3. Testing of earth continuity Path:

The earth continuity conductor including metal conduits and metallic envelops of cable in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one Ohm.

The contractor shall notify in writing to the Employer about the completion of the work, within 7 days from the date of this notification, the Engineer-in-charge shall send their representative to remain present at the time of carrying out of the tests by the Contractor. The contractor will fix up this date in consultation with the Employer/Client/Construction Manager s for such tests.

Should the above tests not comply with the limits & requirements as above the contractor shall rectify the faults until the required results are obtained.

The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The Contractor without any extra charge will carry out the above tests.

1.1.4 DEFECTS LIABILITY PERIOD & MAINTENANCE:

The completed installation inclusive of wiring, light fittings, and fan shall not be final until the expiry of the defects liability period stated from taking over of Installations by the clients. During the period, the Contractor shall be liable for:-

a) The replacements of any defective parts that may develop in goods/items of his own manufacture or supplied by him.
b) The rectification of all the defects arising out of defective workmanship of the contractor.
c) Bringing to the notice of the Employer any defect arising in materials supplied by the Employer. The employer shall provide replacement of such materials.
d) Until the installation is finally taken over, the Contractor shall have the right of entry to the premises, at his own risk and expenses, for maintaining the installation in proper order. To facilitate maintenance the contractor should clearly indicate the detail distribution diagram on every switchgear, D.B., SDB, MBs, and Feeder Pillars etc.

1.1.5 POSITION OF LIGHTING & DISTRIBUTION BOARDS & SWITCHGEARS

a) The recommended positions of the lighting points control switches, distribution boards and switchgears etc., as shown on the layout drawings will be generally adhered to.

b) Should there be any discrepancy or incomplete description, ambiguity or omission in the drawings and other documents whether original or supplementary, forming the contract, completion or maintenance of the installation, the contractor shall immediately on discovering the same draw attention of the Employer.

c) Prior to the installation of lighting, fan and plug points and the distribution boards, switches etc., final positions shall be ascertained by the Contractor with the Employer.

d) The dimensions and other details of the electrical drawings shall be compared with the civil drawings at site before executions of the work.

1.1.6 PAINTING & MARKING

All exposed steel work not actually embedded in building construction (viz. conduits, junction boxes, switchboards DBs, MBs etc.) will be painted with one coat of primer and two coats of synthetic enamel paint to shades approved by the Employer/Client/Construction Manager . The paint will match the existing shades of walls wherever instructed. The contractor without extra charge will do this work. All

switchgears, MBs, SDBs and final DBs etc. shall be properly painted labeled and numbered as required by the Employer/Client/Construction Manager.

1.1.7 Wherever recessed fittings are required to be provided the Electrical Contractor shall be responsible for informing the building contractor to keep necessary recesses in the slab/false ceiling.

2.0 PANEL MAIN DISTRIBUTION BOARDS/ SUB DISTRIBUTION BOARDS

2.01 GENERAL

Main Distribution Board/ Sub Distribution Boards shall be metal clad totally enclosed, rigid floor mounted air insulated. Cubicle type for use on 415 volts, 3 phase, 50 cycle system. System shall be suitable for fault withstand capacity of 50KA RMS or as specified / Indicated in BOQ symmetrical Equipment shall be designed for operation in high ambient temperature and high humidity tropical atmospheric conditions.

2.02 STANDARDS

2.02.1 The equipment shall be designed to conform to the requirements of:-

I. IS: 8623 -Factory Built Assemblies of switchgear and control gear
ii. IS: 4237 - General requirements for switchgear and control gear for voltages not exceeding 1000 volts.
iii. IS: 2147 - Degree of protection provided by enclosures for low voltage switchgear and control gear.
iv. IS: 375 - Marking and arrangement of bus bars.

2.02.2 Individual equipment housed in the Main Sub Distribution Board shall conform to the following IS Specifications.

I. Moulded case circuit breaker - IS 13947/I E-947.

ii. H.RC Fuse links - IS 2208-1962 or IS 9224-1979
iii. Current Transformers - IS 2705
iv. Voltage Transformers - IS 3156
v. Relays - IS 3231
vi. Indicating Instruments - IS 1248
vii. Integrating Instruments - IS 722
viii. Control switches & Push Buttons - IS 6875
ix. Auxiliary Contractors - IS 2959

2.03 CONSTRUCTION

All panels and Main Distribution / Sub Distribution Board shall be metal enclosed, indoor, floor mounted free standing type made up of the required vertical section, which when coupled together shall form continuous dead front Distribution Board. Main Distribution Board/ Sub Distribution Board shall be dust and damp protected. Panels & Main Distribution Board shall be extensible on both sides by the addition of side section after removal of end covers. Panels Main Distribution Board/ Sub Distribution Board shall be fabricated with a framed structure with rolled/ folded sheet steel channel section of minimum 3mm thickness, doors and covers shall be of minimum 2mm thick sheet steel shroud and partitions shall be of exterior of Main Distribution Board/ Sub Distribution shall be smoothly finished, leveled and free from flaws. The corners are to be rounded. Front and rear doors to be fitted with dust excluding neoprene gasket with fasteners designed to ensure proper compression of the gaskets. When covers are provided in place of doors, generous overlap shall be ensured Between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust.

Following minimum clearances to be maintained after taking into account connecting bolts, clamps etc.

I. Between phases - 32 mm
ii. Between phases and neutral - 26 mm
iii. Between phases and earth - 26 mm
iv. Between neutral and earth - 26 mm

All insulating materials used in the construction of the equipment shall be of non-hygroscopic material, duly treated to withstand the effects of the high humidity, high temperature tropical ambient service conditions.

Functional units such as fuse switch/ fuse switch unit/ moulded case circuit breakers shall be arranged in multi-tier formation. The design of the Main Distribution Board/ Sub Distribution shall be such that each fuse switch/ switch fuse units/ MCCB shall be fully compartmentalised.

Insulated barriers shall be provided with in a vertical section and between adjacent sections to ensure prevention of accidental contact with main bus bars and vertical risers during operation, inspection or maintenance of functional units. All doors/ covers providing access to live power equipment/ circuits shall be provided with tool operated fasteners to prevent unauthorized access. The panel shall be so constructed that the cable alley shall be sufficient enough to accommodate all the outgoing and incoming cables. For each cable there shall be separate cable gland plate of detachable type at the bottom and/ or top of the panel as required. Gland plate shall be 3mm thick.

2.03 METAL TREATMENT & FINISH

All metal work used in the construction of the panels and main Distribution Board/ Sub Distribution Board should have undergone a rigorous metal treatment process as follows:-

I. Effective cleaning by hot alkaline degreasing solution followed by cold water rinsing to remove traces of alkaline solution.

ii. Pickling in dilute sulphuric acid to remove oxide scales & rust formation, if any, followed by cold water rinsing to remove traces of acidic solution.

iii. A recognized phosphate process to facilitate durable coating of the paint on the metal surfaces and also to prevent the spread of rusting in the event of the paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution.
iv. Passivating in de-oxalite solution to retain and augment the effects of phosphating. v. Drying with compressed air in a dust free atmosphere.
vi. Primer coating with two coats of a highly corrosion resistant primer, applied wet on wet and stove dried under strictly controlled conditions of temperature and time.
vii. A finishing coat of stoving synthetic enamel paint of gray colour.

2.04 BUSBARS.

The bus bars shall be air insulated and made of high conductivity, high strength aluminum alloy complying with the requirement of grade E-91E of IS-5082.

The bus bars shall be suitable braced with non-hygroscopic SMC supports to provide a through 50KA RMS symmetrical for one second and a peak short circuit withstand capacity of 105KA. The neutral as well as the earth bar should be capable of withstanding the above level. Ridges shall be provided on the SMC supports to prevent tracking between adjacent bus bars. Large clearances and creep age distances shall be provided on the bus bar system to minimize possibilities of fault. The main phase bus bars shall have continuous current rating throughout the length of the panel. The cross section of neutral bus bars shall be same as that of the phase bus bar for bus bars of capacity upto 200Amp. For higher capacities the neutral bus bar shall not be less than half (50%) the cross section of that of the phase bus bars. Connections from the main bus bars to functional circuits shall be so arranged and supported to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit currents. Bus bars shall be colour coded with FR PVC sleeves.

The Main Distribution Board /Sub Distribution Board shall be designed that the cables are not directly terminated on the terminals of switch fuse/ fuse switch/MCCB. but are terminated on cable termination links. Capacity of aluminum bus bars shall be considered as 1.0 Amp per sq.mm of cross section area of the bus bar.

2.06 MOULDED CASE CIRCUIT BREAKERS

2.06.1 GENERAL

Moulded Case Circuit Breaker shall be incorporated in the Main/ sub distribution board wherever specified. MCCBs shall be suitable either for single phase AC 230 volts or there phase 415 volts.

2.06.2 FRAME SIZES

The MCCBs shall have the following frame sizes subject to meeting the fault level:

a. Up to 100A rating ..... 100A frame.
b. From 125 to 225 .....225A frame.
c. From 225 to 400 .....400A frame.
d. Above 400A .....600A frame.

2.06.3 CONSTRUCTIONS

The MCCB's cover and case shall be made of high strength heat treatment and flame retardant thermo-setting insulating material. Operating handle shall be quick make/ quick break, trip-free type. The operating handle shall have suitable `ON', `OFF' and `tripped' indicators. Three phase MCCBs shall have common operating handle for simultaneous operation and tripping of all the three phases.

Suitable extinguishing device shall be provided for each contact. Tripping unit shall be of thermal magnetic or static type provided in each pole and connected by a common trip bars such that tripping of any one pole operates all three poles to open simultaneously. Thermal magnetic or static tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact tips shall be made of suitable air resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearance.

2.06.4 TESTING

a) Original test certificate of the MCCB as per Indian Standard (IS) 315-C-8370 shall be furnished.

b) Pre-commissioning tests on the MV panel incorporating the MCCB shall be done as per standard.

2.07 MEASURING INSTRUMENTS FOR METERING

2.07.1 GENERAL

Direct reading electrical instruments shall be in conformity with IS 1248.The accuracy of direct reading shall be 1.0 for voltmeter and 1.5 for ammeters. Other type of instruments shall have accuracy of 1.5.The errors due to variations in temperature shall be limited to a minimum. The meter shall be suitable for continuous operation between-10oCto+50oC.All meters shall be of flush mounting type of 96mm square pattern. The meter shall be enclosed in a dust tight housing. The housing shall be of steel or phenolic mould. The design and manufacture of the meters shall ensure the prevention of fogging of instruments glass. Instruments meters shall be sealed in such a way that access to the measuring element and to the accessories within the case shall not be possible without removal of the seal. The meters shall be provided with white dials and black scale markings.

The pointer shall be black in colour and shall have zero position adjustment device which could be operated from outside. The direction of deflection shall be from left to right.

Suitable selector switches shall be provided for all ammeters and voltmeters intended to be used on three-phase supply.

The specifications herein after laid down shall also cover all the meters, instrument and protective devices required for the electrical work. The ratings type and quantity of meters, instruments and protective devices shall be as per the schedule of quantities.

2.07.2. AMMETERS.

Ammeters shall be moving iron or moving coil type. The moving part assembly shall be with jewel bearing. The jewel bearing shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks, the ammeters shall be manufactured and calibrated as per the latest edition of IS: 1248. Ammeters shall be instrument transformer operated, and shall be suitable for 5A secondary of instrument transformer. The

scales shall be calibrated to indicate primary current, unless otherwise specified. The ammeters shall be capable of carrying sustained overloads during fault conditions without damage or loss of accuracy.

2.07.3 VOLTMETERS

Voltmeter shall be of moving iron or moving coil type. The range for 415 volts, 3 phase voltmeters shall be 0 to 500 volts. Suitable selector switch shall be provided for each voltmeter to read voltage between any two lines of the system. The voltmeter shall be provided with protection fuse of suitable capacity.

2.07.4 -Deleted

2.07.5. MISCELLANEOUS

Control switches shall be of the heavy-duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting.

Indicating lamps shall be of the filament type of low watt, consumption, provided with series resistor where necessary, and with translucent lamps covers, bulbs & lenses shall be easily replaced from the front.

Push buttons shall be of the momentary contact, push to actuate type fitted with self-reset contacts & provided with integral escutcheon plates marked with its functions.

2.07.6 CABLE TERMINATION.

Cable entries and terminals shall be provided in the Main/Sub distribution board to suit the number; type and size of aluminum conductor power cables and copper conductor control cable specified.

Provision shall be made for top or bottom entry of cables as required. Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated.

Barriers or shrouds shall be provided to permit safe working as the terminals of one circuit without accidentally touching that of another live circuit.

Cable risers shall be adequately supported to withstand the effects of rates short circuit currents without damage and without causing secondary faults.

2.07.7 CONTROL WIRING

All control wiring shall be carried out with 110/660 V grade single core FR PVC cable conforming to IS:694/ IS: 8130 potential standard copper conductors of minimum 1.5 sq.mm for potential circuits and 2.5 sq.mm for current transformer circuits. Wiring shall be neatly bunched, adequately by numbering ferrules at end. All control fuses shall be mounted in front of the panel and shall be easily accessible.

2.07.8 TERMINAL BLOCKS

Terminal blocks shall be 500 Volts grade of the stud type. Insulating barriers shall be provided between adjacent terminal. Terminal blocks shall have a minimum current rating of 10 Amps and shall be shrouded. Provisions shall be made for label inscriptions.

2.08 LABELS

Labels shall be anodized aluminum, with white engraving on black background. They shall be properly secured with fasteners.

