent ride quality. (It is not required in case the design varies however the ride quality shall not be compromised for any other design).

11.0 SAFETY

In addition to other specifications, the lift shall be provided with safety devices as follows :-

i. Against overload
ii. Safety gear on car so that in the event of rope breaking or loosening, the car will be brought to rest immediately by means of grips on the guides.

The overspeeding car shall be automatically brought to a gradual stop on guide rails and power supply to the hoist motor shall be switched off.

iii. Overspeed centrifugal governor operating the safety gear in case of over-speeding of car in the down direction.

iv. Car gate lock so that in the event of car gate being opened when passengers are in the car, the lift will be brought to rest.

v. Overtravel limit switches at top and bottom limits of travel to disconnect the power supply and apply brakes to stop the car within a defined safe distance in case of overtravel in either direction

vi. Ultimate terminal switches to stop the car automatically within top & bottom clearances independently of normal overtravel limit switches but with buffers operative.

vii. Protective guards to counterweights in pit, rope sheaves and wherever required.

viii. Toe guard apron to the car platform.

12.0 CAR

a. Cabin Size

The internal clear dimensions of the cabin shall not be less than those specified in IS 14665-Part I, NBC & CPWD General specifications for electric work (Lifts) . The car shall be so mounted on the frame that

vibration and noise transmitted to the passengers inside is minimised.

b. Frame and Safety Device

The car frame shall consist of mild steel channel/structural steel top and bottom securely riveted or bolted and substantially reinforced and braced so as to relieve the car enclosure of all strains when the safety device comes into action due to overspeed or when the capacity loaded car is run on the buffer springs at normal speed.

The safety device mounted on the bottom members of the frame operated by a centrifugal speed governor shall be arranged to bring the car to a gradual stop on the guide rails in the event of excessive descending speed; and provision shall be made to shut off the power supply to the motor.

c. Buffers

Substantial spring buffers (2 Nos.) shall be furnished and installed in the pit under the car and counterweight. These buffers shall be mounted on RCC Pedestals in the pit. The car buffer spring must be of correct design to sustain the car with capacity load without damage should the car terminal limits become inoperative. The car buffers must be located symmetricaly with reference to centre of car.

The Contractor may alternatively offer oil type buffers. The plunger shall be mild steel, designed for a very high factor of safety and accurately machined. A toughened rubber bumper shall be fitted to the plunger top to cushion the impact of steel buffer plates attached under the car and the counterweight. An oil gauge shall be provided to check the oil level.

d. Counterweight

The lift shall be suitably counter-balanced for smooth and economical operation. Cast iron weights shall be contained in a structural steel frame properly guided with suitable guide shoes (minimum 4 Nos). It shall be equal to the total weight of lift plus approx. 50% of the contract load.

Substantial expanded metal counter-weight screen guard shall be furnished and installed at the bottom of hoist way, as required by Lift Inspector.

e. Hoisting and Governor Ropes

Bright steel wire ropes with fibre cores suitable for Lift duty as per BIS Code shall be used for hoisting ropes.

Not less than 3 independent suspension ropes shall be provided and designed to share load equally by means of adjustable shackle rods with equalizer springs at each end of hoisting ropes.

Each rope shall have adequate section to provide a minimum factor of safety of 4 based on the max. force on the rope.

Governor ropes shall be similar to hoisting ropes. Their ends shall be securely attached to the car and to the safety gear. The governor ropes shall be tensioned by a weight loaded device in the pit.

The contractor shall submit the technical details and source of supply of ropes to the EPI as well as a certificate of performance of ropes from an approved test laboratory or Authority.

Compensation for travel shall be provided for all lifts having a travel of more than 30m.

f. Enclosure

The car enclosure shall be as specified in technical data sheet. The cabin floor, roof and walls shall be free of distortion and undue deflection as per IS 14665 – Part 4, Section 3.

g. Brakes

D.C. brakes will be spring-applied and electrically released. They shall be designed to provide smooth stops under variable loads.

h. Doors

Provision shall be made for vertical and horizontal fine adjustment of doors as per the specifications given in technical data sheet.

i. Door Operators

The door operators shall be VVVF inverter controlled heavy duty A. C. motor, allowing variable opening and closing speeds, and full synchronization of car and landing doors.

j. Travelling Cables

The traveling cables shall be multi-core with high conductivity stranded conductors specifically designed for lift duty. The cables shall be provided with retaining straps and individual cable clamps.

k. Emergency Lighting

A self-contained, non-maintained emergency light with a trickle boost charger shall be provided.

l. Intercom

An Intercom system shall be provided between the car, main landing, machine room and Fire Console room linked to EPABX located at Admn. Bldg.

m. Manual Cranking Facility

Manual cranking facility shall be provided in the machine room to facilitate evacuation of passengers in case of power failure. The manual mode shall be in addition to automatic car failure operation specified elsewhere

n. Emergency Stop Switch

A stop switch in the machine room / top of car shall be provided for use by maintenance crew to cancel all car and landing calls for a particular lift.

o. Maintenance Switch

On operation of the maintenance switch located on top of the car by the maintenance crew, the car shall travel at slow speed not exceeding 0.85 m / sec by continuous operation of a button

p. Landing Door Interlocks

Electrical interlocks shall be provided to ensure that the car does not operate unless all doors are closed and unless the car reaches a landing zone.

q. Overload Indicator (Only in Passenger elevator)

An overload indicator with buzzer shall be provided in the cabin to indicate to the passengers that the car will not start as it is overloaded.

r. Other Features

All features specified in the BIS/NBC/CPWD and in the enclosed technical specifications shall be provided.

s. Lift for Disabled

All the Passengers lifts shall be suitable for use by disabled persons. The following additional facilities shall be provided in this lift:

i. Full length handrails shall be provided on the rear and side wall panels.
ii. The door closing time shall be set for min. 5 seconds and the door closing speed shall not exceed 0.25 m/sec.
iii. The "door open" and "door closed" announcements shall be audibly made in the car.
iv. Braile signs / buttons.

t. Operating Panels, Buttons & Switches

Main and secondary car operating panels, buttons and switches shall be located on one of the two front wall panels next to the car door and as specified in the Schedule of lifts & as per approved G.A. drawings.
All buttons and switches shall be clearly legible with fade-proof text and figures, and shall be easily accessible, (especially for disabled persons in the lift designated for them).

13.0 ELECTRIC WIRING

Necessary insulated wiring to connect all parts of the equipment shall be furnished and installed. Insulated wiring shall be flame retardant and moisture resistant and shall be run in G.S. conduits. All cables shall be flame – retardant with copper conductors.
Trailing cables shall be PVC sheathed copper conductor multi-core ribbon type designed for lift service and shall be flame retardant and moisture resistant. They shall be flexible and shall be suitably suspended to relieve strains on individual conductors. All copper conductors shall be of appropriate gauge copper to avoid excessive voltage drop. All wires, cables, conduits, metal boxes, fittings and earthing shall comply with statutory requirements and BIS specifications.

The controller unit comprising of the MCCB, 25KA, adjustable overload and phase reversal and phase failure protection, all the circuit elements, transformer, rectifier for D.C. control supply, inverter power pack, terminal blocks etc. shall be enclosed in an insect vermin proof, sheet steel floor or wall mounted cabinet with hinged doors at front or at both front and rear. Proper warning boards and danger plates shall be provided on both sides of the controller casing. Sheet steel used for controller cabinet shall not be less than 14 gauge and shall be properly braced, where necessary. Suitable gland plate shall be provided for cable entry. The battery for the charger unit shall be suitably placed in the machine room. Degree of protection of Enclosure shall be IP54. Enclosure shall have provision of earthing studs.

All sheet steel work shall be painted with two coats of synthetic enamel paint of suitable shade both inside and outside over two coats of zinc primer.

Apart from lift controller enclosure, 7 distribution boards (3 Main DB + 4 DB) are required as per BOQ. Cables to incomer of these DB's shall be terminated by others, whereas outgoing cables for lift shall be in the scope of lift contractor. Contractor shall furnish the sizes of cables alongwith KW rating of motors.

14.0 PAINTING

All exposed metal work furnished in these specifications, except as otherwise specified, shall be given one shop coat of anti-corrosive primer after approved surface treatment of metal surfaces and two coats of approved enamel paint of approved shade. After installation of Lifts, a final Touch-up Coat of paint shall be applied.

15.0 WORKS TESTS

The following tests shall be carried out at Works. EPI shall be given notice of the time and procedure of the tests before they are carried out, and shall be given facilities for observing the tests at Works.

a. High voltage works tests of equipment which is not already tested in accordance with appropriate IS codes.

b. Buffer test.

16.0 TESTS ON COMPLETION

The following tests shall be carried out to the satisfaction of the EPI/CDRI.

i. Insulation resistance and earth test for all electrical apparatus.
ii. Continuous operation of the lift under full load conditions and simulated starts and stops (150 nos. per hour each) for one hour at the end of which time the service temperature of the motor and the operating coils shall be tested. This shall be as per B.I.S. specification.
iii. The car shall be loaded until the weight on the rope is twice the combined weight of the car and the specified load. The load must be carried on for about 30 minutes, without any sign of weakness, temporary set or permanent elongation of the suspension rope strands.
iv. The following items shall be tested :
a. Levelling accuracy at each landing in conditions of fully loaded and empty car.
b. No load current and voltage readings both on 'Up' and 'Down' Circuits.
c. Full load current and voltage readings both on 'Up' and 'Down' Circuits.
d. One and quarter load current and voltage readings both on 'Up and 'Down' Circuits.
e. Stalling current and voltage and time taken to operate overload.
f. Overload protection.
g. Gate sequence relays, if provided and installed.
h. Car and landing door interlocks.
i. Collective control and priority sequences, if installed.
j. Safety gear mechanism for car and counterweight with fully loaded car and also with only 68 kg load.
k. Speeds on Up and Down travel with full load, half load and empty car.
l. Door contacts.
m. Final terminal stopping device.
n. Normal terminal stopping device.
o. Car and counterweight buffers with contract load and contract speed.
p. Operation of controllers.
q. Manual operation of lift at mid-way travel.
r. Emergency operation.

v. Tests on completion shall also be performed to the satisfaction of Inspector of Lifts and a certificate will be obtained from the 'Lift Inspector ' by the contractor.