2.09. TEST AT MANUFACTURES WORK

All routine tests specified in IS: 8623-1977 shall be carried out and test certificates submitted to the Project Manager.

2.10 TESTING AND COMMISSIONING

Commissioning checks and tests shall be including all wiring checks and checking up of connections. Primary/secondary injection tests for the relays adjustment/ setting shall be done before commissioning in addition to routine meggar test. Checks and tests shall include the following.

a) Operation checks and lubrication of all moving parts. b) Interlocking function check.
c) Insulation test: when measured with 500V meggar, the insulation Resistance shall not be less than 100 mega ohms.
d) Trip tests & protection gear test.

3.00 DISTRIBUTION BOARDS

Distribution Board shall be double door type with extended loose wire box at the top and suitable for flush installation. All distribution boars shall be of three phase (415 Volts) or single phase (240 Volts) type with incoming isolator or MCB and / or ELCB as in Schedule of quantities. Distribution boards shall contain plug in or bolted type miniature circuit breaker mounted on bus bars. Miniature circuit breakers shall be quick made & quick break type with trip free mechanism. MCB shall have thermal & magnetic short circuit protection. MCB shall conform with IS: 8828-1978. Neutral bus bars shall be provided with the same number of terminals as there are single ways on the board in addition to the terminals for incoming mains. An earth bar of similar size as the neutral bar shall also be provided. Phase barrier shall be fitted and all live parts shall be screened from the front simple clearance shall be provided between all live metal and the earth case and adequate space for all incoming and outgoing cables. All distribution board enclosures shall have an etched zinc base stove painted followed by synthetic stoved enamel, colour light grey. A circuit identification card in clear plastic cover shall be provided for each distribution board.

3.01 Miniatrue Circuit Breakers for lighting circuits shall be of "B" series where as `C' series MCB's shall be invariably used for motor loads, halogen lamps fitting, sodium/ mercury discharge lamps and for all power circuits. All miniature circuit breakers shall be of 9KA rated rupturing capacity.

3**.01 EARTH LEAKAGE CIRCUIT BREAKER/ RESIDUAL CURRENT CIRCUIT BREAKERS.**
Earth leakage circuit breaker shall be current operated type and of 100 mA sensitivity unless otherwise stated. For single phase distribution. ELCB shall be housed within the DB box. For three phase distribution board, either the ELCB shall be housed in the same box or in a separate box & shall be width & depth of D.B. box. ELCB box shall be of same finish. Height of ELCB box shall be sufficient to accommodate ELCB & termination of incoming & outgoing wires.

4.00 FR PVC/GALVANISED CONDUIT AND WIRING SYSTEM

4.01 TYPE AND SIZE OF CONDUIT

All conduit pipes shall be ISI marked to medium grade./ solid drawn or reamed by welding finished with stove enameled surface (where called for Galvanized conduits shall be used for data cables etc, as per Schedule of quantities. All conduit accessories shall be of threaded type and under no circumstances pin grip type accessories shall be used. The maximum number of FR PVC insulated 650/1100 volts grade copper conductor cable that can be drawn in conduit of various sizes shall be as per IS code. No steel conduit less than 20mm in diameter shall be used. FR PVC conduits shall confirm to ISI marked to medium grade. And all accessories and cementing etc. shall be as per manufacturers specification.

4.02 CONDUIT JOINTS

Conduit pipes shall be joined by means of threaded couplers and threaded accessories only. In long distance straight run of conduits, inspection type couplers at reasonable intervals shall be provided or running threads with couplers and jam nuts shall be provided. In the later case the bare threaded portion shall be treated with anti-corrosive preservative. Threads on conduit pipes in all cases shall be between 13mm to 19mm long sufficient to accommodate pipes to full threaded portion of couplers or accessories.

Cut ends of conduit pipe shall have no sharp edges nor any burrs left to avoid damage to the insulation of conductor while pulling them through such pipes.

4.03 PROTECTION AGAINST CONDENSATION

The layout of conduit should be such that any condensation or seating inside the conduit is drained out. Suitable precaution should also be taken to prevent entry of insects inside the conduit.

4.04 PAINTING OF CONDUIT AND ACCESSORIES

After installation, all accessible surface of conduit pipes, fittings, switch and regulator boxes etc. shall be painted with two coats of approved enameled paint or aluminum paint as required to match the finish of surrounding wall, trusses etc.

4.05 FIXING OF CONDUITS

4.05.1 SURFACE CONDUIT

Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or other approved plugs with screws in an approved manner at an interval of not more than one meter but on either side of the couplers or bends, similar fittings, saddles shall be fixed at a distance of
30cm formtthe centre of such fittings. The saddles should not be less than 24 gauge for conduits upto 25mm and not less than 20gauge for larger diameter conduits. The corresponding widths shall be 19mmx25mm. Where conduit pipes are to be laid along the trusses, steel joint etc. The same shall be secured by means of special clamps made of MS. Where it is not possible to drill
holes in the trusses members suitable clamps with bolts and nuts shall be used.

For 25mm diameter conduit width of clip shall be 19mm and of 20 SWQG. For conduit of 32mm and above, width of clip shall be 25mm and of 18 SWG.

Where conduit pipes are to be laid above false ceiling, either conduit pipes shall be clamp to false ceiling framework or suspended with suitable supports from the soffit of slab. For conduit pipe run along with wall the conduit pipe shall be clamped to wall above false ceiling in uniform pattern with special clamps if required to be approved by the Engineer-in-charge.

4.05.2 RECESS/ CONCEALED CONDUIT

The chase in the wall shall be neatly made and of ample dimension to permit the conduit to be fixed in the manner desired. In the case of building under construction, conduit shall be buried in the wall before plastering and shall be finished neatly after creation of conduit. In case of exposed brick/ rubble masonry work special care shall taken to fix the conduit and accessories in the position along with the building work. Work of chasing the wall, fixing the conduit in chases and burying the conduit in mortar before plastering shall form part of point wiring work. The conduit pipe shall be fixed by means of stamples or by means of saddles not more than
60ccm apart or by any other approved means of fixing. Fixing of standard bends and elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with treated with some approved preservative compound to secure protection against rust. Suitable periodical inspection boxes to the barest minimum requirements shall be provided to permit periodical inspection and to facilitate replacement of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers. Where the length of conduit run is more than 10 meters, then circular junction box shall be provided.

4.06 OUTLET BOXES & COVERS

The switch box shall be made of metal on all sides except on the front. Boxes shall be hot dip galvanized mild steel. Upto 20x30cm size M.S. box shall have wall thickness of 18 SWG and MS boxes above 20x30cm size shall be of 16 SWG. The metallic boxes shall be painted with anti-corrosive paint before erection. Clear depth of the box shall not be less than 60mm. All fitting shall be fitted in flush pattern. Phenolic laminated sheet of approved shade shall be used for switch box covers. These shall be of 3mm thick synthetic phenolic resin bonded laminated sheet as base material and confirm to grade P-1 OF IS 2036-1994.

4.07 SWITCHES

All 5/6 and 15/16 Amp switches shall be modular type of 240 volts A.C. grade. All switches shall be fixed on suitable modular plate cover. All 5/6 Amp socket shall be 3-pin type. All 15/16 Amp socket shall be 6-

pin type suitable for 15/16Amp. All switches sockets, telephone and TV outlets controlling the lights or fans shall be connected to the phase wire of the circuit.

4.08 FLUSH COVER PLATE

All switches, sockets, telephone and TV outlets etc. shall be fixed on deluxe plate cover suitable modular plate cover unless otherwise called for in drawings or BOQ. Flush cover plate shall be secured to the box with counter sunk brass screws & cup washers.

4.11 WALL SOCKET PLATE

All 6 and 16amp socket outlet shall be 3 and 6 pin respectively. Each outlet shall have a switch located beside the socket preferable on the same flush cover plate. The earth terminal of the socket shall be connected to the earth wire.

4.10 WIRING

All internal wiring shall be carried out with FR PVC insulated wires of 650/1100 volts grade. The circuit wiring for points shall be carried out in looping in system and no joint shall be allowed in the length of the conductors. Circuit wiring shall be laid in separate conduit originating from distribution board to switch board for light/ fan. A light/ fan switchboard may have more than on a circuit but shall have to be of same phase. Looping circuit wiring shall be drawn in same conduit as for point wiring. Each circuit shall have a separate neutral wire. Neutral looping shall be carried out from point to point of in light/ fan switchboards. A separate earth wire shall be point wiring, Red colour wire shall be used for phase and black colour wire for neutral. Circuit wiring shall be carried out with red, yellow or blue colour FR PVC insulated wire for RYB phase wire respectively and black colour FR PVC insulated wire for the neutral wires. FR PVC insulated copper wire shall be used as Earth continuity conductor and shall be drawn along with other wires. No wire shall be drawn into any conduit until all work of any nature, that may cause injury to wire is completed. Care shall be taken in pulling the wires so that no damage occurs to the insulation of the wire.

Before the wires are drawn into the conduit, the conduits shall be thoroughly cleaned of moisture, dust and dirt. Drawing & jointing of copper conductor wires & cables shall be as per CPWD specifications mentioned above.

4.11 JOINTS

All joints shall be made at main switches, distribution board socket and switch boxes only. No joint shall be made in conduits & junction boxes. Conductors shall be continuous from outlet to outlet.

4.12 MAINS AND SUBMAINS

Mains and sub mains cable where called for shall be of the rated capacity and approved make. Every main and sub main shall be drawn into an independent adequate size conduit. Adequate size draw boxes shall be provided at convenient locations to facilitate easy drawings of the submain & main cables. Cost of junction box/ drawn box is deemed to be included in the rates of submain wiring. A independent earth wire of proper rating shall be provided for every submain. Three-phase submain shall be provided with two-earth wire.

Where mains and Sub-mains cables are connected to the switchgear, sufficient extra lengths of submain and mains cable shall be provided to facilitate easy connections and maintenance for termination of cables crimping type cable socket/lugs shall be provided. Same colour code as for circuit wiring shall be followed. The submain wiring shall be inclusive of the termination with crimped cable sockets at both ends.

4.13 LOAD BALANCING

Balancing of circuits in three-phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

4.14 COLOUR CODE FOR CIRUIT & SUBMIAN WIRING

Colour code for circuit & submain installation shall be Red, Yellow, Blue for three phases. Black for neutral and green only for earth in case of insulated earth wire.

4.15 CLASSIFICATION OF POINTS

Wiring shall be carried out with following sizes of FR PVC insulated stranded single core copper conductor wire /cable.

i.	Light point	-	1.5 sq.mm
ii.	Ceiling/Cabin/Exhaust fan point	-	1.5 sq.mm
iii.	Call bell point	-	1.5 sq.mm
iv.	Plug Point (5 A.S.S. outlet)	-	4.0 sq.mm
v.	Circuit Wiring	-	2.5 sq.mm
vi.	General Power point	-	4.0 sq.mm
vii.	Power Point for A.C. Unit	-	6.0 sq.mm
viii.	Power point for Geyser, Drinking		

Water coolers & hand dryers - 4.0 sq.mm

4.16 TELEPHONE WIRE/ CABLES

Separate conduits shall be provided for internal telephone wiring of telephone system commencing from tag block. Each telephone outlet shall be wired with 2 pair telephone cable from the tag block. All telephone wires shall be of 0.5mm dia or as specified in BOQ annealed tinned high conductivity copper conductor FR PVC insulated & FR PVC sheathed grey conforming to ITD specification SWS 113 B & C. Multiplier FR PVC insulated cables laid in conduit shall be provided for connecting various tag blocks. Telephone cables used for external connections shall be armored. These cables shall be laid directly in ground or in pipe etc. as called for else where.

Following number of 2 pair wires/cables shall be drawn in various sizes of conduits as listed below.

20mm conduit - Upto 3 cables

25mm conduit - more than 3 upto 6 cable

4.17 Maximum number of wires that can be taken in any conduit shall be as per the Table given below:-

FR PVC INSULATED 650/110V GRADE ALUMINIUM/COPPER CONDUCTOR CABLE CONFORMING TO IS 694-1990

The columns headed `S' apply to runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from the straight by an angle or more than 15 degrees. The columns headed `B' apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.

Conduit sizes are the nominal external diameters.

5.00 LIGHTING FIXTURE AND FANS

5.01 General

a) All Light fittings, Fans & Fixtures shall be subject to approval prior to its procurement. The contractor shall supply and install lighting fixtures including lamps, tubes starters, accessories fixing hardware necessary for installations, as shown on the Drawings as required and as herein specified.

b) All fixtures shall be delivered to the building complete with suspension accessories, canopies, hickeys casing, sockets, holders, reflectors, ballasts, diffusing material, louvers, plaster frames, recessing boxes etc. all wired and assembled as indicated.

c) Full size shop detail drawings of special fixture or lighting equipment, where called for in the fixtures schedule shall be submitted to the Engineer for approval.

d) Fixtures, housing, frame or canopy, shall provide a suitable cover for fixture outlet box or fixture opening.

e) Fixtures shall comply with all applicable requirements as herein outlined unless otherwise specified or shown on the drawings.

f) Fixtures shall bear manufacture's name and the factory inspection label.

g) Fixtures shall be complete wired and constructed to comply with the IEE wiring regulations requirements for lighting fixtures, unless otherwise specified.
h) Relamping the fixture shall be possible without having to remove the fixture from its place. i) Lamps of the proper type, wattage and voltage rating shall be furnished and installed in each fixture.