17.0 STATUTORY APPROVALS

All statutory approvals from commencement to commissioning of lifts shall be obtained by the Contractor from the Inspector of Lifts and / or other authorities. However, the client will provide all necessary assistance for providing documents, drawings and certificates pertaining to other contractors, if required.
The contractor shall pay necessary fees in connection with the approval of installation of lifts.

18.0 FEATURES REQUIRED FOR VVVF LIFTS

(a) Group / Independent / Attendant Operation

It shall be possible to group specified cars in a group wherever required with dynamic disposition of cars as required by the traffic pattern. A smart car dispatching system with ring communication shall be provided for optimum passenger comfort and lift performance under all traffic conditions. Any defective car shall be automatically eliminated from the group.

Each car shall be provided with a keyswitch for independent operation housed in a service cabinet. In this mode, the lift shall respond only to car calls. Hall calls will not be registered.

It should be possible for an attendant to operate any car.

(b) **Fireman's Switch**

A fireman's toggle switch shall be provided in a break glass for the specified lift at ground floor to enable firemen to bring the lift non-stop to ground floor from any location and to cancel hall calls until the car is operated on attendant control.

(c) **Emergency Power Operation**

In case of power failure, standby power equipment shall enable lifts to reach a pre-determined floor, in a pre-determined sequence, and then permit operation of one or more lifts on emergency power.
A trickling battery shall be provided to supply power to light fixtures, fan, alarm and intercom.

(d) **Profile Generator**

A profile generator or similar device shall be provided to use the car at an optimum speed level and to improve levelling accuracy.

(e) **Predictive Car Selection**

Once a hall call is registered, a dynamic car algorithm shall transfer the call to an optimally selected car to provide the maximum traffic efficiency.

(f) **Home Landing Facility**

A car shall return to a pre-determined landing after the last call is answered.

(g) **Door Safety**

Multi-beam infrared / ultrasonic electronics curtains shall be provided to scan the doorway and reverse the door closing in case of any obstruction.

(h) **Double Door Operation**

If both up and down calls are registered at a hall which is the last registering hall in the direction of the car, the lift shall travel to that hall and open / close the doors. After this, the car shall reverse its travel and shall open / close the doors again unless no car calls are registered at that floor.

(i) **Nudging Door Operation**

When the doors remain open for more than a predetermined period, a buzzer shall sound and the door shall close automatically. The door sensing device shall be rendered inoperative but the Door Open button and the safety shoe shall remain operative

(j) **Selective floor Service**

Programming for selective floors services shall be software driven.

(k) **Manual Cranking & Slow speed Travel**

A manual cranking facility shall be provided.

Slow speed operation shall be possible from machine room and car top.

(l) **Auto Fan Off**

In case no calls are registered for a pre-set time, the cabin fan shall be automatically switched off.

(m) **Automatic Rescue Device**

In case of mains power failure and Lift control system failure, the Lift's own rechargeable and maintenance free battery power shall move the car to the nearest floor and the door shall open automatically for automatic rescue of passengers. A battery run-down indicator shall be provided.

19.0 PERFORMANCE PARAMETERS

The following parameters shall be achieved in the installation :

*	Levelling Accuracy	$\pm$ 3 mm for 1.5 m/s speed $\pm$ 4 mm for 0.75 m/s speed
*	Jerk level	0.9 – 1.5 m/s^3
*	Noise level in car	58 dB
*	Noise level at 1 M in machine room	60 dB
*	Acceleration rate	0.6 – 1.0 m/s^2 (adjustable)
*	Max. car vibration	20 milli gals.

20.0 SUBMITTALS 'ALONGWITH TENDER' AND 'POST AWARD'

(A) The following items are required to be submitted in duplicate **along with the Tender**.

i. Catalogues with offered items highlighted.
ii. List of imported components, if any.
iii. Compliance Statement for guaranteed performance parameters given in Specification 19.0 above.
iv. Confirmation that offer submitted meets the technical specifications & scope of work and there are no deviations and exclusions from NIT.
v. The contractor shall specify in his offer the full capability of his system in this regard.

(B) The successful contractor, **after award of the contract** ,shall furnish following technical particulars of the equipment/devices for the approval by CDRI/EPI.

i) Single line/ schematic diagram of electronic control panel, lift & equipment etc.
ii) Layout of Hoist-way, Lift machine room, showing foundation details in the pit, machine room, electric control panel, Lift & equipment etc.
iii) Earthing layout.
iv) Inspection manual for equipment & accessories covered in the scope of supply (8 copies).
v) Technical literature of operation, control and maintenance etc. (8 copies) along-with CDS.
vi) Schedule of scope of maintenance service during defect liability period and AMC.

The technical parameters furnished by the tenderer would be examined in detail during design submission stage. All improvements considered necessary to meet the tender Technical Specifications would have to be incorporated without any additional cost to EPI/CDRI with objective of providing high performance and safety Lifts.

21.0. MAINTENANCE DURING DEFECTS LIABILITY PERIOD

Comprehensive maintenance during Defects Liability Period inclusive of periodic servicing, prompt attention to client (CDRI) complaint, prompt rectification of all malfunctions and equipment failures, replacement of defective equipment / parts, replacement of light fittings, lubrication including lubricants, maintaining correct alignment and levelling of cars and ensuring smooth running, starts and stops etc. all complete to EPI/CDRI's satisfaction shall be done.

G. TECHNICAL SPECIFICATION OF LANDSCAPE WORK:

1.0 LANDSCAPE WORK:

Landscaping (Horticulture) operations shall be started on ground previously levelled and dressed to required formation levels and slopes. In case where unsuitable soil is met with, it shall be either removed or, replaced or it shall be covered over to a thickness decided by the Engineer-in-charge with good earth. In the course of excavation or trenching during horticultural operations, any walls, foundations, etc. met with shall not be dismantled without pre-measurement and prior to the written permission of the Engineer-in-charge.

2.0 TRENCHING IN ORDINARY SOIL:

2.1 TRENCHING:

Trenching is done in order to loosen the soil, turn over the top layer containing weeds etc. and to bring up the lower layer of good earth to form a proper medium for grassing, re-grassing, hedging and shrubbery. Trenching shall be done to the depth ordered by the Engineer-in charge. The depth is generally 30 cm for grassing and 60 cm for re-grassing in good soil.

2.1.1 The trenched ground shall, after rough dress, be flooded with water by making small kiaries to enable the soil to settle down. Any local depression unevenness etc. shall be made good by dressing and/or filling with good soil.

2.1.2 Weeds or other vegetation which appear on the ground are then uprooted and removed and disposed off and paid.

2.1.3 Trenching shall consist of the following operations: 1. The whole plot shall be divided into narrow rectangular strips of about 1.5 m width or as directed by the Engineer-in-Charge. 2. These strips shall be sub-divided lengthwise into about 1 m long sections. Such sections shall be excavated serially and excavated soil deposited in the adjacent section preceding it. 3. In excavating and depositing care shall be taken that the top soil with all previous plant growth including roots, get buried in the bottom layer of trenched area, the dead plants so buried incidentally being formed into humus. 4. The excavated soil shall be straight away dumped into the adjoining sections so that double handling otherwise involved in dumping the excavated stuff outside and in back filling in the trenches with leads is practically eliminated.

2.1.4 Measurements Length and breadth of the plot shall be taken correct to 0.1 m and depths correct to cm. Cubical contents shall be calculated in cubic meters, correct to two places of decimal. No deduction shall be made nor extra paid for removing stones, brick bats and other foreign matter met with during excavation upto initial lead of 50 m and stacking the same.

2.1.5 Rate The rate shall include the cost of all labour and material involved in the operations described above, including cost of all precautionary measures to be taken for protections and supporting all services etc. Met with during trenching. It does not include the cost of mixing of earth, sludge/manure.

2.2 GOOD EARTH

2.2.1 The earth shall be stacked at site in stacks not less than 50 cm high and of volume not less than 3.0 cum.

2.2.2 Measurements: Length, breadth and height of stacks shall be measured correct to a cm. The volume of the stacks shall be reduced by 20% for voids before payment, unless otherwise described.

2.2.3 Rate: The rate shall include the cost of excavating the earth from areas lying at distance not exceeding one km. from the site, transporting the same at site breaking of clods and stacking at places indicated. The rate shall also include royalty if payable.

2.3 SUPPLY AND STACKING OF SLUDGE

2.3.1 It shall be transported to the site in lorries with efficient arrangement to prevent spilling en-route. It shall be stacked at site. Each stack shall not be less than 50 cm height and volume not less than 3 cum.

2.3.2 Measurements Length, breadth and depth of stacks shall be measured correct to a cm. The volume of the stack shall be reduced by 8% for looseness in stacking and to arrive at the net quantity for payment.

2.3.3 Rate The rate shall include the cost of labour and material involved in all operations described above, including carriage up to one km. The rate shall also include royalty if payable.

2.4 SUPPLY AND STACKING OF MANURE

2.4.1 Farmyard Manure: Same as 2.3.1.
2.4.2 Measurements: Same as 2.3.2.
2.4.3 Rate : Same as 2.3.3.

2.5 EXCAVATION AND TRENCHING FOR PREPARATION OF BEDS FOR HEDGE AND SHRUBBERY

2.5.1 Beds for hedges and shrubbery are generally prepared to width of 60 cm. to 125 cm. and 2 to 4 meters respectively.

2.5.2 Beds for hedges and shrubbery shall be prepared in the following manner. The beds shall first be excavated to a depth of 60 cm. and the excavated soil shall be stacked on the sides of the beds. The surface of the excavated bed shall then be trenched to a further depth of 30 cm, in order to loosen the soil, in the manner described in 2.1. No flooding will be done at this stage but the top surface shall be rough dressed and levelled. The excavated soil from the top 60 cm depth of the bed stacked at the site shall then be thoroughly mixed with sludge over manner in the proportion 8:1 by ratio or other proportion described in the item. The mixed earth and manure shall be refilled over the trenched bed, levelled neatly and profusely flooded so that the water reaches even the bottom most layers of the trenched depth of the bed. The surface after full subsidence shall again be refilled with the earth and manure mixture, watered and allowed to settle and finally fine dressed to the level of 50 mm to 75 mm below the adjoining ground or as directed by the Engineer-in-Charge. Surplus earth if any, shall be disposed off as directed by the Engineer-in-charge. Any surplus earth if removed beyond initially lead shall be paid separately. Stones, bricks bats and other foreign matter if met with during excavation or trenching shall be removed and stacked within initially lead & lift, such material as is declared unserviceable by the Engineer-in-charge shall be disposed by spreading and levelling at places ordered by him. If disposed outside the initial lead & lift, then the transport for the extra leads will be paid for separately. If a large proportion of material unsuitable for the hedging and shrubbery operations is met with and earth from outsides is required to be brought in for mixing with manure and filling, the supply and stacking of such earth will be paid for separately.

2.5.3 Measurements

Length, breadth and depth of the pit excavated and trenched shall be measured correct to a cm. The cubical contents shall be calculated in cubic meter correct to two places of decimal.

2.5.4 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above. The rate shall not include the cost of supply & stacking of the manure unless the same is specifically included in the description of the item.

2.6 DIGGING HOLES FOR PLANTING TREES

2.6.1 In ordinary soil, including refilling earth after mixing with oil cake, manure and watering.

2.6.1.1 Holes of circular shape in ordinary soil shall be excavated to the dimensions described in the items and excavate soil broken to clods of size not exceeding 75 mm in any direction, shall be stacked outside the hole, stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the size as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities as required to replace such discarded stuff shall be brought and stacked at site by the contractor which shall be paid for separately. The tree holes shall be manured with powdered Neam/castor oil cake at the specified rate along with farm yard manure over sludge shall be uniformly mixed with the excavated soil after the manure has been broken down to powder, (size of particle not be exceeded 6 mm in any direction) in the specified proportion, the mixture shall be filled in to the hole up to the level of adjoining ground and then profusely watered and enable the soil to subside the refilled soil shall then be dressed evenly with its surface about 50 to 75 mm below the adjoining ground level or as directed by the Engineer-in-charge.

2.6.1.2 Measurements:
Holes shall be enumerated.

2.6.1.3 Rate:
The rate shall include the cost of all the labour and material involved in all the operations described above, excluding the cost of supply and stacking the requisite quantity of manure/ sludge and oil cake.

2.7 M.S. FLAT IRON TREE GUARD

2.7.1 M.S. Iron Riveted Tree Guard

2.7.1.1 The tree guard shall be 600 mm in diameter and 2-meter-high above ground level and 25 cm in below ground level.

2.7.1.2 The tree guard shall be framed of 4 nos. 25 x 6 m M.S. flat 2 meter long excluding displayed outward at lower and upto an extent 10 cm and 8 nos. 25 x 3 mm vertical M.S. Flat Rivetted to 3 Nos. 25 x 6 mm Flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. bolts and nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

2.7.1.3 Measurement:
The tree guard shall be enumerated.

2.7.1.4 Rate:
The rate shall include the cost of all the labour and material involved in all the operations described above.

2.7.2 M.S. Flat Iron Welded Tree Guard

2.7.2.1 The tree guard shall be 600 mm in diameter and 2-meter-high above ground level and 25 cm in below ground level.

2.7.2.2 The tree guard shall be framed of 4 nos. 25 x 6 mm MS. Flat 2 meters long excluding displayed outward at lower and upto an extent 10 cm and 8 Nos. 25 x 3 mm vertical M.S. Flat Riveted to 3 nos. 25 x 6 mm flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. Bolts & nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

2.7.2.3 Measurement:

The tree guard shall be enumerated.

2.7.2.4 Rate:

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

2.8 FILLING MIXTURE OF EARTH & SLUDGE OVER MANURE

2.8.0 The separately specified earth and sludge shall be broken down to particles of size not exceeding 6 mm in any directions before mixing. Good earth shall be thoroughly mixed with sludge over manure in specified proportions as directed by Officer-in-Charge. During the process of preparing the mixture as above, trenches shall be flooded with water and levelled.

2.8.1 Measurements
Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

2.8.2 Rate
The rate shall include the cost of all the labour and material involved in all the operations described above, but do not include the good earth, sludge or manure which will be paid separately.

3.0 SPECIFICATIONS OF PLANTS (Plants, Trees Shrubs taken in SOQ) :

3.1 The plants, Trees and shrubs included under SOQ should be as per following specification.

1 The plants should be full of fresh and healthy foliage.
2 The plants should be free from insect, pest and disease.
3 Plant should be healthy and vigorous growth
4 The height of the plants will be measured from top of the pots.
5 The plants should be well settled and should not be newly shifted.
6 The plants should be true to the variety and named Variety should be tagged.
7 Moss stick used should be made on plastic pipe.
8 Moss stick should be straight and properly fixed in the pot.
9 The rejected plants materials should be removed from the site immediately.
10 Moss stick should be covered with the plants in case of plants supplied with moss stick.
11 The Plant should be well stablished and good spread.
12. Good earth and manure used for filling the pot/poly bag free from any inert material and mixed to proper ratio.
13. Pot/ Poly bag used for filling the plants should be proper size good quality not damaged.
14. There should be proper drainage in pots for plants.
15 The flowering plants should also have proper flowering and should be true to the variety.
16 All plant should have the tendency of growth and should not be stunted type.
17. There should be no stagnation of water in the pots.

H**. TECHNICAL SPECIFICATION OF STP WORK**:

1.0 DESCRIPTION OF PROCESS SCHEME
In order to conserve water, the treatment plant will be designed to ensure that treated effluent (water) characteristics are well below the permissible limits. It is proposed to use Attached Growth system working on the principle of Fluidized Aerobic Bio-reactor process based on the FAB process.

Waste water will flow via gravity through a bar screen chamber & Oil & Grease Trap to an Equalization Tank. A bar screen will be provided at the inlet point in the bar screen chamber and the waste water will flow through this bar screen into the Tank. Bar screen will be so designed that it can be cleaned manually from outside the Tank. The oil & grease from the Oil & Grease Trap would have to be removed manually.

Waste water from the equalization tank will be transferred by means of Pumps into the FAB tank where it will be mixed with living organisms also called MLSS (Mixed Liquor Suspended Solids) in presence of air & air will be introduced through submerged air diffusers (MLSS in aeration tank will be maintained 2500-3000 Mg/L). The FAB system will be designed in a way so as to achieve complete mixing of organisms with raw sewage. After achieving a complete mixing of organisms over a retention period of 10-12 hrs, the effluent would flow via gravity into the Tube Settler. In the tube settler, PVC Tube Media would be provided to enhance settling of the sludge with attached settling process. Through the use of baffles the liquid in the Tube Settler is maintained in quiescent condition which allows the solids to settle to the bottom for collection. The accumulating solids known as "Sludge" will be constantly pumped back into the FAB tank by sludge recycle pumps. This return sludge undergoes further digestion in the aeration tank and also provides the active organism needed to digest the incoming raw sewage.

The Tube Settler will be provided with adjustable overflow weir to collect the treated effluent and a scum baffle will keep any floating matter from passing out in the final treated water. Treated water from Tube Settler will over flow into a chlorine contact tank where hypochlorite solution will be added to disinfect the treated water.

Excess sludge from the bottom of the Tube Settler will be collected in an adjoining aerobic digester cum thickener tank. In this tank sludge will be aerated. The air will be shut off periodically and supernatant water shall flow into the collection tank. This way the sludge will be thickened and its volume will be reduced. The sludge digester cum thickener tank will be sized to hold excess sludge. The excess sludge will be further passed into a filter press where the sludge will be pressed between plates manually and the liquid concentration in the sludge will be further reduced. The sludge will then form into semi-solid cake which can be removed for disposal.
The treated sewage from STP will be used for irrigation system & flushing water with in the complex.

2.0 DOCUMENTS TO BE SUBMITTED WHILE SUBMITTING SCHEME TO ENGINEER FOR APPROVAL

i) Flow scheme with hydraulics
ii) Size of units
iii) Description of process
iv) List of mechanical and electrical equipment
v) Total Power requirement unit wise
vi) Guarantees

3.0 SUBMISSION OF DESIGN AND DRAWINGS

Selected tenderer shall submit detailed drawings for approval to the client.

4.0 SELECTION OF EQUIPMENT

Subject to the requirement of this specification and the design criteria the tenderer shall select the type of equipment and the form of construction and installation, subject to approval of the Project architect/EIC.

The tenderer shall be entirely responsible for the performance of the sewage treatment works in their totality with due regard to capacity, hydraulics, quality of final effluent, suitability of piping, mechanical and electrical equipment complete and shall give due guarantee for the same.

The tenderer shall submit to the Client / Owner GFC drawings together with sufficient details to give a clear indication of the work to be carried out for approval of the Engineer.

The approval of the Engineer shall in no way relieve the tenderer of his responsibilities for the satisfactory functioning of the works.

All construction materials and workmanship shall conform to the relevant section of the specification and to the approval of the Engineer.

5.0 ERECTION

The tenderer shall undertake the erection of the plant under the direct supervision of the plant manufacturer or their nominated agencies, as approved by the Engineer. The tenderer shall also supply and install all the mechanical and electrical equipment's required for functioning of the sewage treatment plant. The tenderer shall provide with all the facilities required by the Engineer for inspection of the installation.

6.0 PAINTING AND PROTECTIVE COATINGS

All surfaces exposed to the atmosphere shall be painted in accordance with relevant section of specification or as per manufacturer's instructions.

All M.S surfaces exposed to sewage treatment plant shall have protective coatings using epoxy-based paint. The tenderer shall submit full details of all the protective coatings proposed, for approval before any of the equipment, pipe work, etc. of the plant is supplied.

7.0 TESTING

The tenderer shall make all arrangements as required or necessary to prove that the completed works fulfil every aspect of the design requirements and specifications. The tenderer shall provide all labour, material and attendance necessary to the Engineer's satisfaction.

8.0 LUBRICATION

The tenderer shall ensure that all moving parts are lubricated in accordance with the equipment manufacturer's recommended procedures prior to commencement of operation of any plant and also during the operating period.

8.1 In general, STP shall comprises erecting, testing and commissioning of the following items of STP. The sewage treatment plant in general shall comprise following items of work.