5.02 CONSTRUCTION

a)Fixtures shall be constructed of 0.5 mm thick steel minimum. If other metals are used they shall be of the required thickness to have at least the same mechanical strength. Cast portions of fixtures shall be not less than 1.5 mm thick.

b)Metal parts of the fixture, shall be completely free from burrs and tool marks. Solder shall not be used as a mechanical fastening device on any part of the fixture. Fixture joints shall be welded and ground smooth.

c)Fixtures with visible frame shall have concealed hinges and catches.

d) Recessed fixtures shall be constructed so as to fit into ceiling without distorting either the fixture or the ceiling. Plaster rings shall be provided for plaster ceilings. The Contractor shall coordinate the dimensions with the false ceiling tile dimensions.

e) Fixtures with hinged diffuser doors shall be provided with spring clips or other retaining devices to prevent the diffuser from moving.

f) All plastic diffusers shall be of acrylic, unless otherwise noted.

g) Incandescent fixtures shall be equipped with prcelain medium base with nickel-plated shells.

h) Fluorescent fixtures shall be provided with white lamp holders.

i) Industrial type fluorescent fixtures shall have type lamp holders.

5.03 FINISH

a) All hardware shall be bonderised, cadmium plated, given a corrosion-resistant phosphate treatment of other approved rust inhibiting prime coat, to provided a rust proof base before application of finish. Finish shall be baked enamel.

b) Non-reflecting surfaces such as fixtures frames and trims, shall be finished with baked enamel paint, unless other-wise specified. The colour of the paint shall be as indicated on the Drawings or as directed later by the Engineer-in charge.

c) Light reflecting surfaces shall be finished with baked white enamel paint having 3 reflection factor of not less than 855.

d) All parts of the reflector shall be completely covered by the finish and free from irregularities.

e) Unpainted surfaces shall be finished with a clear lacquer except for anodized of "Azac" surfaces.

f)After finish has been applied and cured, it shall be capable of withstanding lcm radius bend without showing sings of cracking, peeling or loosening from the base metal.

g) Finish shall be capable of withstanding 72 hours exposure to an ultra-violet RS sun lamp placed 10cm from the surface without discoloration, hardening, or warping and shall retain the same reflection characteristics after exposure.

5.04 WIRING

a) Fluorescent fixtures shall be wired with not smaller than 1.5 sq.mm asbestos- covered wire.
No splice or tap shall be located within an arm, stem or chain. ire shall be continuous from splice in outlet box of the building wiring system to lamp socket or to ballast terminals.

b) Wiring within incandescent fixtures and for connection to the branch circuit wiring up to the outlet box of lighting point shall not be less than 1.5 sq.mm silicone rubber insulated wire. (150 Deg C temperature).

5.05 INSTALLATION

Fixtures shall be installed at mounting heights as detailed on the Drawings or as instructed on site by the Engineer.
Pendent fixtures within the same room or area shall be installed plumb and at uniform height from the finished floor. Adjustment of height shall be made during installation. Flush mounted recessed fixtures shall be installed so as to completely eliminate leakage of light within the fixtures and between the fixture and adjacent finish.

Fixtures mounted outlet boxes shall be rigidly secured to a fixture stud I the outlet box. Hickeys or extension pieces shall be installed where required to facilitate proper installation.

Fixtures located on the exterior of the building shall be installed with no-ferrous metal screws finished to match the fixtures.

5.06 LAMPS-GENERAL

Lamp shall be supplied and installed in all lighting fixtures listed in the Schedule of lighting Fixtures on the drawings.
Lamps used for temporary lighting service shall not be used in the final lamping of fixture units. Lamps for permanent installation shall not be placed in the fixtures, until so directed by the
Engineer-in-charge and this shall be accomplished directly before the building areas are ready for occupancy by the Client.

5.07 LAMPS-FLUORESCENT

Lamps shall be of hot electrodes, preheated, normal start type. Lamps shall have bi-pin bases and a minimum specified rated life.
Unless otherwise indicated on the Drawings, Lamps shall have the coluir rendering features and lumens/ watt output of lajps with WHITE colour designation as manufactured by OEM

5.08 LAMPS –INCANDESCENT

Incandescent lamps shall be inside frosted type. Lamps shall have minimum approximate rated life of 750 hours

5.09 BALLAST-FLUORESCENT

- Only single and / or two-lamp ballast shall used in any one fixture. Ballast shall conform to IS 1534 (Part-I) 1977.
- Ballasts shall be high power factor type.
- Ballasts shall have manufacturers lowest sound level ad case temperature rise rating. Ballasts shall be special cool operated type.
- Ballasts for indoor fixtures shall be protected by an integral thermal automatic resettling protective unit which shall disconnect the ballast in the event of overheating.
- Ballasts shall be of the same manufacture as the lamps.

5.10 TESTING

After all lighting fixtures are installed and are connected their respective switches, test all fixtures to ensure operation on their correct switch in the presence of the Engineer. All un- operating fixtures or ones connected to the wrong or inconveniently located switch shall be correctly connected as directed by the Engineer.

5.11 CEILING FANS

All ceiling fans shall be provided with suspension arrangement in the concrete/slab/ roof member. Contractor to ensure that provision are kept at appropriate stage all locations shown on the drawing. Fan box with MS hook is to be provided by electrical contractor. Ceiling fan shall be double ball bearing type, copper wound motor complete with canopy, down rod, blades etc. and shall conform to relevant IS standards ceiling fan shall be white in colour. Ceiling fan shall be provided with standard regulator. Regulator shall be suitable for 240 volts A.c. volts A.C supply 50 Hz and shall be of continuous duty type.

5.12 EXHAUST FANS

Exhaust fans shall be heavy-duty type with double ball bearing & conforming to IS 23412-11967. Exhaust fan shall be complete with copper wound motor, capacitor, louvers/ shutter, frame & mounting bracket. Exhaust fan shall be suitable for operation on 240 volts single phase A.C. supply.

6.00 L.T. CABLES

6.01 GENERAL

LT Cables shall be supplied, inspected laid tested and commissioned in accordance with drawings specifications, relevant Indian Standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drums. The recommendations of the cable manufacturer with regard to jointing and sealing be strictly followed.

6.02 MATERIAL

The L.T.Cables shall be XLPE insulated FR PVC sheathed aluminium conductor armored cable conforming to IS: 7098 (part II) 1985. The cable shall be laid directly in ground, pipes, masonry ducts, cable tray surface of wall etc. as shown on drawings.

6.03 INSPECTION

All cables shall be inspected at site and checked for any damage during transit.

6.04 JOINTS IN CABLES

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoiding of cable joints. The apportioning shall be got approved from Engineer-in-Charge before the cables are cut to lengths.

7.0 RISING MAINS

7.1The rising mains shall be supplied in convenient sections to suit the building to form a vertical straight run. Each section shall be provided with a number of wall straps preferably one meter apart for fixing the trunking to the wall. It should be provided with front and rear sheet steel cover plates so that it forms a totally enclosed vermin and dust proof metal clad construction of 1.6/2mm thick absolutely flat sheet steel, vermin proof breathers shall be provided in each section to dissipate heat, and to prevent any possibility of an electrical fault due to the presence of vermin.

i). Construction: The bus bars shall be made from rectangular section of high conductivity electrolytic grade aluminum. The current density in the bus bars shall not exceed 1.0 ampere / mm2. Neutral bar shall have cross section equal to phase bars. In each vertical run the bus bars shall rest rigidly on a thrust pad at the bottom thereby allowing expansion of the bars upwards. Suitable expansion joints shall be provided. Top of the mains shall be closed by a suitable blank end cover. It must be possible to extend the mains at a later date.

ii).Adapter boxes and tap off boxes shall be provided on rising main enclosure to tap TPN connections of ratings specified in schedule. These shall be without MCCB fitting and shall be provided with detachable

end plates with provision of rectangular holes for solid aluminum strip connections (insulated with colored insulating tape or strip to distinguish each strip) to I/C MCCBS fixed on rising mains.
iii).Wherever rising mains pass through floors, a fireproof barrier shall be provided.
Iv).Provision shall be made to ensure earth continuity between adjacent sections and for earthing the complete run of each rising main.
V).Ratings: The rising mains shall be of 400 amp standard ratings for normal supply Bus bars shall be individually insulated with red, yellow, blue and black insulating sleeves to indicate phased and neutral.
vi).Metal Treatment : The sheet steel parts shall be given a rigorous rust proofing treatment which shall comprise alkaline degreasing, descaling in dilute sulphuric acid and a phosphating process followed by two coats of filler oxide primer and one coat of paint of approved shade. Final coat of paint shall be applied just before erection.

7.2 ERECTION OF RISING MAINS

i).The rising main sections shall be thoroughly examined and cleaned before erection. The rising mains shall be erected in straight vertical line. Position of anchoring points on the wall shall be accurately marked and 10mm dia G.I rag bolts shall be grouted to a depth of 75mm into the wall. All nuts shall be G.I and hexagonal. Spring steel washer shall be fixed under each nut.

ii).All sections of the rising main shall be so fixed that there is no mechanical strain on them. Electric connection between bars and earth continuity of the enclosure shall be ensured between sections.

iii).Any damage to the bars or the enclosure / chamber of a section shall be made good to the entire satisfaction of consultant before such section is re-erected.

iv).The upper end of the rising mains shall be fixed with blanking off cap.

v).The adapter boxes to tap the rising mains shall be fixed so that contacts on the adapter make a sound connection with the bars, and adapter cover is intimately connected to the rising mains chamber to ensure earth continuity. The height at which adapters are fixed on the rising mains above the floor level shall be such that solid strip connections from adapters to I/C switch fuse units fixed on the rising mains are as direct and as short as possible subject to approval of the consultant.

vi).All steelwork shall be made rust free anti painted with two coats of oxide paint followed by two coats of enamel paint of approved shade.

8.0 UNDER GROUND L.T CABLES
8.1 GENERAL
MV cables shall be supplied inspected laid tested and commissioned in accordance With drawings, specifications, relevant Indian Standards Specifications and cable Manufacturer's instructions. The cable shall be delivered at site in original drums with Manufacturers name clearly written on the drum. The recommendation of the cable manufacturer with regard to joining and sealing shall be strictly followed.
8.2 MATERIAL
The MV cable shall be FR PVC insulated Aluminum conductor armored cable conforming to IS:1554–1988(Part–I) laid in trenches/ ducts as shown on drawings.
8.3 All cables shall be inspected upon receipt at site and checked for any damage during transit.
8.4 JOINTS IN CABLES
The contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoidance of joining cables. This apportioning shall be got approved by the Client/Construction Manager before the cables are cut to lengths strait joints are prohibited.

8.5 LAYING CABLES
Cables shall be laid by skilled and experience workmen using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. Great care shall be exercised in laying cables to avoid forming kinks the drums shall be unrolled and cables run over wooden rollers in trenches at intervals no exceeding 2 meters. Cables shall be laid at depth of 0.7 meters below ground level. A cushion of sand, not less than 80mm shall be provided both above and below the cable and joint boxes and other accessories. Cable shall not be laid in the same trench or along side a water main. The cable shall first be laid in excavated trench

80mm layer of sand and shall be spread over the cable. The cable then shall be lifted and placed over the sand bed. The second layer of 80mm sand shall then be sprayed over the cable. The relative position f the cables, laid in the same trench shall be preserved and the cables shall not cross each other as far as possible at all changes in directions in horizontal and vertical planes, the cable shall be bent smooth with a radius of bend not less than 12 times the diameter of cable, minimum 3 meters long lop shall be provided at both sides of every straight joint and 3 meters at each end of cable. Distinguishing marks shall be made on the cable ends for identification. Insulation tapes of appropriate voltage and in red, yellow and blue colour shall be wrapped just below the sockets for phase identification.

8.6 PROTECTION OF CABLES

The cables shall be protected by bricks on the top layer of the sand for the full length of underground cable. Where more than one cable is running in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80mm on either side of the cables. Running them through Hume Pipes of suitable size shall protect Cables under road crossings and any other places subject to heavy traffic. The depth of the Hume Pipe shall be 1 meter below the finished floor level

8.7 EXCAVATION AND BACK FILL

All excavation and back fill including timbering, shoring and pumping quired for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceed 150mm.Each layer shall be properly rammed and consolidated before laying the next layer. The contractor shall restore all surface, road ways, side walks, curbs, walls of other works cut by excavation to their original condition, satisfactory to the owner's representative.

8.8 TESTING OF CABLES

Prior of burying of cables, following tests shall be carried out :
a).Insulation test between phases and phase and earth for each length of cable before and after jointing.
On completion of cable laying work, the following test shall be conducted in the presence of the owner's representative.
a). Insulation resistance test (sectional and overall)
b). Continuity Resistance Test c). Sheathing continuity test
d). Earth test
All tests shall be carried out in accordance with relevant Indian Standard Code of Practice and Indian Electricity Rules. the contractor shall provide necessary instruments, equipment and labour for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried out in the presence of the Client/Construction Manager / Consultant.

9.0 EARTHING

9.1 GENERAL

All the concurrent metal parts of electrical installation shall be earthed properly. All material conduits trunking, switchgear, distribution boards, switch boxes, outlet boxes, and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. Earthing work shall conform to CPWD General Specifications for Earthing work shall conform to internal –
2005 and Indian Electricity Rules 1956 amended upto date and in the regulations of the local Electricity supply authority.

9.2 Earthing Conductor

Earth continuity conductor along with submain wiring from Main/Sub Distribution boards to various distribution boards shall be of copper. Earth continuity conductor from distribution board onward upto outlet points shall also be of bare copper. Earth continuity conductor connecting Man and Sub Distribution boards to earth electrode shall be with galvanized MS strip.

9.3 Sizing of earthing conductor

All fan regulator, 5 and 15 Amp outlet points, switch boxes shall be earthed with earth wire as specified in bills of quantities. Separate earth wire shall be drawn alongwith each circuit. From main/sub distribution board to distribution board, earth continuity conductor shall be as mentioned in bills of quantities. Single phase distribution boards shall have one earth continuity conductor while three phase distribution board shall be provided with two earth continuity conductors. Earthing of main switch board and sub- switch boards shall be earthed with two independent earth electrodes or as indicated elsewhere. Earth conductor laid in ground shall be protected for mechanical injury and corrosion by providing GI pipe.
GI pipe shall be of medium class 40mm dia and 4.5 meter in length or as specified in bills of quantities. Galvanizing of the pipe shall conform to relevant Indian Standards.

GI pipe electrode shall be cut tapered at the bottom and provided with boles of 12mm dia drilled not less than 7.5cm from each other upto 2 meter of length from bottom. The
electrode shall be buried in the ground vertical with its top not less than 20cm below ground level as per detail enclosed. Earth electrode shall not be situated less than 2 metres from the building. The location of the earth electrode will be such that the soil
has reasonable chance of remaining moist as far as possible. Masonry chamber of size
300 x 300 x 300mm shall be provided with water funnel arrangement a cast iron or MS
frame and cover having locking arrangement at the top.

9.4 Plate Earth electrode

Earthing shall be provided with either GI plate electrode or copper plate electrode of following minimum dimension.

i). GI Plate electrode : 600mm x 600mm x 6mm thick
ii). Copper plate electrode : 600mmx600mmx 3mm thick

The electrode shall be made buried in ground with is faces vertical and not less Than 3 meters below ground level. 20mm dia medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top of this pipe for watering and earth electrode. Earth electrode the Watering funnel attachment shall be housed in masonry enclosure of not less than 300x 300x300m deep. A cast iron or MS frame with cover having locking arrangement shall be provided at top of meters from the building care shall be taken that the excavation for earth electrode may not affect the column footing or foundation of the building. In such cases electrode may be further away from the building. In such cases electrode may be further away from the building.

9.5 Artificial Treatment of Soil

If the earth resistance is too high and the multiple electrode earthing does not give adequate low resistance of earth, then the soil resistivity immediately surrounding the earth electrodes shall be reduced by addition of sodium chloride calcium chloride, sodium carbonates copper sulfate, salt and soft coke or charcoal in suitable proportions.

9.6 Resistance to earth

The resistance to earthing system shall not exceed 2 ohm

10.0 Drawing / Procurement & Inspection of Equipment

10.1 Based on the tender drawings and the equipment / scheme finally selected, the contractor shall supply layout, cable line diagrams etc. required for the satisfactory and complete installation of the total electrical power supply and distribution system as envisaged in the tender. Some of the important drawings / details to be submitted for approval are given below:

a). General arrangement drawings of switchgear, panels ducts etc.

b). Wiring diagram, schematic diagram sand control diagrams for equipment, Switchgear, PCC and the whole system. Schedule and termination details Shall also be provided.

c). Building plan, elevation / section and details including the layout of plant, equipment, switchgear, bus-ducts and related services like chimney, cooling systems, fuel handling system etc. with dimensions based on the equipment finally selected.

d). Details of all foundations, cable ducts, cable protections pipes and other civil works e). Complete schedule of LT cables and instrument/ control cables
f). Layout plan showing the co-ordinates routing for power cables, control / instrument cables and other cables as required, co-ordinated with other services like water supply line, drainage / sewerage line, fire lines, mechanical service pipe line etc. The sectional details, road-crossing details etc. shall also be given at different locations.

g). Technical catalogue for all equipment, switchgear, cables & material including a complete write up/details of operation, interlocks & controls etc.

i). Operation and maintenance manuals along with list of spare parts for all equipment. Switchgear cables and materials etc.

k). A detailed explanatory note giving the details of operational sequence, time period and safety aspects etc,

10.2 Procurement & Inspection of Equipment

Approved list of makes and vendors are given at Annexure 'A'. The ENC reserves the right to check and verify makes of equipment/materials supplied shall be strictly as mentioned therein. For items not specially mentioned, prior approval shall be taken before procurement of the same all equipment's materials supplied shall be brand new and shall be procured directly from the manufacturers dealers or authorized agents. Engineer- In-charge shall have access to the manufacturer's premises for stage inspection/final inspection of any item during its design, manufacturing, assembly testing. After carrying out the necessary factory tests and routine tests as per IS Standards, a copy of the routine test certificate shall be forwarded alongwith the call for carrying out the inspection at the manufacturer's work.

Based on the inspection certificate, Engineer- In-charge reserves the right to carry out the inspection at mutually agreed date and/or give inspection waiver. A minimum of two weeks will be needed after receipt of complete shop inspection report and other details to depute our inspector for inspection.

CHAPTER-10- ROAD WORKS

A. Work shall be carried out as per the Ministry of Road Transport and Highways (MORT & H) Specification. Specification for Road and Bridges works (5th revision).

B. For items whose specifications are not given in MORT&H specifications for road and bridge works, then State PWD Specification, BIS specification or sound Engineering practice, as determined by the Engineer in that order should be followed.

C. Technical and General conditions given in document shall also be followed as particular specification certain conditions regarding street lighting shall also be followed.

TECHNICAL CONDITIONS

1. A register in prescribed form showing day to day receipt, consumption and balance of cement at site of work will be maintained at the work/test site by the department, which shall invariably be signed by the contractor or his authorized representative in token of its correctness.

2. A field lab, at his own cost will be established by the contractor at site of work and all the required equipment including cube testing machine of suitable quality **and consumable** shall be provided by the contractor as required for various quality control tests subject to approval of Engineer-in-charge. Nothing shall be payable to the contractor towards equipment/day to day expenditure. Technical staff will belong to the Deptt. and ministerial staff shall be supplied by him

3. Strict control on all operations of work shall be exercised to ensure that the work is of the proper as envisaged in the specifications and design. Although the tests to be performed for quality control and their minimum frequency will be in accordance with accepted norms, in which respect the MORT & H specifications for road and bridge works latest Edition will be referred to.

4. For testing of materials for bridge construction, relevant I.S specification shall be referred to and department will have the discretion to get the sample tested from the reputed testing Laboratory. Testing charges shall be borne by the agency.

5. For testing the strength of the finished products like cement concrete, masonry, bearing and also the workmanship to be ensured in the various construction works of bridges, reference shall be made to the relevant clauses of IRC bridges codes.

6. The frequency of testing shall generally conform to what has been stipulated in the codes, but this shall be increased beyond the stipulated minimum frequency, if frequent deficiencies in quality of works are noticed in particular location by the Engineer.

7. Proper and pucca reference pillars for fixing the longitudinal center line of the bridge and transverse center lines of the piers shall be made before starting the work. The main point about these reference pillars is that they shall be so located as not to be disturbed during construction or during floods and shall last till the work is completed.
8. To have proper control on the proportion of various aggregates of cement concrete mix, weight batching instead of volumetric batching shall be adopted.

9. Where the concrete has been specified in terms of strength, the concrete mix shall be specifically designed and contractor shall satisfy Engineer-in-charge through laboratory test results that the concrete is of specified strength and quality, ensuring at the same time that the concrete mix so designed is no leaner than a nominal mix, if same has been specified.

a. The job mix formula/Mix designed for CC work, etc. will be done from IIT/NIT/NABL Accredited Labs

10. The following basic records, in addition to what might be considered necessary, shall be kept at site and be made available to the inspecting officers.

a. Record of placement of concrete and test cubes shall be maintained in the following form:

Date	**Time of Start**	**Time of Completion**	**Unit/Member concreted**	**Bulking of sand if any**	**Extra sand used to take care of bulking**
1.	**2.**	**3.**	**4.**	**5.**	**6.**
Water Cement Ratio Mix 7.					
Water content of course aggregate	**Water contents of fine aggregate**	**Extra water added**	**Total water content**	**Water cement ratio**	
(i)	**(ii)**	**(iii)**	**(iv)**	**(v)**	
Slump of concrete	**Sources of supply of cement and batch No.**	**Whether the batch of cement tested or not**	**Identification number of concrete cube taken**	**7 days cube Strength as specified as per actual test**	
8.	**9.**	**10.**	**11.**	**12.**	
28 days cube Strength as specified / as per actual test	**Sign of J.E.**	**Sign of SDE**	**Sign of Contractor**	**Remarks of Engineer-in-Charge.**	
13.	**14.**	**15.**	**16.**	**17.**	

b. Record of test for controlling the quality of concrete such as grading, analysis of Aggregates, silt content of fine aggregates, water content of fine aggregates, water content of coarse aggregate etc.

c. Record of test results on samples of mild steel. For steel, high tensile steel.

d. Record of cement tests for different consignment/batches/sources of supply. e. CPM/PERT chart, original and as revised/updated.

MATERIALS AND WORKS TEST REGISTER.

1. A register on prescribed proforma showing test results of materials and work tests will be maintained at the site of work by the department and every entry there of, shall invariably be signed by the contractor or his authorized representatives in token of its correctness.

2. Concrete of any mix ordinary or controlled shall be regularly tested as per Indian Roads Congress (IRC) standard and only such concrete will be accepted which conforms to the standards laid down in IRC 21-2000 standard specifications and code or practice for roads and bridges. The concrete declared below standard by the Engineer shall be replaced by the contractor simultaneously taking care of safely and soundness of other members or adjoining part of the same member entirely at his own risk and cost.

3. Whenever test cubes are taken these should be suitably numbered and there should be corresponding markings on the individual components, or portions of the components to enable the identification of the unit from which the sample for test cubes was obtained. In this respect, for all the bridge works on the National Highways, a new register should be regularly entered. A span should be designate by mark 'S' and the number below it shall indicate the number of span and the beams should be designated by mark 'B' and should be numbered as 1,2,3 from the up-stream end. Thus the marking as S4, B3 will indicate that this pertains to the span No. 4 from left side while facing downstream side and beam No. 3 from the up-stream side. The cubes should also be serially numbered in the register.

4. The sampling of the concrete and testing of cubes should be done with the full knowledge of the contractor and the signatures of contractor or contractor's representative should be taken in the space specified for it.

5. Whenever the result of the cube tests carried out after three or seven days show a strength, which is not satisfactory, the Engineer of the bridge work should draw the attention of the contractor in writing to the possibility of the concrete not attaining the prescribed standards at the end of 28 days. He may also be warned not to proceed further with the work as the 28 days strength of concrete may show sub- standard results. Another notice should be given to the contractor if the prescribed standard strength has not been attained. The unit of which the sub-standard work forms part becomes liable to rejection.

6. When the cube tests persistently point to a concrete strength lower than that specified, a change in the proportions of concrete for subsequent batches must be given serious thought.

7. In case, however, the concrete strength falls below the required designed strength but its use can be permitted under IRC-21 -2000 of the IRC Bridge code section-iii, the unit may be accepted at the discretion of the Engineer and the information that it complies with the code should be placed on record in the remarks column of the register after obtaining the approval of the Superintending Engineer.

8. For all works concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working conditions and so maintained throughout the construction, Mixing shall be continued till materials are uniformly distributed & uniform colour of the entire mass is obtained and each individual particle of the course aggregates shows complete coating of mortar containing its proportionate amount of cement. In no case shall mixing be done for less than two minutes after all ingredients have been put into the mixer.

9. Works strength tests shall be made in accordance with IS-516. Each test shall be conducted on ten specimens, five of which shall be tested at seven days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic meters of concrete or a part thereof, however, If concreting done in a day is less than 15 cubic meters the minimum numbers of cubes can be reduced to 6 with specific permission of the Engineer.

10. Similar works tests shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimen may be suitably increased as deemed necessary by the Engineer when procedure of tests given above reveals a poor quality of the concrete and in other special cases.

11. Acceptance criteria of the concrete will be as per the provisions of IRC 21-2000.

12. Design mix concrete shall be designed on the basis of preliminary test, in accordance with IRC

13. 21-2000. The proportions for ingredients chosen shall be such that concrete has adequate workability for the conditions prevailing of the work in question and can be shown to the satisfaction of the Engineer that supply of properly graded aggregate of uniform quality can be maintained till the completion of the work. Grading of aggregates in different sizes and blending them in the right proportions, as required **should be carried out**.

14. Steel reinforcement shall be protected at all times from injury when placed in work. It should be free from scale, paints, oil or other substance. All rust and scale, should be removed and cleaned by a satisfactory method to the approval of the Engineer. All steel reinforcement shall be accurately placed in position as shown in the drawings and firmly held during the placing and setting of the concrete. When splicing of reinforcement is necessary, the splices shall be staggered as far as possible subject to approval of Engineer-in-charge.The bars shall be lapped accurately in accordance with the codal provisions. Welding of reinforcement steel shall not be resorted to unless approved by the Engineer, in exceptional cases.

15. All material brought by the contractor to the site of work shall be open to suitable tests by the Engineer in accordance with the approved method. The contractor shall afford all such facilities as the Engineer may require for collecting and forwarding all such samples and shall hold the material represented by the sample until tests have been made and material found as per standard. The contractor will supply the material approved by the Engineer and the cost of testing charges will be borne by the agency.

16. The contractor shall supply to the Engineer concrete cubes free of cost and in sizes and quantity as provided for in IRC-21-2000 during the execution of the work. All expenses incurred in respect of preparation and testing of specimen, whether at the work site in the laboratory including carriage to and from etc shall be borne by the contractor.The samples will be taken by contractor in the presence of an authorized representative of the Engineer.