(a) 1 No. manual bar screen suitable for 500m3/day flow rate.
(b) 3 Nos. Sewage lifting pumps from equalisation tank (one duty + one stand by) self-priming type capacity 10.0m3/hr at 10m head.
(c) 2 Nos. Drainage lifting pumps from drainage sump (one duty + one stand by) submersible type capacity 18.0m3/hr at 10m head.
(d) 1 Lot Air Grids for MBBR tanks for 500m3/day sewage flow.
(e) 3 Nos. Air blowers (two working and one standby) twin lobe rotary air blower each of capacity 400m3/hr at 6000 mm wg.
(f) 1 No. UV reactor of capacity 40.0m3/hr.
(g) 2 Nos. Filter feed pumps (one working + one standby) each of capacity 40.0m3/hr at 30m head.
(h) 2 Nos. Treated water pumps (one working + one standby) each of capacity 40.0m3/hr at 40m head.
(I) 1 Nos. M.S. pressure Dual Media filter with frontal pipe work capacity. Flow Rate 40.0m3/hr and 3.0kg/cm2 working Pressure.
(j) 1 No. M.S. activated carbon filter with frontal pipe work capacity. Flow Rate 40.0m3/hr and 3.0kg/cm2 working Pressure.
(k) 2 Nos. Sludge pumps (one duty + one stand by) self-priming type capacity 10.0m3/hr at 10m head.
(l) 1 No. Filter press feed screw pumps (one working + one standby) each of capacity 2.0m3/hr at 40 m head.
(m) 1 No. Ozonator of suitable for 500 KLD.
(n) All interconnecting piping and valves for above equipment.
(o) Operating platform alround STP.
(p) 1 Lot Electrical cabling, earthing, MCC and local push buttons station to cater phase-I requirements (Electrical Cabling, earthling including the incoming power supply etc shall be provided by the client. However, connections/terminations to the equipment's, testing and commissioning shall be carried out by the contractor).

(q) Operation & Maintenance contract of STP for a period of two years after commissioning. All spares and replacement of any defective part shall be included in the contract.

9.0 ELECTRICAL WORKS

9.1 Cables

a) Contractor shall provide all power and control cables from motor control centre to various motors, level controllers and other control devices.

b) Cables shall conform to IS:1554 and carry ISI mark.

c) Wiring cables shall conform to IS: 694.

d) All power cables shall be aluminum conductor PVC insulated/PVC sheathed FRLS armoured cables of 1100 volts grade.

e) All control and wiring cables shall be copper conductor PVC insulated armoured and PVC sheathed 600-volt grade.

f) All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

9.2 Motor Control Centers

Cubicles switch board of floor mounted and shall be fabricated from 16-gauge M.S. sheet with dust and vermin proof construction. It shall be painted with stove enameled paint of approved make and shade. It shall be fitted with suitable etched plastic identifications plates for each motor. The cubicles shall in general comprise of the following:

(A) Incoming and outgoing MCCB's of required capacity with rotary handle.

(B) PVC Colour coated TPN Aluminum bus-bar having current density 0.8Amp/sq.mm.

(C) Isolation switch fuse unit one for each motor.

(D) Fully automatic DOL/Star Delta starters appropriate for motor rating with ON/OFF push buttons and on/off indicating neon lamps for individual motor.

(E) Single phase preventor of appropriate rating for each motor.

(F) Selector switch for pump operation.

(G) Panel type ampere meters of appropriate rating one for each motor.

(H) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.

(I) Rotary switch for manual or auto operation for each pump.

(J) Space for liquid level controllers specified separately in this contract.

The panel shall be prewired with colour-coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories within the switch board panel.

I. TECHNICAL SPECIFICATION OF SOLAR PANEL WORK:

Solar photo Voltaic Power Generation System

1) SOLAR PV MODULE:

A) The solar photovoltaic modules will be used Poly/Multi crystalline, Thin film PV technology modules.
B) The capacity of each Solar Modules should be equal to or greater than 300Wp. Solar Modules to be used have to be framed only. At locations where there is constraint of space, it should be considered higher efficiency modules only.
C) Module would be PID Free and of positive Tolerance only.
D) Modules would have an efficiency of not less than 16% and the fill factor should be above 75%.
E) Minimum dimension of the SPV module shall be preferred.

F) Each SPV Module would have IEC/BIS test certificate from any recognized IEC accredited or MNRE approved laboratory.
G) The SPV modules would confirm to the minimum technical specification laid down by MNRE that can be referred on the MNRE website.
H) The PV Modules shall be tested for Salt Mist Corrosion Test as per MNRE requirement.

PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

2) INVERTER:
The Inverter/s used would be robust, intelligent **On-grid** inverters of reputed manufacturer/makes. The inverter/s must conform to the IEC 61683 and IEC 60068-2, IEC 62116, IEC 61727. The typical specifications required are as under:
a) All inverters should be 3 phase, 415V, 50Hz AC output
b) The AC capacity of the Inverter can be minimum of 80% of the connected DC capacity to the inverter.
c) Minimum Start Voltage should be greater than 200V
d) MPPT Range: 200V-800V
e) Maximum Input Voltage: 1000V DC
f) Euro / CEC Efficiency above 97%
g) Frequency: 50Hz +/- 1.5%
h) Power Factor > 0.99
i) THD < 3%
j) Ambient Temperature range: -5 deg C to + 60 deg C
k) Warranty: 5 Years Comprehensive warranty. This warranty from the manufacturer shall be in addition to the scope covered under defects liability period.
l) Integrated Ground Fault Protection
m) Anti Islanding Feature
n) Transformer less
o) Over Voltage/ Under Voltage Protection
p) Auto Shut down in case or Over Heat/ Over Temperature

3) SOLAR MODULE MOUNTING STRUCTURE:
a) The structure shall be designed in accordance to the requirement of the site with minimum tilt angle of 15 degrees for RCC roof structure. The array mounting structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly.
b) The module mounting structure shall be mounted on clear roof space availability with fixed tilt. Tilt angle to be decided by the party to maximize annual energy output as per the site geographical location. Recommended minimum angle of tilt for R.C.C Flat roof terrace for the location is 15 degrees.

The minimum thickness of galvanization for MS or MS extruded sections should be of 50 microns.

All fixing fasteners and nuts and bolts should be of Stainless Steel only.
c) The minimum clearance of the lowest part of the module and the RCC roof level shall not be less than 300 mm.
d) All structures are to be pre-fabricated for easy assembly at site.

4) EARTHING:

The array structure of the PV yard shall be grounded properly using adequate number of earthing pits. All metal casing or shielding of the solar power plants shall be thoroughly grounded to ensure safety of the solar power plants.

5) ARRAY JUNCTION BOX:

a) The array junction box would be dust, vermin & water proof as per IP65 rating and should be made of FRP/ABS plastic (Test certification is required for IP65
degree of protection).

b) Suitable Fuses/ MCB's should be provided for each string.

c) A DC Surge Protection Device Class II should be provided in the AJB for grounding the surges to protect the inverter.

d) The AJB should have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables.

e) Suitable markings to be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification.

Annex – II

(Schedule-D)

LIST OF APPROVED MAKES OF MATERIALS- CIVIL, INTERIOR, PLUMBING, HVAC, SOLAR PANEL, STP, ELECTRICAL AND FIRE FIGHTING FOR REGIONAL OFFICE BUILDING, NHIDCL, GUWAHATI

APPROVED MAKE LIST

SR.NO.	DETAILS OF EQUIPMENT/ MATERIAL	MAKES/ MANUFACTURER
A. CIVIL WORK		
1	Cement	ACC / Ultra tech / JK Cement / Jaypee-Rewa / Ambuja / Shree/ Dalmia/ Amrit/ STAR/ TAJ.
2	Reinforcement Steel / Structural Steel	SAIL/ RINL/ TATA TISCON/ Jindal Steel & Power Ltd./ JSW Steel Ltd.
3	ALUMINIUM Extrusion / SECTIONS	Hindalco / Jindal / Indal.
4	Aluminium Accessories and Hardware	Classic/ Crown /EBCO /Earl Bihari
5	Aluminium Composite Panels	Aludecor/ Alucobond/ Alstone
6	Anchor Fastner/Dash Fastner	Hilti / Fischer /Bosch
7	Ready Mix Concrete (RMC)	The RMC shall be procured from the source as approved by Engineer – in Charge. RMC Producing plants of the main Cement producers refer from approved list shall be preferred.
8	Concrete Additive	Pidilite / Fosroc / Fairmate / MC Bauchemie/ Sika/Cico
9	Door closer / Floor spring	Hardwyn/ Godrej/ Dorma/ Doorking/ Everite
10	Door Locks	Godrej / Harrison / Dorma/Link
11	Door Shutters- Flush	Duro / Greenply/ Archidply / Century / Merino
12	Doors & Windows Fixtures / Fitting.	Everite / Classic/ Crown / Earl Bihari
13	UPVC DOORS/ WINDOWS/ VENTILATORS	WINSTA, WINPLAST, REHAU, DIMEX.
14	PAINTS (Plastic Emulsion Paint (exterior))	Asian (Apex Ultima)/ Berger (Weathercoat all Guard)/ ICI (Dulux weathershield max)
15	Paints - Other Paints / Primer	ICI Dulux/ Asian/ Berger/ Nerolac
16	Paints - Texture paint	Berger / Spectrum / Unilite Heritage /Asian
17	Paver blocks / Tiles (All Types)	KK / Uni Stone Products (India) Pvt. Ltd/ Hindustan Tiles/ NITCO
18	Epoxy Flooring	Fosroc/ Dr. Beck/ Flamaflor
19	False Ceiling - Calcium Silicate Boards & Tiles	India Gypsum/ Armstrong / Hilux / Saint Gobain (Gyproc)/Aerolite
20	False Ceiling - Metal	Armstrong / Hunter-Douglas / USG-Boral/ Saint Gobain/ Unimet
21	False Ceiling - Mineral fibre	Armstrong / Decosonic / USG-Boral/ AMF/ Saint Gobain (Gyproc)
22	Fire Rated Doors & Frames	Navair / Shakti-Hormann / Pacific/Promat
23	Fire Rated Glass	Asahi India Safety Glass Ltd./ Saint Gobain/ Pilington, Schott, Pyroguard, Glaverbel

24	Fire Retardant Paint	Viper FRS 881/ Nullifire/ Berger
25	Fire Seal	Sealz, Alstroflam/ Abacus
26	Fire: Door Closures, Mortice Dead locks	Becker Fire Solution/ Inersoll Rand/ Dorma/Godrej/ Geze/ Hafele
27	Fire: Panic Exit Devices	Becker Fire Solution/ Inersoll Rand LCN Series/ Dorma PHA Series/ D-line/Godrej
28	Glass : Float & Mirror	Modiguard / Atul / Saint Gobain/ Asahi India Safety Glass Ltd / Modi Glass
29	Glass for Aluminum Doors/ Windows/ Structural Glazing	Modiguard / Saint Gobain / Pilkington/ Asahi India Safety Glass Ltd./Modiglass
30	GRC Jali	Unistone/ Kuber Fibrostone/Everest Composites/ Birla white
31	GRC wall cladding	Unistone/ Kuber Fibrostone/Everest Composites/ Birla white
32	Grout: Non-Shrink	Fosroc / Sikka/Pidilite or equivalant
33	Laminates/ Veneers	Century/Archidply/Greenlam/Formica/Sunmica/Merino
34	Night Latch	Godrej / Dorma/ Ozone/Harrison/Link
35	Paints - Cement Based	Snowcem Plus/, Berger (Durocem Extra)/ Nerolac (Super Acrylic)/ TATA Cem, Asian
36	Plywood/Block board/Ply board	Duroply / Greenply/ Archidply/ Century/ Kitply/ National / Anchor/ Merino
37	Silicon sealants /Weather Sealant / Structural Glazing Sealant	GE- Silicon / Pidilite / Forsoc / Cico /Dow Corning / Sikka/ Wacker
38	Stainless Steel	Salem Steel/ Jindal or equivalent
39	Stainless Steel bolts, Screws, Nuts & Washers	Kundan / Puja / Atul
40	Stainless Steel Clamps	Hilti /Intellotech Koncept or equivalent
41	Stainless Steel Hinges	Hettich/ Godrej/ Dorma
42	Stone Adhesives	Fosroc / Sikka/Pidilite
43	Tiles: Ceramic Tiles	Kajaria / Somany/RAK or equivalent
44	Tiles: Glazed (Ceramic) tiles	Kajaria / Somany/RAK or equivalent
45	Tiles: Vitrified Tiles	Kajaria / Somany/RAK
46	Vinyl Flooring	Wonder floor/Responsive or equivalent make
47	Water Proofing Materials	BASF/ Fosroc / Sikka / CICO / STP/ Pidilite/CHRYSO
48	Wooden Laminated Flooring	NITCO /Euro / Pergo
49	Expansion Joints	Sanfield (India) Ltd., MIGUA, TRISTAR
50	Automatic sliding door	Dorma or equivalent make
51	False flooring	Arena, unitile, or equivalent make
52	Roller blinds	Hunter dougles/ Phifer or equivalent make
53	M.D.F	Nuwood(Grade -I AND GRADE II), Durotuff
54	wallpaper	Elemento/ marshall/ tatva/ baron/ tarket
B. PUBLIC HELATH WORK		
55	Ball valves with floats	Zoloto / Leader / Sant/ Audco/GPA
56	Brass - Stop & Bib Cock	Zoloto / Sant / Jaquar
57	C. I Pipes & Fittings	Electrosteel/ Kapilansh/ NECO/ RIF/ SKF/BIC
58	C.I. Manhole Covers	NECO/R.I.F./B.I.C./HEPCO/SKF/ KAJECO
59	C.P. Fittings: Mixer / Bib Cock/ Pillar taps/ Angle valve/ Valves Washers / Waste/ Urinal / Spreaders / Accessories etc.	Jaquar /Kohler/ Grohe/Marc

60	Geyser	Spherehot / Racold / Usha Lexus /Bajaj
61	Liquid Soap Dispenser	Euronics/Utec/Kopal
62	MS Saddle with G.I. Riser	Harvel/Alprene/Rain Bird, USA
63	Pipe Fittings: G.I.	R/Unik/Zoloto/K.S./Sun/Swastik
64	Pipe:- G.I.	Jindal / Tata / Prakash Surya/SAIL/ Swastik
65	Pipes & fitting: PVC for SWR Soil, Waste & Vent Pipes and fittings, Type B PVC Casing & Screen Pipes	Prince / Supreme / Finolex
66	Pipes & Fittings: CPVC	Flowguard/ Astral/ Ashrivad/ AKG/Supreme
67	Pipes & fittings: UPVC	Finolex / Prince / Supreme / AKG / Kasta / Vector / Astral
68	Pipes & Gully Trap: Stone ware	Perfect / S.K.F/ R.K/ Hind / Anand
69	Pipes: M.S.	Jindal / Prakash – Surya /TATA
70	Pipes: R.C.C	Indian Hume Pipe / Pragati Concrete Udyog Daya/ KK / JSP
71	SS Gratings/ Soap Dish/Towel Rail etc.	Camry/Glacier/Gem/ Jaquar/ Grohe
72	Stainless Steel Sink	Hindware / Neelkanth / Nirali / Jayna
73	Valve: Butterfly	Zolato/Audco /Sant/ KSB
74	Valve: Solenoid	Rain Bird, USA/Toro/Nelson,
75	Valve: Non Return	Sant/ Leader/ Zoloto / AIP / Kirloskar/ IVC/ Leader/ Audco
76	Vitreous China Sanitary wares	Hindware / Parryware / Cera / Kohler
77	Water supply pumps	KSB/ Grunfos/ Kirloskar/ Crompton/ Mather & Platt
78	Automatic Hand dryer	JAGUAR/ Kopal / Utech Systems / Euronics Automat
79	CI FLOOR TRAP	ROCA/ JAGUAR/ KOHLER/
80	UPVC MULTI INLET FLOOR TRAP WITH ACCESSORIES	FINOLEX/ SUPREME/ PRINCE/ KISSAN/ ASTRAL
C**. ELECTRICAL WORK**		
81	HT Panel with Vacuum Circuit Breaker (VCB)	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
82	Batteries	Hitachi/Panasonic/ Yuasa/ SF/ Exide/ Amco/ Amaraja
83	Battery Charger	Amaraja/ Sabnife/ Statcon/ Voltstat/ HBL
84	Bus bar	Jindal/ Hindalco/ Indal
85	Bus trunking , rising mains, end feed unit, top-off box (plug-in type)	L&T/ Schneider/ C&S/ Godrej /Legrand/ EAE
86	Ceiling /Exhaust/Wall fans	Crompton/ Usha/ Orient/ Bajaj/ Havells
87	Control fuse base with HRC fuse / HRC Fuse	L&T/ Siemens/ ABB/ Alstom/ Schnieder
88	Data/Telephone/TV Outlets	Systemax/ Belden/ Simone/ MK/ Legrand/ Havells/ Anchor
89	DG Set - Assembler	Jakson & Company / Jakson Ltd/ Sterling Generators / Sudhir Gensets/ C&S Himoinsa/ Powerica/ Kirloskar (KOEL authorized OEM) / TIPL
90	DG Set - Alternator	Stamford/ Leroy Somer/ Toyo Denki/ AVK-SEG/ Kirloskar (KOEL Green)
91	DG Set - Engine	Cummins/ Mitsubishi/ Perkins/ Volvo/ Caterpiller/ Kirloskar (KOEL Green)
92	Fire Extinguisher	Ceasefire/ Exflame/ Minimax/ Life Guard/ Safex

93	HT & LT Cables (Power & Control Cables, Solar Cables)	Gloster/ Havells/ Nicco/ Finolex/ KEI/Polycab
94	Insulators	Jaya Shree/ Modern/ IEC/ WSI
95	LED Light Fixtures and Lamps	Philips/ Wipro/ Trilux /Havells
96	Lighting for Facade	Philips/ Wipro/ Trilux /Allurays/RZB/BEGA
97	Lightening Arrestors	L&P ELECTRO/ LPI/ Indelec
98	LT Panels / Synchronizing Panels/ Capacitor Panels	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
99	MCBs / RCCB/Isolaters / RCBO / Change over switch	Hager/ Havells/ Legrand/ L&T/ Schneider/ ABB/ Siemens
100	Modular Switches/ Socket outlets and wiring accessories with moulded cover plate	MK (wraparound plus) / Siemens (Delta)/ Legrand (mylinc)/ L&T (Entice)/ Havells (Crab tree-Athena)/ Anchor (Roma)/ Schnieder (Opale)/ Wipro (North-West)
101	MS Conduit	BEC/ AKG/ Steel Kraft
102	Street Light Poles & Light Fixtures – Solar & Conventional	Philips/ Wipro/ Havells/ Bajaj/ Keselac Schreder
103	Transformer (Oil Type / Dry Type)	ABB/ Siemens/ Kirloskar/ Voltamp/ Areva/ Schneider
104	UPS	Emerson (Vertiv)/ Schnieder (APC)/ Eaton/ Socomec
D. FIRE FIGHTING WORK		
105	Air Release Valve/Air Cushion Tank	Zoloto/Advance/Leader/Audco/Castle
106	Alarm valve & Hydraulic (Alarm motor with coupling)	HD fire protect/TYCO/VIKING/Newage
107	Ammeter/ Voltmeter/ PF/ kW/ Hz/ meter /Energy Meter/ Multimeter	As per respective electrical make list
108	Anchor Fastener	Fischer / Hilti or equivalent
109	Ball Valves	L&T/ Audco /Zoloto/ Advance/Emerald/ KSB
110	Battery	Exide/ AMCO /Amararaja/ Panasonic
111	Butterfly valves	L&T/ Audco/ Zoloto / Advance/ KSB
112	Cables	As per electrical make list