17. 43 grade O.P.C ISI marked cement approved by Engineer shall be used confirming to IS:8002

18. For reinforcement steel Fe-500 grade TMT Bars conforming to relevant IS code shall be used.

19. Agency will produce to the Engineer, the originals bills of cement and steel etc. in token of proof purchase of material along with quality control test certificate of manufactures.

20. Agency will get the material tested from any laboratory (approved) as directed and whenever required by Engineer and all liability of testing shall be borne by the agency.

21. Bitumen, Cement and steel shall be arranged by the agency.

ADDITIONAL CONDITIONS

1. Before laying any construction layer of GSB, sub grade or base course, earth work on berms, if it is to be done by the agency against this agreement, should be completed in all respect simultaneously. Before taking work of any next layer, earth work on berms should be completed. Payment of any layer will be released only when earth work on berms are completed.
2. No compensation for any damages caused to the earthwork by rains, floods or any other natural calamities shall be paid to the contractor. The contractor shall have to make good all such damages at his own cost as per direction of Engineer.
3. The final payment of the tenderer will not be paid until and unless he furnishes to the satisfaction of the Engineer, proof from revenue authority that the price of earth used for the work having been fully paid to the owner of the land from which the earth was removed by the contractor from his (owner) land for the work and to indemnify against all the losses, damages, cost of land expenses which the Govt. suffer or incur as a result of such claim.
4. The earthwork has to be carried out in continuous stretches according to the directions of the Engineer.
5. Level should be taken and entered in measurement book before commencing the work at an interval not exceeding 15 meters and after finishing the work complete in all respect as per MORT&H specification. The finished work will be checked longitudinally as well as in cross section for computing the quantity of earth work as per Clause No. 113.3 of MORT&H (road wing) specification (4th revision) or 2001/latest edition
6. The contractor shall make arrangement at his own cost for at least two numbers of modern leveling instruments (wild type) for the purpose of carrying out leveling operation failing which the same shall be arranged by the Engineer at his risk and cost.
7. The agency to whom the work is allotted will have to produce original vouchers for all quantities in lieu of purchase of bitumen from refinery, steel, cement and bricks from the original manufacturer or other authorized dealers / distributors to

the entire satisfaction of the Engineer for ascertaining the genuineness of material. Attested copy of voucher will have to be submitted along with bills.

8. In case of embankment with Fly Ash, the contractor shall take special care to keep the surface wet at all times so that the Fly Ash does not get mixed up with the atmosphere thus causing poor visibility besides health hazards. If the contractor does not comply with this provision, the Engineer shall make necessary arrangement after giving appropriate notice to the contractor, for keeping the fly ash surface wet and the contractor shall pay the expenses incurred on demand or otherwise the same shall be recovered by Engineer from bills due to the contractor.

ADDITIONAL CONDITIONS FOR BITUMINOUS WORK

1. The contractor will quote the rate of Bitumen Macadam item with 3.4% of Bitumen contents for upto 75mm thick and 3.3% for 80mm to 100mm thick by weight of total mixture. Nothing extra will be paid if Job Mix formula warrants more bitumen contents. If density as per Job Mix formula comes out to be less than 2.2gm/CC, rate will reduce accordingly & if is more than 2.2gm/CC nothing extra will be paid.

2. The contract unit rate for SDBC item shall be as specified in Clause 507.9 of MoRT&H specification (4th revision), except that the rate shall include the provision of bitumen @ 5.0 percent, by weight of total mixture. Nothing extra will be paid if job mix formula warrants more bitumen contents. If density was per Job Mix formula comes out to be less than 2.29gm/CC, rate will reduced accordingly & if is more than 2.29gm/CC nothing extra will be paid.

3. The contract unit rate for DBM item shall be as specified in Clause 505.9 except that the rate shall include the provision of bitumen content @ 4% for 75mm to 100mm thick DBM and 4.5% upto 75mm thick by weight of total mixture. Nothing extra will be paid if job mix formula warrants more bitumen contents. If density as per job mix formula comes out to be less than 2.30 gm/CC, rate will be reduced accordingly and if it is more than 2.30 gm/CC nothing extra will be paid.

4. The contract unit rate for BC item shall be as specified in Clause 507.9 of MoRT&H specification (5th revision), except that the rate shall include the provision of bitumen @ 5.4 percent for 30-40mm thick and 5.2% for 50mm thick, by weight of total mixture Nothing extra will be paid if job mix formula warrants more bitumen contents. If density as per job mix formula comes out to be less 2.30 gm/CC, rate will be reduced accordingly and if it is more than 2.30 gm/CC nothing extra will be paid.

5. The agency to whom the work is allotted will have to produce original vouchers for all quantities in lieu of purchase of bitumen from refinery steel, cement, and bricks from the original manufacturer or other authorized dealers/distributors to the entire satisfaction of the Engineer for ascertaining the genuineness of material. Attested copy of voucher will have to be submitted along with bills.

6. The documentary proof of procurement of bitumen from refinery as per requirement prescribed in the MORT&H specification/technical note of MORT&H and IRC special publication No. 53 from the reputed source and test result from CRRI will be produced by the agency.

7. The Job mix formula will be got tested IIT/NIT/NABL Accredited Testing Labs and testing charges will be borne by the agency. Nothing shall be paid on this account.

8. After filling the depression of the existing road surface and before applying tack coat, the existing levels of the road, surface and after construction shall be taken jointly by the authorized representative of the contractor and Engineer at grid of point at 10 mtrs. Centre to centre longitudinally in straight reaches but5 meter at curves as per Clause No. 113.3 of MORT&H specification. The cubic contents of the mix laid compacted and finished shall be computed on the basis of the initial and final levels as per formula approved by the Engineer.

   The contractor shall provide, install, maintain and operate at his own cost in good working condition a weigh bridge of suitable capacity at site of the hot mix plant under the direction of Engineer or his representative.

   Each truck before loading of the mix shall be weighted on the weigh bridge and its weight shall be recorded in the measurement book under the signature of authorized representative of the contractor and of the Engineer. The truck shall be again be weighed on the weight bridge after loading of the mix and its weight recorded as per prescribed proforma.

   The volume shall then the worked out by dividing the weight of the mix laid on particular stretch of the road with average field density of the very particular stretch. For this purpose the average density for the stretch shall determined by the actual determination of field density by core cutter method. The test will be carried out at the rate of minimum of one test per 700 sqm area as prescribed in MORT&H specification.

For purpose of payment, volume worked out by actual levels as laid down in para 8 (a) and determination of volume by density methods as per Para (b) and theoretical volume with designated thickness and area will be considered and the lowest value of the three shall be shall be adopted.

In case the contractor/Engineer feels that there are substantial undulation at site and additional material is to be consumed on account of this and if there is a provision in the estimate undulation/leveling course, the contractor will submit a case/claim to the Engineer with for full justification along with supporting data i.e. leveling/surveying done at site etc. before execution and Engineer will get the same approved from Employer before execution.

9. Unloading of bitumen at plant site will be done in the presence of representative of Engineer. The day to day receipt and issue account of bitumen shall be maintained by the representative of Engineer and signed daily by the contractor or his authorized representative on the performa appearing on subsequent pages.

10. The Hot Mix Plant will be so located subject to the approval of the Engineer involving such lead in transportation of the mix so as to avoid its segregation and temperature drop beyond specified limits. The maximum lead should not be more than 25 km.

11. The contractor shall carry out the survey of existing road and submit the proposal for improvement of riding quality including the existing level and final level at his own cost and shall get it approved from the concerned Superintending Engineer in writing before commencing the work.

12. When the work under one agreement is being executed, the contractor shall not undertake any other work from same hot mix plant without written permission of the Engineer and shall also make separate arrangement of bitumen for that work.

BASIC BUILDINGS DESCRIPTION :

Sr. No.	Core Processing Centre	
1	Frame type	Clear –rigid frame
2	Width	As per Drawing
3	Length	As per Drawing
4	Eave height	As per Drawing
5	Bay spacing	As per Tender Drawing
6	Bracing	CROSS ROD BRACING + PORTAL BRACING
7	Roof Sheeting	Supply, fabricate and erect roofing with galvanized sheet(pre-painted AL-Zn alloy colour coated steel)(0.5mmTCT) flashing with profiled support system including fixtures and fastenings as per drawing and specifications
8	Wall cladding	Supply, fabricate and erect roofing with galvanized sheet(pre-painted AL-Zn alloy colour coated steel)(0.5mmTCT) flashing with profiled support system including fixtures and fastenings as per drawing and specifications
9	Insulation	Fibreglass insulation having thickness 50 mm with MS wire mesh facing reinforced aluminium foil having density 16 Kg/Cu.m
11	Turbo Ventilators	600mm. Dia, stainless steel with ball bearing
13	Cage ladder	2 No.
14	Roll up door Manual	As per Drawing
15	Load Considerations	The load considerations of the Refrigeration components, hanging loads, docks , all other applicable loads are also to be considered.
16	Minimum Structural Steel	40 MT (Bidder must design the PEB with all applicable, vet and submit the PEB design after successful vetting)

*For further detail kindly refer the Tender drawings.

- Profiled Eaves Gutters shall be Considered
- Downspouts shall be Considered, up to FFL
- Column & roofing structure so designed shall not allow pigeon sitting (to avoid Pigeon / Birds habitation.)
- Painting Includes Two coats of synthetic enamel on site & one coat red oxide at factory to all primary & secondary members.
- Cage ladder with a small platform at top to go up to the roof for maintenance.
- All structural steel members shall be made free from rust, grease / grime, welding wastes, sharp edges using polishing & shot blasting and immediately spray painted using one coat of zinc chromites antirust primer and Two coats of synthetic enamel oil paint It shall be the responsibility of the contractor to get the shade of paint approved from employer at appropriate time.
- Spacing of purlins to support Roofing sheets shall not be more than 1.2m c/c
- Gutters, gable ,corner flashing shall be profiled and adequately sized, box shaped and shall be made out of 26 G profiled colour coated galvanized steel.
- Bidders to provide option of using screw less, continuous, joint less, crimping type sheeting.

- **SPECIFICATION OF MATERIALS**
- Built Up Members: Grade 50 confirming to ASTM A572 materials having min. yield stress of 345N/mm2.
- HOT ROLLED Members: IS 2062 Grade A.
- Web to flange welds of Built Up members are Single side fillet welds by continuous automatic
- SAW process, unless noted otherwise except for crane beams(Double side weld)
- All primary members shall have at least one welded splice.
- Secondary: Light gauge cold formed sections having min. yield stress of 345 N/mm2 .
- Anchor bolts, Brace or Sag Rods: Material having min. yield stress of 240 N/mm2..
- Bolts and Nuts : High tensile conforming to ASTM A-325M for primaries and ordinary ASTM A307M for Secondary.
- Sheeting conforming to ASTM A792M (or) AS1397, Coating AZ150.For Trapezoidal Y.S 550 N/MM2,
- **Primary Built up members :**
- Cleaning: Sweep Blasting
- Primer: 1 coat of Red Oxide DFT 30 microns
- The Anchor Bolts shall be Black Steel.
- Secondary Cold Formed members shall be 120GSM
- **ROOF SHEETING**

  single skin Galvalume 26g painted Galvalume
- **WALL SHEETING**
- single skin Galvalume 26g painted (STD Color)
- Insulation Fibreglass 50mm thk. 16 Kg/m3 density with Aluminium facing for roof area.

1. BUILDING ADDITIONS: NA

2. STANDARD PRODUCT SPECIFICATIONS

A Standard System shall be made up of primary members, secondary members, connections, roof sheeting, wall sheeting, sheeting fasteners, sealer, closures, ridge caps, flashing and trim, gutters and downspouts.

PRIMARY MEMBERS:

Primary structural framing shall include the transverse rigid frames, lean-to-rafters and columns, canopy rafters, interior columns (beam and column frames), bearing frame rafters and corner columns and end wall wind columns.

SECONDARY MEMBERS:

Secondary structural framing shall include the purlins, girts, eave struts, wind bracing, flange bracing, base angles, clips and other miscellaneous structural parts.

PAINT OF STRUCTURAL MEMBERS:

All structural members shall be cleaned by wire brushing to remove dirt, grease, oil and loose mill scale and given one shop coat of red oxide, air drying & two coats of synthetic enamel on site.

CONNECTIONS:

All field connections shall be bolted (Unless otherwise noted). Primary bolted connections shall be furnished with high strength bolts conforming to the physical specifications of ASTM A325 (or equivalent). Secondary bolted connections shall be furnished with machine bolts

PHYSICAL SPECIFICATIONS OF STRUCTURAL MEMBERS:

Members fabricated from plate or bar stock shall have flanges and webs joined on one side of the web by a continuous welding process and will conform to the physical specifications of ASTM A 570 (Grade 50) or equivalent and having a minimum yield strength of 50,000 P.S.I. (345 MPa). Members fabricated by cold forming process shall conform to the physical specifications of ASTM A570 (Grade 50) or equivalent and having a minimum yield strength of 50,000 P.S.I (345 MPa). Members fabricated from hot rolled structural shapes shall conform to the physical specifications of ASTM A572 (Grade 36) or equivalent and having a minimum yield strength of 36,000 P.S.I. (250 MPa). Rod and angle bracing shall conform to the physical specifications of ASTM A36 (or equivalent) and having a minimum yield strength of 36,000 P.S.I. (250 MPa). Roof and wall cladding shall conform to the physical specifications of ASTM A 653 (or equivalent) and having a minimum yield strength of 50,000 P.S.I. (345 MPa). All other miscellaneous secondary members shall have minimum yield strength of 36,000 P.S.I. (250 MPa).