113	Check Valve/Foot Valve/Sluice Valve/	L&T/Audco / Zoloto Advance/KSB
114	Control / Potential / Current Transformer	As per respective electrical make list
115	Deluge valve/ Solenoid valve/ Spray nozzle	HD / Tyco/Viking
116	Diesel engine driven pump	Ashok Leyland/ Cummins/ Perkins/ WILO-Mather & Platt/ Kirloskar/Armstrong Fluid Technology
117	Fire Extinguisher	Minimax / Newage/ Eversafe/ Tyco –Johnsons Control
118	Fire Hydrant Valves/ Fire RRL Hose Pipes / Fire Hose Reels/ Fire Man‘s Axe/ Gun metal short branch pipe/ 2/ 3/4 FB inlet/ draw Out connection/Hose Box/ Hose reel drum /Nozzle/ blank Caps & Chains / Coupling	Ceasefire / Newage /Minimax/HD/Tyco
119	Fire Pumps	Mather&Platt(WILO)/Grundfos/Kirloskar/Xylem – ITT/ Armstrong Fluid Technology
120	Electrical Motors	ABB/ Siemens/Kirloskar/C&G/BALDOR
121	Flow Meter	Scientific Equipments(p) Ltd./System Sensor or equivalent
122	GI clamps	Chilly/Hilti or equivalent
123	Gl / MS Pipes	Tata / Jindal- Hissar/ SAIL
124	Sprinkler Heads (Sidewall/ Upright/ Pendant)	Grinnel- Tyco / Viking / HD
125	Fire Suppression System/Gas Flooding Sytem	Tyco/Newage/Minimax/Viking
126	Clean Agent Fire Extinguisher	Kanex/Tyco/Newage/SVS Buildwell/Minimax/Lifeguard/Ceasefire
127	Intelligent Addressable Fire Alarm Panel/Detectors/ Hooters/ Manual Call Point UL Listed/ Talkback/ Control Module/ Monitor Module/ Control relay Module/ Short Ckt. Isolator/	Honeywell-Notifier/ Siemens/ Schneider/ Bosch/ GE Edwards/Tyco
128	Panic Button	Eureka Forbes/ Fire Pro / Tyco
129	Termination Control Cable	Dowell‘s/ Elemex/ Wago/ Phoenix
130	Door Controller, Card Reader, Biometric Reader, Access Control server Software, Smart card	
131	CCTV Camera/ NVR/ Central Monitoring Software / Other Items	Honeywell / Pelco /Cisco /Bosch/ GE/ Axis/ Sony

132	PA Speaker, Voice controller, paging station, Microphone	Bosch/ Honeywell/Bose
E. HVAC WORK		
133	2-Way Pressure Independent Balancing & Control Valve	Siemens/ Danfoss/Oventrop /Belimo
134	Adhesives for Insulation	Pidilite/Superlon / Armacell
135	Air cooled package units	Voltas/ Bluestar/HITACHI or equivalent
136	Air Handling Units with Coils etc.	Zeco/ Edgetech/VTS/ Waves/Flaktwood
137	Air Distribution (Ducting) - GI/GSS Sheets	SAIL / TATA Steel/ Jindal-Hissar
138	Aluminium Sheet for Ducts	Jindal/ Hindalco/ Indal
139	Cable Lugs/Thimbles/Glands	As per Approved Makes of Electrical Works
140	Cable Tray	As per Approved Makes of Electrical Works
141	CAV Box/VAV Box	Trox/ System Air / Ruskin Titus /Honeywell /Johnson‘s Control/Belimo
142	Centrifugal Fans/ Fan section/ Plug Fans	Kruger / Greenheck /Comefri/ Wolter/ Nicotra/Systemair
143	Electric Motor	ABB/ Siemens/ Crompton Greaves /BALDOR
144	Fasteners-Dash	HILTI / Fischer / Cannon / Wurth
145	Inline Fans	Kruger / Nicotra/ Greenheck/ Ostberg
146	Humidifier	KEPL / Rapid cool/ Emerald /Enmax
147	Split AC Units /Precision AC	Toshiba/Daikin/ Hitachi/ Carrier
148	VRV/ VRF Outdoor/ Indoor Units/ Refnet Joints/Remote Controllers	Mitsubishi Electric/ Daikin/ Toshiba/ Panasonic/Carrier
149	Chillers	Daikin-Mcquay/ Carrier / Trane / York/Dunhambush
150	Chilled Water Cassette Unit	Carrier/TRANE/Daikin/Johnson Control
F. LIFT WORK		
151	Lifts	OTIS/ Kone / Mitsubishi/ Schindler/ Johnson Lifts Pvt. Ltd.
H. SEWAGE TREATMENT PLANT		
152	Air Blowers	Beta/ Everest/ Kulkarni / TMVT
153	Air Diffusion System	Airfin/Usha Ruba/Rehau
154	Air Vent Valve	Oven trop (Germany) / CIM / Rapid Control
155	Anti-Corrosive Tape for Pipe protection	Pypcoat / Marphalt / Cotek/STP
156	Ball Valve	Zoloto/Honeywell/RB
157	Bar Screen	KSP/AWMS/PAMM
158	Blowers	Kay / airvac /Everest
159	Butterfly valves	Zoloto/Audco/Kirloskar/AIP/Advance
160	Centrifuge	Apollo/United/B.A Engineering

Annex – III

(Schedule-D)

Safety Precautions for Guidance

Extract of C.P.W.D. Safety Code is reproduced below for guidance :

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1(¼ horizontal and 1 vertical.)

2. Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends there of with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

3. Working platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.

4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.)

5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder upto and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least ¼" for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.

6.(a) Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The side of the trenches which are 1.5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated

materials shall not be placed within 1.5 m. (5ft.) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.

(b) Safety Measures for digging bore holes:-

(i) If the bore well is successful, it should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned ones should be completely refilled to avoid caving and collapse;

(ii) During drilling, Sign boards should be erected near the site with the address of the drilling contractor and the Engineer in-charge of the work;

(iii) Suitable fencing should be erected around the well during the drilling and after the installation of the rig on the point of drilling, flags shall be put 50m alround the point of drilling to avoid entry of people;

(iv) After drilling the borewell, a cement platform (0.50m x 0.50m x 1.20m) 0.60m above ground level and 0.60m below ground level should be constructed around the well casing;

(v) After the completion of the borewell, the contractor should cap the bore well properly by welding steel plate, cover the bore well with the drilled wet soil and fix thorny shrubs over the soil. This should be done even while reparing the pump;

(vi) After the borewell is drilled the entire site should be brought to the ground level.

7. Demolition - Before any demolition work is commenced and also during the progress of the work,

(i) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

(ii) No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically charged.

(iii) All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

8. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned:- The following safety equipment shall invariably be provided.

(i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

(ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes, shall be provided with protective goggles.

(iii) Those engaged in welding works shall be provided with welder’s protective

eyeshields.

(iv) Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

(v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and ventilated atleast for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition, the contractor shall ensure that the following safety measure are adhered to :-

(a) Entry for workers into the line shall not be allowed except under supervision of the JE or any other higher officer.

(b) At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

(c) Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.

(d) Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.

(e) Safety belt with rope should be provided to the workers. While working inside the manholes, such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

(f) The area should be barricaded or cordoned of by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

(g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.

(h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

(i) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge shall decide the time up to which a worker may be allowed to work continuously inside the manhole.

(j) Gas masks with Oxygen Cylinder should be kept at site for use in emergency.

(k) Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type.

Non sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

(l) The workers engaged for cleaning the manholes/sewers should be properly trained before allowing to work in the manhole.

(m) The workers shall be provided with Gumboots or non sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.

(n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.

(o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

(p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.

(vi) The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precaution should be taken:-

(a) No paint containing lead or lead products shall be used except in the form of paste or ready made paint.

(b) Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint is dry rubbed and scrapped.

(c) Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.

(vii) Workmen executing work on scaffolds or other structures above specified height shall be provided with full body harness and fall arresters.

9. An additional clause (viii)(i) of Central Public Works Department Safety Code (iv) the Contractor shall not employ women and men below the age of 18 on the work of painting with product containing lead in any form, wherever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use :

(i) White lead, sulphate of lead or product containing these pigment, shall not be used in painting operation except in the form of pastes or paint ready for use.

(ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

(iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from

dust caused by dry rubbing down and scraping.

(iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

(v) Overall shall be worn by working painters during the whole of working period.

(vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled13 by painting materials.

(vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by competent authority of C.P.W.D PWD(DA).

(viii) C.P.W.D./PWD (DA) may require, when necessary medical examination of workers.

(ix) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

10. When the work is done near any place where there is risk of drowning, all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

11. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions :-

(i) (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

(b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

(ii) Every crane driver or hoisting appliance operator, shall be properly qualified and no person under the age of 21 years should be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

(iii) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or as means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of a hoisting machine having a variable safe working load each safe working load and the condition under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

(iv) In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-inCharge. As regards contractor’s machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.

12. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

13. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

14. These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

15. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer-in-Charge of the department or their representatives.

16. Notwithstanding the above clauses from (1) to (15), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

Schedule - E

(See Clause 2.1 and 14.2)

Maintenance Requirements

1. MaintenanceRequirements

(i) The Contractor shall, at all times maintain the Building in accordance with the provisions of this Agreement, Applicable Laws and ApplicablePermits.

(ii) The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.

(iii) All Materials works and construction operations shall conform to the CPWD Specifications for Buildings, and the relevant IRC publications. Where the specifications for a work are not given, Good Industry Practice shall be adopted. [Specify all the relevant documents]

2. Repair/rectification of Defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies within the time limit set forth therein.

3. Other Defects anddeficiencies

In respect of any Defect or deficiency not specified in this Schedule, the Authority's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Authority's Engineer.

4. Extension of timelimit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof.

5. Emergencyrepairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Building poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

6. Daily inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project Highway and maintain a record thereof in a register to be kept in such form and manner as the Authority's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Authority's Engineer at any time during office hours.

7. Pre-monsoon inspection / Post-monsooninspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts and 69 drainage system before [1st June] every year in accordance with the guidelines contained in IRC: SP35. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Authority's Engineer.

8. Repairs on account of naturalcalamities

(a) All damages occurring to the Project Highway on account of a Force Majeure Event or wilful default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties

Annex -I

(Schedule-E)

Repair/rectification of Defects and deficiencies

The Contractor shall repair and rectify the Defects and deficiencies within the time limit as specified by the Authority's Engineer.

Schedule – F

(See Clause 4.1 (vii) (a))

Applicable Permits

The Contractor shall obtain, as required under the Applicable Laws, all the Applicable Permits and clearances from the various State Government Departments.