ROOF SHEETING / WALL SHEETING :

BASE METAL:
Providing and fixing trapezoidal profile sheeting having high crest height of 28mm at 196mm c/c with a cover width of 980mm. In between the two crests there are two additional small ribs to provide extra strength to the sheet. The side lap is provided with anti-siphoning flute for perfect water tightness.
The base steel shall be Bare / Colour coated Galvalume / Zincalume steel, made out of 0.50mm TCT (Total Coated Thickness) having tensile strength of 550mpa. The steel will have a metallurgical coating of 150gsm of aluminium and zinc alloy (both sides inclusive) comprising of 55% aluminium + 43.5% zinc + 1.5% silicon as per ASTM A-446 Grade E / ASTM A-792 OR AS: 397.
The profiled sheets shall be supplied up to 12 Mt long in single sheet to minimize the longitudinal joints.

COLOUR COATING :
The organic coating will consist of 20 - 25 microns of Silicon Modified Polyester / Super polyester paint inclusive of 5 - 7 microns of corrosion inhibiting primer. The reverse side will be as per manufacturer's standard backer coat.

SHEETING FASTENERS :

Standard fasteners shall be No. 14, Type A, self tapping sheet metal screws with metal and neoprene washers. All screws shall have hexagonal heads and made of zinc plated steel.
Fasteners to be used will be self-drilling self- tapping type of the best quality as per AS-3566 Class 3 approved, which should compatible to be used with Galvalume / Zincalume steel sheets.

SEALER / ROPE SEAL :

This is to be applied around Skylights and self flashing windows. Sealer shall be 6mm wide x 5mm thick, asbestos fiber filled pressure sensitive Butyl tape. The sealer shall be non asphaltic, non shrinking non drying and non toxic and shall have superior adhesion to metals, plastics and painted surfaces at temperatures from - 51 deg.'C' to + 104 deg. 'C'.

CLOSURES / FILLER STRIPS :

Solid or closed cell E.T.P. (Ethylene Polypropylene Terpolymer) closures matching the profile of the panel shall be installed along the eaves, rake and other locations specified on LCPL drawings.

RIDGE CAP:

A formed panel matching the material color, slope and profile of adjoining Kolor Metal roof panels.

FLASHING AND TRIM :

Flashing and/or trim shall be furnished at the rake, corners, and eaves, framed openings and wherever necessary to provide weather tightness and finished appearance. Color shall be white for rake and eave flashings and color of wall for corner flashings unless otherwise specified by client. Material shall be 26 G thick conforming to the physical specifications of ASTM A446 Grade C or equivalent and having minimum yield strength of 36,000 P.S.I. (265 MPa).
These shall be formed out of the same substrate and corresponding thickness as that of the roofing / cladding sheets and shall be supplied in standard lengths of 2.5mm or as directed in the required shapes and girths and fixed by means of hex-head mechanically galvanized stitching screws with EPDM washers.

EAVE GUTTERS AND DOWNSPOUTS:

Eave gutters shall be box shaped, color coated, and 0.5mm nominal thickness (26 gauges) galvanized steel. The outside face of the gutter shall be supported with color coated 0.5mm nominal thickness (26 gauges) galvanized straps to the eave member at a maximum spacing of 3m. Downspouts shall be rectangular shaped, color coated 0.5mm nominal thickness (26 gauges) galvanized steel. Downspouts shall have a 45 degree elbow at the bottom and shall be supported by attachment to the wall covering at 3.0m maximum spacing.

STRUCTURAL FASTENERS:

Primary structural connections are made with electro galvanized (silver) high strength bolts Gr. 8.8 steel conforming to IS 3757. Purlins & girts are connected to their supporting members by machine bolts Gr. 4.6 steel conforming to IS 1363 electro-galvanized (yellow). Anchor bolts are made of rods conforming to ASTM F1554 with minimum yield strength of 250 MPa. Roof & wall panels are fastened by No. 12 carbon steel self-drilling screws hot-dip galvanized with polymer coated finish with an integral washer head to which an EPDM Elastomeric layer is bonded.

POLYCARBONATE SHEET.

• Impact Strength

The impact strength of solid PC sheet is 200 times that of glass.

• Light Weight
the weight of solid PC sheet is only about half of glass, and the weight of hollow PC sheet is only about one twelfth at the same thickness.

• Transparency
The light transmission of 3mm solid PC sheet is 88%, and the light transmission of 6mm hollow PC sheet is 80%.

• UV-Protection
PC sheet is co-extruded with a high-density ultra violet ray absorbent to fight against ultra violet ray, while keeping the PC sheet from decoloring.

• Resistance to weather
PC sheet have good weather ability, it can maintain excellent properties in a wide temperature range from -40°C to +120°C.

• Inhibiting Condensation
When outdoor temperature is 0°C, indoor temperature is 23°C, PC sheet will not get condensation even with relative humidity as high as 80%.
• Thermal Insulation.
The K-value of glass is 1.2 times that of solid PC sheet and is 1.7 times that of hollow pc sheet. So PC sheet can prevent heat loss and save more energy.

• Sound insulation.
The hollow from and polycarbonate resin offer significant advantage to the sound insulation.

• Flame Resistance.
Through testing by National Center for Quality Supervision & Testing of Fire Building Materials, each behavior of the material conforms to the standard of difficult-flammability material. PC sheet is rated Class B1 according to QB8624-1997.

• Easy Installation
PC sheet can be bent while hot or cold. It is possible to construct curved roofs and windows. The minimum radius of curvature of PC sheet is 175 times of its thickness.

• Technical data:

Impact strength (J/m): 850
Light transmission (%): 88
Specific gravity (g/cm3): 1.2
Coefficient of thermal expansion (mm/moC): 0.065
Servide temperature (°C): -40°C to +120°C
Heat conductivity (W/m2oC): 2.3-3.9
Tensile strength (N/mm2): ≥60
Flexural strength (N/mm2): 100
Modulus of elasticity (Mpa): 2400
Tensile street at break (Mpa): ≥65
Elongation at break (%): >100
Specific heat (KJ/kg•K): 1.17
Heat deflection temperature (°C): 140
Effect of soundproof (10mm hollow): decay 20db

3. List of Approved Makes

A Structural

Steel Authority of India.
Essar Steel
TISCO
Jindal

B Paint

Asian Paints
Berger Paints
ICI Paints/ICI India Ltd.
Shalimar Paints
Nerolac Paints

C Welding Consumable

Advani Oerlikon Ltd
Essab
D&H

D Polycarbonate sheet

GE
Jindal

E Galvalume sheet

JSW Steel
TATA Bluescope
Bhushan Steel Ltd.
Steel Authority of India Ltd.

Manufacturers Test Reports for Structural Steel, Radiographic/Utrasonic Test reports for welded joints, Paint Quality Test, Roofing & Cladding Galvalume Sheets, Turbo ventilators to be submitted along with the materials while procuring on construction site.

SPECIAL SPECIFICATIONS

CONTENTS

1.1 SITE OFFICE FOR THE ENGINEER

1.1.1 Provision of Site Office

The successful Tenderer is to provide and maintain a site office at a location approved by the Engineer / Construction Manager in consultation with the Employer, within 15 days from the date of issue of Notice to Proceed.

1.1.2 Furnishing of the Site Office for the Engineer

A separate Engineers office as specified in the contract data shall be provided. This Engineers office shall be of standard quality and furnished. The maintenance of this Engineers office is also the responsibility of contractor. If the same is not handed over a penalty amount of Rs. 5000 may be deducted from Contractor's Bill.

1.1.3 Surveying Equipment

1.1.3.1 The Contractor shall provide at the site, at his own expense, set of surveying and measuring equipments as specified in the contract data. The set shall be used by the Contractor for requirement at site and also shall be made available from the commencement of contract for the use of the Engineer's Representative. The set shall consist of the following instruments:

1.1.3.2 All equipment shall be supplied with their tripods, staff and such other equipment/item as the Engineer's Representative may require for the measuring, or setting -out of the work.

1.1.3.3 The Contractor shall be solely responsible for the maintenance of all such instruments and equipment and shall ensure they are, at all times, in good repair and adjustment. All equipment other than expendable items shall revert to the Contractor upon completion of the works.

1.1.3.4 The Contractor shall provide the Engineer, throughout the Contract period, with all necessary assistants and chainmen to assist with surveying work. The assistant shall keep the survey equipment in good order.

1.2 LABORATORY AND LABORATORY TESTING

1.2.1 Description

1.2.1.1 Testing of materials and completed work shall be carried out by a site laboratory established and allocated exclusively for that purpose, all testing shall be carried out under the direction and supervision of the Engineer's staff. All tests shall be performed in strict accordance with the appropriate Indian Standards or other standards as approved by the Engineer.

1.2.1.2 Any testing relating to the Works as required by the Engineer which cannot be carried out in the site laboratory shall be carried out at the Contractor's expense, at an independent laboratory approved by the Engineer.

1.2.1.3 The provision of laboratory facilities on site, as specified, shall in no way relieve Contractor of the responsibility for providing additional laboratory space and testing equipment as necessary in order to control materials at mixing plants and elsewhere and enable him to fulfil his obligations under the Contract.

1.2.1.4 If for any verson a laboratory cannot be setup at site, all the tests shall be got done in a laboratory approved by the Engineer.

1.2.2 Laboratory Building

1.2.2.1 The Contractor shall provide, furnish, equip, keep clean and maintain to the satisfaction of the Engineer a laboratory building of a floor area not less than 30sq.m. The building shall be provided with electrical power, potable water, drainage, and shall have adequate daylight and artificial lighting.

1.2.2.2 The Laboratory shall be adequately staffed by the contractor with materials technicians and assistants in the numbers deemed necessary by the Engineer so that no interruption of unnecessary delay shall occur to construction activities due to delays in sampling or testing, in-site or in the laboratory, as

required by the Contract. The testing equipment provided in the laboratory shall be sufficient but not limited to carry out the following tests;

(a) modified Proctor compaction tests

(b) Field Density tests using core cutter and sand replacement methods

(c) Crushing strength of 150mm size concrete cubes.

(d) Sieve analysis

(e) Slump tests

The Contractor shall, at the Commencement of the Contract, submit a detailed list of the equipment he is proposing to provide showing for each item its type and model, serial number, manufacturer's name and year of manufacture for the Engineer's approval.

The testing of the works by the Engineer, in no way, absolves the Contractor from his responsibilities to carry out his own testing of the quality of his works and the materials used.

1.2.2.3 The laboratory building and equipment shall be used exclusively for the purposes for which they are intended and shall, together with all equipment, all samples and records, be open to inspection by the Engineer during all working hours.

1.2.2.4 The laboratory shall be fully operational within 15 days of commencement of Contract and remain so until all work in the opinion of the Engineer is complete. A sum of Rs. 5000/ day will be deducted from the money due to the Contractor for each day over the 15 day limit, for failure on the part of the Contractor to provide the laboratory to the Engineer's satisfaction. At the end of Construction the laboratory building with furniture and equipment shall revert to the Contractor. The laboratory shall not, however, be removed from site without the prior consent of the Engineer.

1.2.2.5 If in case the tests are to be done in an approved laboratory, such an approval shall be obtained from the Engineer within 15 days of commencement of Contract; in such cases the Clause 1.2.2.4 will not apply.

1.2.2.6 2 Vernier Callipers and 2 Screw Gauges having 0.01 mm least count shall be made always available at site by the Contractor

1.2.2.7 After removal of the laboratory the Contractor shall clean and level the site removing all foundations, drain water pipes and other services installed for the laboratory and return the ground to its original condition.

1.2.3 Contractor's Senior Materials Technician

1.2.3.1 The Contractor shall provide a full-time senior materials technician to be responsible for the day-to-day activities of the laboratory and for site testing. He shall be directly and solely responsible to the Engineer or designated members of his staff. The senior materials technician shall have not less than ten years experience of the testing of earthworks and pavement materials and their construction, including asphalt concrete, and of concrete for structures, and shall be fully converse with the testing of materials as per latest Indian Standards. The experience and qualifications of the senior materials technician shall be to the approval of the Engineer.

1.2.4 Sample

1.2.4.1 The Contractor shall submit samples of all materials and goods for inclusion in the works to the Engineer and only those approved by the Engineer and to the standards specified elsewhere in the Contract may be ordered for supply. Samples shall be submitted promptly in order not to delay the works.

All work executed shall be of equal standard in all respects to the approved samples and the Engineer may reject any work which, in his opinion, does not comply with the approved samples.

1.3 SITE SURVEYS, SETTING OUT AND DESIGN DETAILING

1.3.1 Description

The Contractor shall be responsible for the true and proper setting-out of the works in relation to the lines and levels of reference given by the Engineer or shown on the Drawings and for the correctness of the position, levels, dimensions and alignment of all parts of the works and for the provision of all necessary instruments, appliances and labour used in connection therewith.

He shall carry out a detailed survey of the site in advance of his commencement of Construction work, and shall supply full details to the Engineer as specified in the following sub clauses.

All setting out and levelling shall be based on permanent Benchmarks obtained from the Local Authority.

1.3.2 Existing levels and Layouts

1.3.2.1 Before commencing operations of any section of the works, the Contractor shall survey all existing detail in that section, in plan and in level and shall plot the results in such detail and to such scales as shall be to the satisfaction of the Engineer. These survey plots shall be supplied to the Engineer at least two weeks in advance of the search for services specified in the specification and, in any event, at least four weeks before the intended commencement of construction on the section. Unless otherwise instructed by the Engineer the detailed survey plots will be supplied in 1:200 scale and printed on high quality transparent draughting medium as approved by the Engineer.

1.3.2.2 In addition to the requirements of Sub - clause 1.3.2.1 above, horizontal control lines shall be marked out by pegs at intervals of not more than 20m and the lines traversed with theodolite by steel band or by any other method acceptable to the Engineer. The alignments established shall be referenced by pegs offset at suitable distance on each side of the horizontal control lines. These offset pegs shall be painted in a conspicuous colour.

1.3.2.3 Cross sections of the existing ground and of the ground after completion of earthworks shall be taken at intervals not exceeding 20m along the horizontal control lines in an approved and acceptable manner.

1.3.3 Bench Marks and Survey Points

1.3.3.1 As the work proceeds, the contractor shall establish, at suitable location, substantial permanent benchmarks, clear of the works, from which, all subsequent setting out and levelling shall be carried out. The location of the benchmarks shall be agreed with the Engineer before they are established.

1.3.3.2 Benchmarks shall be constructed in class 20/20 concrete, with minimum dimensions of 0.3m x 0.3m, the upper surface being approximately 50mm above ground level. A 20mm diameter mild steel rod, not less than 300mm in length, shall be cast into the concrete so that it projects about 10mm above the centre of the surface of the concrete. The concrete surface shall be clearly engraved with the reference number of the benchmark. The co-ordinates and level of each benchmark shall be determined in metres to 3 decimal places.

1.3.3.3 The Contractor shall check co-ordinates and levels of benchmarks at monthly intervals and immediately notify the Engineer of any discrepancies.

1.3.4 Survey, Design, Working and Shop Drawings

1.3.4.1 The Contractor should note that the Drawings and Quantities in the Tender Documents, whilst detailed, have to be considered as preliminary, and only provide and indication of the locations, layouts and scope of works. The locations, layout and scope of works may be altered and in such cases the Contractor shall not be entitled to any claim whatsoever for such alterations over and above the measured works or measured variations at the tendered rates except in accordance with the provisions of relevant Clauses of the Conditions of Contract.

1.3.4.2 Subject to the above limitation, design detail will be provided by the Engineer in advance of the Contractor’s intended commencement of construction as indicated in his approved construction programme or as otherwise agreed with the Engineer.

1.3.4.3 Should any Contractor's proposals for the any specialised items differ in entirely or substantially from that of the Engineer's or should it affect another component of the element or item of work beyond permissible variations from it, then the Contractor shall, at his own cost, be responsible for redesign to provide a complete acceptable system before approval of any part thereof. For such works, the Contractor shall furnish, at his own expense, the Engineer with copies of all design calculation, sketches, working drawings and similar information in as much detail as the Engineer may reasonable require for his full information and subsequent approval.

Such approval of the Contractor's design shall not relieve the Contractor from any of his duties, responsibilities or obligations under the Contract.

The above design work to be undertaken by the Contractor or his approved subcontractor shall be in accordance with f current practice generally using accepted design techniques in accordance to international standards or as specified in the relevant Tender Document all to the approval of the Engineer.

1.3.4.4 Contractor shall prepare the working drawings/shop drawings and documents, including diagrams and schedules shall show the details of proposals for the execution of the works and shall include everything necessary for the following purposes :

To illustrate in detail the arrangement of the various section of the works and to identify the various components.

To integrate the various sections of the works.

The shop drawings required shall include but not be limited to the following

General layout drawings for equipment and like items as deemed necessary by the Engineer.

a) Detailed layout drawings all lift stations and pumping stations, showing the connection of mechanical and electrical services, ducting, paper work, conduit, cable tray and trunking together with earthing system

b) Detailed layout drawings showing sections such as through ceiling voids and vertical shafts.

c) System diagrams, circuit diagrams and wiring diagrams for all installations and equipment.

d) The drawings, specifications and technical information for materials and equipment of building components such as doors, windows etc.

1.3.4.5 Working drawings and documents shall be made available in sufficient time in order to maintain the Programme of Work on site.

The Contractor shall liase with the Engineer for the period required for any approval, which shall be a maximum of two weeks.

The Contractor shall ensure that all items to be ordered by him can be accommodated in the positions shown on the drawings and for taking all necessary dimensions on site together with any supporting information which may be necessary for preparing working drawings.

Materials or equipment shall be ordered nor construction of the associated works be commenced until such approval has been obtained from the Engineer.

The Contractor shall be deemed to have obtained a full and proper understanding of the Engineer's design and design intents and to have satisfied himself with their accuracy and suitability. In this respect, the Engineer will meet all reasonable requests made by the Contractor in furnishing design information and the like to he Contractor. No claim in respect of lack of knowledge will be admissible.

1.3.5 Construction Levels

Before commencement of construction, the Contractor shall conduct a detailed topographic survey of each road in the project and submit to the Engineer, for approval, the following:

(a) Tabulated control levels to which the works are to be referred to. Co-ordinates of each salient point shall be determined in metres to 3 decimal places.

(b) Plan of the proposed road showing the location of the asphalt carriageway. The drawing shall clearly indicate the location of the boundary walls wherever available. Where boundary walls are not available the survey should show the extent of the right of way of the road. The existing services, as determined by site excavation, should also be marked up on these plans.

(c) Profile of the existing road as directed by the Engineer

(d) In the dual carriageway, profile shall be drawn for both carriageways.

1.4 SOIL INVESTIGATION AND REPORT

1.4.1 A soil investigation has been undertaken during the Design phase. However in case additional investigations are required during the course of construction the Contractor shall be advised of such requirement and the Contractor shall promptly carry out such investigations as advised by the Engineer.

1.5 PROGRESS PHOTOGRAPHS

1.5.1 The Contractor shall submit to the Engineer each month, throughout the period of the Contract, progress photographs as mentioned in the General conditions of the contract, taken at the direction of the Engineer. The camera used for this purpose shall be such that the date is printed out.

1.5.2 In addition copies of previously selected progress photographs and mounted in three separate and suitable albums shall also be delivered to the Engineer on the Preliminary Handing-over of the works. The arrangements for the progress photographs are subject to the approval of the Engineer and shall be discussed at as early a date as possible so that complete coverage can be assured.

1.6 NOTICE BOARDS

The Contractor shall provide, erect and maintain for the duration of the contract, two steel framed timber notice boards for the works, in location approved by SPV and the Engineer's Representative.

Notice Boards shall have a block board panel size of around 3m as detailed on the Drawings or equally approved. Prior to sign writing, the board shall be painted with two coats of white oil based paint back and front. The board shall be supported above the ground on steel struts painted matt black and fixed into concrete foundations, all to the approval of the Engineer. The sign shall be painted by a skilled sign writer to show the details described in the Contract. The Contractor is responsible for obtaining all necessary approvals for the erection of these notice boards.

Under no circumstances, shall sub-contractor's or supplier's name boards be fixed on hoarding or elsewhere on site.

1.7 ADVERTISING

1.7.1 Neither the Contractor nor any of those in his employment shall give information concerning the works for publication in any form without the written approval of the Engineer.

1.7.2 Neither the Contractor nor any of his sub-contractors shall erect placards or advertisements within the site other than the notice boards permitted under the relevant Clauses.

1.8 SITE SAFETY

1.8.1 Site Safety

In order to improve the general vehicular traffic condition and to guarantee public safety from and around the work the Contractor shall provide all labour, and materials, and construct and maintain temporary traffic diversions through out the construction activities, to the directive and approval of the Engineer. It is therefore recognised that there is a particular responsibility placed upon the Contractor to take special precautions for public safety and to minimise the scale and extent of disruption. Plans for diversion shall always be submitted to the Engineer for prior approval.

1.8.2 Safety on Site

1.8.2.1 The Contractor shall ensure that the works are carried out in a safe manner. According to internationally accepted guidelines on safe working procedures and to the satisfaction of the Engineer.

1.8.2.2 The following requirements shall be complied with by the Contractor:

a) Excavation - All excavations shall be adequately supported to avoid collapses and effective safety barriers shall be erected with warning signs and devises around all open excavations to the satisfaction of the Engineer.

Struts and walling shall not be used as ladders and for the purpose of access to the base of excavation the Contractor shall provide proper ladders which shall be suitably secured.

Reflective wearing shall be worn by all workmen on or close to a highway and, where necessary, temporary road signs and cones shall be provided to ensure a safe working area.

b) Protective Clothing - The Contractor shall ensure that all personnel on site are supplied with the necessary protective clothing such as safety helmets, goggles, face masks, ear muffs, gloves, boots, etc. which are required for the operations being performed.

c) Scaffolding - Suitable and sufficient scaffolds shall be provided and properly maintained for all work that cannot safely be carried out from the ground or from part of the structure or from a ladder.

Every scaffold shall be of good construction, of suitable and sound material and of adequate strength for the purpose for which it is used. Unless designed as an independent structure, every scaffold shall be rigidly connected to a part of the structure which is of sufficient strength to afford safe support. Protective headgear shall always be worn.

d) Lifting Device - Every rope, chain, pulley, bloc, hook, winch, crane or other lifting gear used for raising or lowering loads of as a means of suspending them shall be of good construction, sound material, adequate strength and free from defects. They shall be properly maintained and tested at regular intervals by a competent person, who shall be to the approval of the Engineer.

e) Working in existing manholes etc. , - Checks shall be carried out before entry to ensure that the atmosphere is fir for respiration and no smoking naked lights or flames are to be permitted in any sewer, manhole of chambers or adjacent to them when these are open

The equipment which shall be made available shall include but not limited to:

a) Gas detector lamps with lead acetate papers.

b) Lifting harness with ropes

c) Handlamps with spare batteries

d) First aid kit.

e) Protective head gear.

f) Rubber Gloves.

g) Breathing apparatus.

1.8.2.3 Throughout the period of the Contract, the Contractor shall provide safety helmets and high reflectivity jackets to all Consultant's staff and visitors. Barriers must be provided to all excavations for the safety of the public and flagmen must be used for all items of plant for the safety of the operatives, supervision staff and members of the public.

1.8.3 Vehicular Movement

1.8.3.1 Before commencing the works, the Contractor shall consult with and obtain from the Employer and the Engineer their requirements for temporary safety signs, road markings, lighting and other measures necessary to ensure the safety of the public, and shall comply with these requirements will not relieve the Contractor of his obligations under the Contract. The Contractor shall also take a No Objection Certificate from Consultants supervising other Contracts in the area, get details of newly installed and temporary services and obtain access requirements for other contractors.

1.8.3.2 The Contractor shall deploy, as a full time member of his site staff for the duration of the contract, whose duties shall include the production and implementation of safety management schemes. Qualification and experience of the safety management staff shall be subject to the approval of the Engineer.

1.8.3.3 Throughout the Contract, the Contractor shall maintain vehicular and personnel access to all parts within the site at all time.

Adequate warming and direction signs are to be erected wherever necessary and diversions are to be maintained in good condition to the satisfaction of the Engineer.

1.8.3.4 Temporary diversions shall be constructed and maintained to the standards approved by the Engineer. Upon completion of the Permanent works, the temporary diversions shall be removed and the site restored to the satisfaction of the Engineer.

1.8.3.5 All diversions and safet sign boards must be constructed and maintained to the highest standards with regular washing of cones and daily maintenance of flashing lights. The signs and cones should be self-stabilising, and if extra stability is required only small sandbags should be used.

1.8.3.6 All stockpiles of material to be used in the works must be fenced off and all unsuitable material must be removed from site on a daily basis and not stockpiled on site.

1.8.3.7 Payment for safety management shall be considered as included in the various pay items of B.O.Q. deductions to be made, from moneys due to the Contractor, for failure on the part of the Contractor to provide adequately for safety and for the accommodation of safety management plan.

1.9 SERVICES

1.9.1 Contractor to establish location of Services

Before the Contractor may proceed with the Works in any given area he is required to establish the precise location of all services in that area as executed by other contractors.

1.10 AS BUILT RECORDS

1.10.1 On or before the completion of the works, at the direction of the Engineer, the Contractor shall prepare detailed drawings and other records, as required, of the works executed. The Contractor is required to submit the soft copy as well as two hard copies of the as built records to the scale advised by the Engineer.

1.11 PROGRAMME OF WORKS

1.11.1 In respect of the programme of works required under Clause 17 of the General Conditions of Contract the following specific requirements shall apply: -

- The works shall be programmed in such a way as to minimise disruption to other works
- Works shall not be carried out simultaneously over large areas of the site but shall be sequenced so that all operations likely to cause disruption to other works shall be undertaken and completed in discrete area before commencement of operations in other areas.
- Works, which, by their nature, will create disruption and / or obstructions to other works, shall be programmed to be undertaken in a continuous sequence of events from the initial disruption until the restoration of access without and significant delay between operations.

1.11.2 The Contractor's Programme of Works, submitted in accordance with Clause 17 of the Conditions of Contract, shall be subject to the approval of the Engineer and of Employer, the Contractor has not properly achieved the objectives of the programme, then they may require the Contractor to revise his Programme and the Contractor shall do so forth, for this reason the Contractor is advised to liaise closely with the Engineer during the production of his Programme.

1.11.3 The Contractor should note that when a phase or phases of the works is/are programmed to be completed before commencement of another phase, the Contractor may not commence work on the later phase until the former phase is completed, even if the former phase overruns its allocated construction time, without the specific permission of the Engineer's Representative.