Schedule – G

(See Clauses 7.1 and 19.2)

Annex-I

(See Clause 7.1)

Form of Bank Guarantee

[Performance Security/Additional Performance Security]

Refer Section 2.21 of RFP & Appendix VII of RFP document.

Annex – II

Form for Guarantee for Advance Payment

[National Highways & Infrastructure Development Corporation Limited, New Delhi] WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the [name and address of the authority], (hereinafter called the "**Authority**") for Construction of Inland Water Transport Terminal, Jogighopa in the state of Assam on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of theAgreement.

(B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest bearing @Bank Rate + 3% advance payment (herein after called"AdvancePayment")equal to10%(tenpercent)oftheContractPrice;and that the Advance Payment shall be made in two instalments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such instalment to remain effective till the complete and full repayment of the instalment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second} instalment of the Advance Payment is Rs. ------ cr. (Rupees crore) andtheamount of this Guarantee is Rs. ------- cr. (Rupees ------ crore) (the "Guarantee Amount")[$].

(C) We, …….. through ourbranchat (the "Bank") have agreedtofurnish this bank guarantee (hereinafter called the "Guarantee") for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay tothe Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specifiedtherein.

1. A letter from the Authority, under the hand of an officer not below the rank of [General Manager in the National Highways Authority of India], that the Contractor has committed default in the due and faithful performance of all orany of its obligations for the repayment of the instalment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the

[$] The Guarantee Amount should be equivalent to 110% of the value of the applicable instalment.

Agreement and its decision that the ContractorisindefaultshallbefinalandbindingontheBank,notwithstandingany differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reasonwhatsoever.

2. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

3. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

4. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

5. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

6. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

7. The Guarantee shall cease to be in force and effect on[$] unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.

[$] Insert a date being 90 (ninety) days after the end of one year from the date of payment of the Advance payment to the Contractor (in accordance with Clause 19.2 of the Agreement).

8. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writingand declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

9. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

10. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature) (Name) (Designation) (Code Number) (Address)

NOTES:

i. Thebankguaranteeshouldcontainthename,designationandcodenumberofthe officer(s) signing theguarantee.

ii. The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annex – III

(Schedule - G)

(Clause 7.5 of Agreement)

Form for Guarantee for Withdrawal of Retention Money

The Managing Director,
National Highways & Infrastructure Development Corporation Limited
New Delhi

WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [name and address of the authority], (hereinafter called the "**Authority**") for the construction of the IWT Terminal at Jogighopa, Assam [National Waterway No. 02] on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement.

(B) In accordance with Clause 7.5.3 of the Agreement, the Contractor may withdraw the retention money (hereinafter called the "**Retention Money**") after furnishing to the Authority a bank guarantee for an amount equal to the proposed withdrawal.

(C) We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the amount of Rs. ---------- cr. (Rs.----------crore) (the "**Guarantee Amount**").

NOW, THEREFORE, the Bank hereby unconditionally and irrevocably guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of General Manager in the National Highways & Infrastructure Development Corporation Limited (NHIDCL) , that the Contractor has committed default in the due and faithful performance of all or any of its obligations for under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in

default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Retention Money and any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Retention Money.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect 90 (ninety) days after the date of the Completion Certificate specified in Clause 12.4 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post

it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This guarantee shall also be operatable at our…….Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of NHIDCL, details of which is as under:

S. No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002610
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Canara Bank (erstwhile Syndicate Bank) transport Bhawan, 1st Parliament Street, New Delhi-110001

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED For and on behalf of the Bank by:

(Signature)

(Name)

(Designation) (Code Number) (Address) NOTES:

(i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.

(ii) The address, telephone number and other details of the head office of the Bank as well as of

issuing branch should be mentioned on the covering letter of issuing branch.

Schedule - H

Contract Price Weightages

1.1 The Contract Price for this Agreement is **Rs……. Crores**

1.2 Proportions of the Contract Price for different components of the Building shall be as specified below:

Sr. No.	Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage Weightage
(1)	(2)	(3)	(4)	(5)
1.	Civil, Interior, Public Health and Road work	81.44	Earth Work	6.97
			Cement Concrete Work	1.27
			Reinforced Cement Concrete Work	47.32
			Masonry Work	2.87
			Cladding Work	4.43
			Wood and P.V.C Work	6.91
			Steel Work	0.40
			Flooring	5.09
			Roofing	5.54
			Finishing	3.20
			Dismantling & Demolishing	0.05
			Road Work	1.33
			Sanitary Installations	0.90
			Water Supply	0.67
			Drainage	1.51
			Pile Work	6.03
			Water Proofing	0.52
			Structural Glazing Aluminium Composite Panel	4.99
2.	Electrical Work	5.18	Internal Wiring	29.66
			Telephone, TV Points	9.27

Sr. No.	Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage Weightage
(1)	(2)	(3)	(4)	(5)
			Internal Lighting Fixtures	23.20
			Electrical NS Items	5.89
			Electrical Installation works for 125 KVA DG Set	6.62
			11KV Sub Station ETC	19.44
			Fans & Fittings & Others	5.92
3.	Fire Fighting, Fire detection, Access Control & CCTV	4.59	Fire Suppression Work	8.05
			Internal & External Fire Hydrant System	7.38
			Sprinkler System	6.50
			Hand Appliances	0.47
			Electrical Works	19.19
			CCTV System	24.17
			Access Control System, Visitor Management Solution	34.24
4.	HVAC Work	5.22	Variable Refrigerant Flow Air-conditioning System	93.28
			Low Side Work	6.18
			Power & Control Cabling	0.54
5.	Other Works	3.57	Lift Work	40.78
6.			Landscape Work	10.70
7.			STP Work	2.74
8.			Solar Power Plant Work	19.64
9.			Rain water harvesting measures	4.74
10.			Audio, Video Work	5.42
11.			Digital Conference System	15.98
Total		**100**		

Note: Submission of measurements, in case of EPC contracts, is only for record purpose and progress of work. Payment of bills of the contractor is made on basis of stage-wise completion of work as per terms of

the contract.

Schedule – I

(See Clause 10.2 (iv))

Drawings

1. Drawings In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Authority's Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-I.

2. Additional Drawings If the Authority's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may by notice require the Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Authority's Engineer, as if such drawings formed part of Annex-I of this Schedule-I.

Annex – I

(Schedule - I)

Uploaded separately.

Schedule - J

(Clause 10.3 (ii))

Project Completion Schedule

1. Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule-J for each of the Project Milestones and the Scheduled Completion Date of 18 months from the commencement date, as shown below. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Employer of such compliance along with necessary particulars thereof.

2. Project Milestone-1: 60 days from the Commencement Date.

Submission of detailed design and detailed architectural drawings, Geo-technical investigation, detailed Structural drawings, detailed drawings for all services, landscaping etc., complete in all respects and proof checked by preferably an IIT, or NIT for structural design, foundation design, filling and compaction analysis for filling work etc. The details, investigations and specifications etc. will form part of the contract. The BOQ as per detailed design will also be part of the DPR and will form basis for generation of computerized measurements which shall be the responsibility of the EPC contractor. Once approved by the Authority or his Authorised representative, the DPR as prepared by the EPC contractor will form part of the contract. Any data forming part of this document is for rough guidance. For instance, the geo-technical investigation and all similar data is for rough guidance at the bidding stage and further development with the objective to generate necessary efficiencies in design and execution in a time frame.

3. Project Milestone-2: 105 days from the Commencement Date.

Prior to the occurrence of Milestone-1, the Contractor shall have completed (i) excavation (including dewatering etc.) and safe disposal of mud, muck, organic matter and organic waste away from the site, (ii) construction of Retaining walls and (iii) land filling with good earth (including royalty) by mechanical transport for all leads including ramming and compaction of the earth in layers not exceeding 20 cm in trenches, plinth, sides of foundation etc. complete with due regard to long term stability & avoidance of settlement through investigation, safe design & Geo-technical investigation complete in all respects as per direction of Engineer-in-Charge or Authority.

Note: After completion of the Milestone-1 and Milestone-2 the contractor shall be paid 7.5% of the project cost.

4. Project Milestone-3: 145 days from the Commencement Date.

Prior to the occurrence of Milestone-2, the Contractor shall have completed 100% of foundation work including driving of piles, construction of pile caps, foundation beams, sub soil supporting structure below plinth level as per investigation, design, duly proof checked

from all considerations of safety and stability. Each item shall be measured by the authority with 100% check upto foundation level. After completion of the Milestone-3 the contractor shall be paid 7.5% of the project cost.

5. **Milestone-4:** 215 days from the Commencement Date.

Prior to the occurrence of Milestone-3, the Contractor shall have completed work for 15% of the project cost.

6. **Milestone-5:** 290 days from the Commencement Date.

Prior to the occurrence of Milestone-4, the Contractor shall have completed work for 15% of the project cost.

7. **Milestone-6:** 380 days from the Commencement Date.

Prior to the occurrence of Milestone-5, the Contractor shall have completed work for 20% of the project cost.

8. **Milestone-7:** 450 days from the Commencement Date.

Prior to the occurrence of Milestone-6, the Contractor shall have completed work for 20% of the project cost.

9. **Milestone-8:** 540 days from the Commencement Date.

Prior to the occurrence of Milestone-7, the Contractor shall have completed work for 15% of the project cost.

All the milestones shown are mandatory. The contractor shall strictly follow all intermediate milestone utilising his resources to the optimum.

10. Scheduled Completion Date:

(i) The Scheduled Completion Date shall occur on the [Scheduled Construction Period] day from the Appointed Date.

(ii) On or before the Scheduled Completion Date, the Contractor shall have completed construction in accordance with this Agreement.

11. Extension of time:

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

Schedule - K

(Clause 12.1 (ii) of Agreement)

Tests on Completion

1. Schedule for Tests

(i) The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Authority's Engineer and the Authority of its intent to subject the Project Highway to Tests, and no later than 10(ten) days prior to the actual date of Tests, furnish to the Authority's Engineer and the Authority detailed inventory and particulars of all works and equipment forming part ofWorks.

(ii) The Contractor shall notify the Authority's Engineer of its readiness to subject the Project Highway to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Authority's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Authority's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and thisSchedule-K.

2. Tests

Visual and physical test: The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include [***].

B. Other Tests

(i) Environmental audit: The Authority's Engineer shall carry out a check to determine conformity of the Project Highway with the environmental requirements set forth in Applicable Laws and Applicable Permits.

(ii) Safety Audit: The Authority's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the Project Highway with the safety requirements and Good Industry Practice.

3. Agency for conductingTests

All Tests set forth in this Schedule-K shall be conducted by the Authority's Engineer or such other agency or person as it may specify in consultation with the Authority.

4. CompletionCertificate

Upon successful completion of Tests, the Authority's Engineer shall issue the Completion Certificate in accordance with the provisions of Article 12.

5. The Authority Engineer will carry out tests with equipments at his own cost in the presence of contractor's representative.

Schedule - L

(Clause 12.2 of Agreement)

Completion Certificate

1. I, ……. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated (the"**Agreement**"), for Construction of North East Regional Office of National Highways & Infrastructure Development Corporation Ltd. at Guwahati, Assam (the "**Project**") on Engineering, Procurement and Construction (EPC) basis through (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement, and I am satisfied that the Project can be safely and reliably placed in service of the Users thereof.

2. It is certified that, in terms of the aforesaid Agreement, all works forming part of Project have been completed, and the Project is hereby declared fit for entry into operation on this the……day of……20…,Scheduled Completed Date for which was the …… day of ……20…..

SIGNED, SEALED ANDDELIVERED

For and on behalf of the Authority's Engineerby:

(Signature)

(Name) (Designation)(Address)

Schedule - M

(See Clauses 14.6, 15.2 and 19.7)

Payment Reduction for Non - Compliance.

Schedule - N

(Clause 18.1 (i) of Agreement)

Selection of Authority's Engineer

1. Selection of Authority's Engineer

(i) The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Authority's Engineer.

(ii) In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2. Terms of Reference

The Terms of Reference for the Authority's Engineer (the "**TOR**") shall substantially conform with Annex 1 to this Schedule N.

3. Appointment of Government entity as Authority's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Authority's Engineer; provided that such entity shall be a body corporate having as one of its primary functions the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the Authority shall not be eligible for appointment as Authority's Engineer.

Annex – I

(Schedule - N)

Terms of Reference for Authority's Engineer

1. Scope

(i) These Terms of Reference (the"**TOR**")for the Authority's Engineer are being specified pursuant to the EPC Agreement dated ..... (the "**Agreement**), which has been entered intobetween the[name and address of the Authority](the"**Authority**") and..... (the "**Contractor**")for Construction of Inland Water Transport Terminal at Jogighopa on National Waterway No. 2 in the State of Assam (the "**Project**") on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

- In case the bid of Authority's Engineer is invited simultaneously with the bid of EPC project, then the status of bidding of EPC project only to be indicated

(ii) The TOR shall apply to construction and maintenance of the Project.

2. Definitions and interpretation

(i) The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in theAgreement.

(ii) References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of thisTOR.

(iii) The rules of interpretation stated in Article 1 of the Agreement shall apply, mutatis mutandis, to thisTOR.

3. General

(i) The Authority's Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good IndustryPractice.

(ii) The Authority's Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority beforedetermining:

a) any Time Extension;

b) any additional cost to be paid by the Authority to theContractor;

c) the Termination Payment; or

d) issuance of Completion Certificate or

e) any other matter which is not specified in (a), (b), (c) or (d) above and which creates a financial liability on either Party.

(iii) The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shall be submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.

(iv) The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.

(v) The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.

(vi) In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the Authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

4. Construction Period

(i) During the Construction Period, the Authority's Engineer shall review and approve the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, dredging & site grading etc. and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1 (vi). The Authority's Engineer shall complete such review and approval and send its observations to the Authority and the Contractor within 15 (fifteen) days of receipt of such Drawings.

(ii) The Authority's Engineer shall review and approve any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.

(iii) The Authority's Engineer shall review and approve the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty one) days stating the modifications, if any, required thereto.

(iv) The Authority's Engineer shall complete the review and approve of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

(v) Deleted

(vi) The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7 (seven) days of receipt of such report.

(vii) The Authority's Engineer shall inspect the Construction Works and the Project and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.

(viii) The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.

(ix) For determining that the Works conform to Specifications and Standards, the Authority's Engineer 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 the Agreement and in accordance with Good Industry Practice for quality assurance. For purposes of this Paragraph 4 (ix), the tests specified in the Appendix B or any modification/substitution thereof shall be deemed to be tests conforming to GoodIndustry Practice for quality assurance.

(x) The timing of tests referred to in Paragraph 4 (ix), and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the Quality Control Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.

(xi) In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.

(xii) The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project , whether because of an accident, unforeseeable event or otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

(xiii) In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report from the Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.

(xiv) The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuant to Clause 12.2.

(xv) Authority's Engineer may recommend to the Authority suspension of the whole or part of the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.

(xvi) In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whether or not such suspension may be revoked by the Authority.

(xvii) The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate, as the case may be. For carrying out its functions under this Paragraph 4 (xvii) and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5. Maintenance Period

(i) The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with theContractor.

(ii) The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and theContractor.

(iii) The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in thisbehalf.

(iv) In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissiblelimit.

6. Determination of costs and time

(i) The Authority's Engineer shall determine the costs, and/or their reasonableness, that are required to be determined by it under theAgreement.

(ii) TheAuthority's Engineer shall determine the period of Time Extension that is required to be determined by it under theAgreement.

(iii) The Authority's Engineer shall consult each Party in every case of determination in accordance with the provisions of Clause18.5.

7. Payments

(i) The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2 (iv)(d).

(ii) Authority's Engineer shall-

a) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

b) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable totheContractor, after adjustments in accordance with the provisions of Clause 19.10.

(iii) The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

(iv) The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause19.16.

8. Other duties and functions

The Authority's Engineer shall perform all other duties and functions as specified in the Agreement.

9. Miscellaneous

(i) A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of

all the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authorityforthwith.

(ii) The Authority's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

(iii) Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form or in such other medium as may be acceptable to the Authority, reflecting the Project as actually designed, engineered and constructed, including an as- built survey illustrating the layout of the Project ,All the buildings and structures forming part of Project Facilities; shall hand them overto the Authority against receipt thereof.

(iv) The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between theParties.

(v) TheAuthority'sEngineershallinformtheAuthorityandtheContractorofanyeventof Contractor's Default within one week of itsoccurrence.

Schedule - O

(See Clauses 19.4 (i), 19.6 (i), and 19.8 (i) of Agreement)

Forms of Payment Statements

1. Stage Payment Statement forWorks

The Stage Payment Statement for Works shall state:

a) The estimated amount for the Works executed in accordance with Clause19.3

   (i) subsequent to the last claim;

b) amounts reflecting adjustments in price for the aforesaidclaim;

c) the estimated amount of each Change of Scope Order executed subsequent to the lastclaim;

d) amounts reflecting adjustment in price, if any, for(c) above in accordance with the provisions of Clause 13.2 (iii)(a);

e) total of (a), (b), (c) and (d)above;

f) Deductions:

   (i) Any amount to be deducted in accordance with the provisions of the Agreement excepttaxes;

   (ii) Any amount towards deduction of taxes;and

   (iii) Total of (i) and (ii)above.

g) Net claim: (e) – (f)(iii);

h) The amounts received by the Contractor upto the lastclaim:

   (i) For the Works executed (excluding Change of Scopeorders);

   (ii) For Change of Scope Orders,and

   (iii) Taxesdeducted

2. Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

a) the monthly payment admissible in accordance with the provisions of the Agreement;

b) the deductions for maintenance work notdone;

c) net payment for maintenance due, (a) minus(b);

d) amounts reflecting adjustments in price under Clause 19.12;and

e) amount towards deduction oftaxes

3. Contractor's claim for Damages

Note: The Contractor shall submit its claims in a form acceptable to the Authority.

Schedule - P

(Clause 20.1 of Agreement)

Insurance

1. Insurance during Construction Period

(i) The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire andterrorism:

a) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing and removing any part of the Works and of removing debris of whatsoever nature;and

b) insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at theSite.

(ii) The insurance under sub para (a) and (b) of paragraph 1(i) above shall cover the Authority and the Contractor against all loss or damage from any cause arising under paragraph 1.1 other than risks which are not insurable at commercialterms.

2. Insurance for Contractor's DefectsLiability

The Contractor shall effect and maintain insurance cover of not less than 15% of the Contract Price for the Works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for any loss or damage for which the Contractor is liable and which arises from a cause occurring prior to the issue of the Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3. Insurance against injury to persons and damage toproperty

(i) The Contractor shall insure against its liability for any loss, damage, death or bodily injury, or damage to any property (except things insured under Paragraphs 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this Agreement. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number ofoccurrences.

The insurance cover shall be not less than: Rs. 2,00,00,000/- (Two Crore only)

(ii) The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor's performance of this Agreement excluding:

a) the Authority's right to have the construction works executed on, over, under, in or through any land, and to occupy this land for the Works;and

b) damage which is an unavoidable result of the Contractor's obligations to execute the Works.

4. Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractor and the Authority.

Schedule-Q

Tests on Completion of Maintenance Period

1. Quality test: Quality of component of building shall be checked with the respective testing methods and techniques .

2. Visual and physicaltest

The Authority's Engineer shall conduct a visual and physical check of construction to determine that all works and equipment forming part thereof conform to the provisions of this Agreement. The physical tests shall include measurement of cracking, rutting, stripping and potholes and shall be as per the requirement of maintenance mentioned in Schedule-E.

Schedule-R

Taking Over Certificate

I, ……. (Name and designation of the Authority's Representative) under and in accordance with the Agreement dated …… (the "**Agreement**"), for Construction of Inland Water Transport Terminal at Jogighopaon National Waterway No. 2 in the State of Assam (the "**Project**") on Engineering, Procurement and Construction (EPC) basis through (NameofContractor),herebycertifythattheTests on completion of Defect Liability Period of the Agreement have been successfully undertaken to determine compliance of the Project with the provisions of the Agreement and I hereby certify that the Authority has taken over the Project from the Contractor on this day.....

SIGNED, SEALED ANDDELIVERED

(Signature)

(Name and designation of Authority'sRepresentative)

(Address)

******* End of the Document *******