1.11.4 In addition to the Works Programme required under Clause 17 of the Conditions of Contract, the Contractor shall produce individual programmes for each element of the works likely to cause significant disruption to other works, for the approval of the Engineer and prior to commencement of the element of the works, clearly showing the sequencing of construction operations is such a manner as to minimise the duration of the disruption.

1.11.5 The Contractor shall note that different work in various parts of site by other contractors may be in progress or may commence during the Contract Period. It will be the Contractor's responsibility to liase with contractors on adjacent sites in order to ensure the detail progress. The Contractor's Programme will be phased and will make full allowance for the need for a co-operative timing with adjacent contractors.

1.12 CONTRACTOR'S OFFICES, YARD, STORES AND PLANT AREA

1.12.1 The Contractor's main office shall be located in the general vicinity of the Engineer's office, on land to be provided, by the Contractor, for the duration of the project. The Contractor's main office shall be used for the purposes of administering the Project but may not be used for the storage of construction materials nor for storage or maintenance of plant and shall not be allowed to become unsightly.

1.12.2 The Contractor's other offices, yard, stores and plant area shall be provided, by the Contractor, at location(s) to the approval of the Employer. The Contractor shall be responsible for all associated expenses including rents, assessments or temporary occupation license fees, establishment, running and maintenance costs, the supply of all services, as well as the obtaining of any appropriate No Objection Certificates.

1.12.3 Within 7 days of the Commencement date of the Contract, the Contractor shall submit, for the approval of the Engineer, a drawing showing detailed plans for his offices, yard, stores and plant area, together with al sanitary arrangements, and for the supply of water and electricity. Until the Engineer has given his approval in writing, no construction of any of the Contractor's facilities shall commence. The area shall be fenced in accordance with the Engineer's approval.

1.12.4 The Contractor shall not be permitted to erect temporary building or structures elsewhere without the specific permission in writing of the Engineer, including approval of the dimensions and specifications of such buildings or structures and their location.

1.12.5 The Contractor shall take all steps necessary as directed by the Engineer to minimise or eliminate dust, noise or any other nuisance, which may occur. Plant emitting dust, smoke, excessive noise or other nuisance shall not be permitted to be sited at any location which shall cause nuisance to any building or other installation, whether complete or under construction, site offices, camps, or other similar buildings.

1.12.6 Under no circumstances shall overnight accommodation be permitted on site except for Site watchman in carrying out their duties.

1.12.7 Throughout the period of the Contract, the Contractor shall maintain the area of his operation within the limits of the site in a clean, tidy and safe condition by arranging materials and the like in an orderly manner. All rubbish, debris, waste materials and the like shall be systematically cleared from the site as it accumulates.

1.12.8 The Contractor shall satisfy himself as to the means of access to the site and other relative items affecting him, his sub-contractors and suppliers.

1.12.9 Upon completion of the Contract, or, in the case of facilities required by the Contractor during the Period of Maintenance, on completion of the period of maintenance the Contractor shall remove all buildings and other facilities from the site including all foundations and services, clean and level the site and restore the ground to its original condition.

2.1 SITE PREPARATION

2.1.1 General

The Contractor shall maintain close liaison with the Engineer and the Employer and shall obtain their approval prior to removal of any service installation. Where external Service Authority installations are to be removed, they shall be removed after the existing facilities have been

relocated and commissioned or after they have been redundant and after any electrical supply has been made safe by the Authority or the Contractor whichever is appropriate.

"Site clearance" shall include the demolition/removal of all plants, bushes, underground structure, foundations, manholes, chambers, drains, septic tanks, cesspits, soak away, pipelines, undergrowth, trees (of any girth), tree stumps, buildings, services, rubbish and debris which are required to be cleared to construct the Works. Site clearance as directed by the Engineer shall include clearing and grubbing for the road corridor. The rate shall include for backfilling with suitable material all voids created by the removal of above mentioned items.

It is deemed that except for the items mentioned in this bill, costs of all other works in connection with site clearance are included in various pay items of other bills.

2.1.2 Removal of Trees

a) General

1. This item consists of the removal of trees of any girth, their disposal as instructed by the Employer and Engineer and the backfilling of the hole left after uprooting the tree.

2. If any tree is conflicting with the road works then Contractor shall inform the Consultant.

Removal of trees shall be performed only after written approval from the Employer.

b) Measurement and Payment

Payment under this item shall be made per unit of trees removed.

The unit price shall constitute full compensation for the removal, hauling, disposing off of the tree of any girth as described herein and as directed by the Engineer and for all material, labour equipment, supplies and incidentals necessary to complete the Work.

No payment shall be made for the removal of bushes, stumps, roots etc., whose cost is considered as included in other pay items of the bill.

2.1.3 Removal of Fence

a) General

The Contractor shall take down existing fencing and gates within the Contract Right-of-Way as shown on the Drawings or as directed by the Engineer and shall ensure the provision of suitable terminal posts, tensions, tie wires, lengths of fencing or whatever is necessary to ensure the integrity of the remaining lengths of fencing and stop the entry of animals should the remaining fenced area be under cultivation or a plantation.

Prior to removal, the fencing is to be inspected by the Engineer to assess its suitability for re-use.

Sections of fencing designated by the Engineer as suitable for re-use shall be dismantled, removed and stored in a manner approved by the Engineer to leave all parts of the fencing system suitable for re-use and late re-erection as directed by the Engineer.

b) Measurement and Payment

Payment under this Item shall be made per linear metre of fence removed.

The unit price shall constitute full compensation for the works described herein and as directed by the Engineer and for all material, labour, equipment, supplies and incidentals necessary to complete the Works.

2.1.4 Removal of Concrete Structures

a) General

The Contractor shall remove wholly or in part and satisfactorily dispose of all structures (manhole, slabs, walls, building or any other concrete structure) as indicated on the Drawings or directed by the Engineer, and which are not specifically described under a separate Clause of this Specifications.

All material removed and all structures demolished shall be removed from the Work Site, hauled away and disposed off in approved disposal area and as approved by the Engineer.

The voids or depression which are the result of the demolition of structures shall be backfilled with borrow material as approved by the Engineer. Backfilling material shall be placed in horizontal layers of over 15 cm in depth and compacted to not less than 98%.

b) Measurement and Payment

Payment for the removal and disposal of all structures and related obstructions as described above will be at the cubic metre rate included in the Bill of Quantities which shall include all labour and equipment to demolish, remove the obstructions as building materials, concrete, debris etc., loading, hauling irrespective of haulage distance, disposing off all materials removed, and backfilling with borrow material and depression of voids, as indicated on the Drawing, specified herein and as directed by the Engineer.

LIST OF APPROVED MAKES/AGENCIES

FOR WORKS COVERED UNDER THIS CONTRACT

(A) All materials and products used in the work shall conform to the relevant standards/ specifications and shall be of approved make and design. Lists of approved manufacturers/ vendors for Civil works, Plumbing works, Fire fighting & Fire Alarm works, Electrical works etc. is given herein below. The approval of a manufacturer/ vendor shall be given only after review of the sample/specimen by the Engineer-in-charge. The complete system and installation shall also be in conformity with the "Applicable Codes Standards and Publications".

(B) List of Approved makes for Products, Materials and specialist agencies is given below. Other equivalent manufacturers may be considered with prior approval; however the decision of the Engineer-in-charge shall be final.

CIVIL WORKS

SL. NO.	ITEM	MAKE
1	GREY CEMENT	ACC, AMBUJA, JK UltraTech, OR OTHER BRAND WITH APPROVAL OF ENGINEER INCHARGE.
2	WHITE CEMENT	JK, BIRLA OR EQUIVALENT
3	REINFORCEMENT/STRUCTURAL STEEL	SAIL, TISCO, RINL, JINDAL
4	ANTI-TERMITE TREATMENT	PEST CONTROL INDIA LTD, PEST CON INDIA, PEST CONTROL INCORPORATED, OR ANY OTHER AGENCY TO BE APPROVED BY THE ENGINEER IN CHARGE

5	CONCRETE ADDITIVE	FOSROC, STP, CICO-TL, SIKA, PIDILITE
6	FLUSH DOORS	GREEN, DURO, CENTURY, MAYUR, JAYNA, ARCHID PLY, ALPRO
7	FIRE CHECK DOORS	GLOBAL FIRE PROTECTION COMPANY, RADIENT SAFE FIRE DOORS, GODREJ
8	PLYWOOD / BLOCK BOARD / SOFT BOARD	ANCHOR, DURO, MAYUR, GREEN LAM, CENTURY, ARCHID PLY, ALPRO
9	PRELAMINATED PARTICLE BOARD	ACTION TESA, NOVAPAN, ANCHOR, MERINO, GREEN LAM, CENTRURY, ARCHID PLY
10	LAMINATES	CENTURY, ROYAL CHALLENGE, MERINO,GREEN LAMP, ARCHID LAM
11	ADHESIVE FOR WOOD WORK	DUNLOP, FEVICOL, VAMICOL, PIDILITE
12 a)	POLYRETHANE SEALANT	MBT, CHOKSEY,PIDILITE
b)	SILICON SEALANT	DOWN CORNING, ALSTONE OR EQUIVALENT
13	POLYETHELENE BOARD	SUPREME OR EQUIVALENT
14 a.	ALUMINIUM EXTRUSIONS	JINDAL, HINDALCO, NARMADA, BHARUKA, INDAL, MAHAVIR OR EQUIVALENT
b.	STAINLESS STEEL	SALEM, JINDAL OR EQUIVALENT
c.	EXPANSION, FASTENERS	FISCHER, HILTI, ANCHORS, AXEL

SL. NO.	ITEM	MAKE
15	FLOAT GLASS	MODI GUARD, SAINT GOBAIN, ASAHI, ATUL
16	CERAMIC TILES	NITCO, KAJARIA, SOMANY, JOHNSON, SUNHEART, VARMORA
17	VITRIFIED PORCELINE TILES	NAVEEN DIAMOND TILES, NITCO, JOHNSON, MARBITO BRAND, RAK, KAJARIA, VARMORA, CT TILES
18	INTERLOCK TILES/GRASS PAVER BLOCKS/ KERB STONE	DALAL TILES, UNISTONE, MODERN OR EQUIVALENT
19	TERRAZZO TILES	NITCO, MODERN, A-1, NTC, DALAL TILES OR EQUIVALENT AS PER ISI SPECIFICATION
20 a)	CEMENT CONCRETE TILES	UNISTONE, ULTRA, DALAL TILES OR EQUIVALENT
b)	HANDMADE CERAMIC TILES	RAJA, ARIHANT, JAIN
21	ROOF WATER PROOFING	NINA CONCRETE SYSTEM PVT. LTD, C R S ASSOCIATES AND ENGINEERS PVT.LTD, CREATIONS,PIDILITE
22	PAINT	NEROLAC, JOHNSON & NICHOLSON, BERGER, ASIAN PAINTS, SHALIMAR
23	TEXTURED COATING	UNITILE, SPECTRUM, HERITAGE OR EQUIVALENT
24	DOOR FITTINGS	GODREJ, DOORSET, OZONE, INDOBRASS
25	LOCKS AND HANDLES	EVERITE, GODREJ, HARRISON, INDOBRASS
26	NON METALLIC HARDENER COMPOUND	FOSROC, S TP, PIDILITE, CICO
27	ROLLING SHUTTER	RAMA, PRAKASH, SANJEEV OR EQUIVALENT AS PER CPWD SPECIFICATIONS.
28	DOOR CLOSER	DOORSET, EVERITE, GARNISH, INDOBRASS
29	FLOOR DOOR SPRING	D-LINE,OZONE,DOORSET,EVERITE,INDOBRASS
30	HDF LAMINATED BOARD	ARMSTRONG, BVG, EGO FLOORS, SQUARE FOOT, ACTION TESA
31	EXPANSION FASTENERS	HILTI, FIHSER, GKW, AXEL
32	FASTENERS	HILTI, FIHSER, GKW, AXEL
33	GYPSUM CEILING	INDIA GYPSUM, LAFARGE
34	CALCIUM SILICATE BOARD FALSE CEILING	AEROLITE, HYLUX
35	PATCH FITTING	DORMA, GEZE, OZONE OR AS APPROVED
36	WORK STATION AND MODULAR FURNITURE	GODREJ, BP ERGO, FEATHERLIGHT, WIPRO
37	BLINDS	VISTA, MAX, ARMSTRONG
38	ADHESIVE	FEVICOL, VEMICOL OR EQUIVALENT
39	FURNITURE HARDWARE	UNIQUE, HATTICH INDIA, EBCO, EARL BEHARI.
40	LACQUERED GLASS	SAINT GOBIN, ASAHI, ATUL
41	MELAMINE POLISH	ASIAN PAINT, BERGER, SHALIMAR

	ELECTRICAL WORKS LIST OF APPROVED MAKES	
1	Switch Fuse Unit (HRC Type)	Schnider/GE/L&T/Siemens/C&S/Havells/MDS
2	MCB's, MCCBs, RCCBs, ELCB's & MCB DBs	Legrand / ABB / L&T /Siemens / Havells / C&S / Schneider / GE / Hagger / Anchor / Standard / Action
3	LT XLPE Aluminium Armoured cables upto 1100v	Plaza/Skytone/ National/Ralison/PYTEX/Paragon/ KEI
4	HT XLPE Aluminium Armoured cables upto 11000V	Skytone/ National/INCAB/ Nicco
5	Air Circuit Breakers	Schneider/ GE /L & T/Siemens
6	Terminals	Elmex /Technoplast
7	Lugs	Dowells/ Ismal
8	Glands	Gripwell/ Comet
9	Indicating lamps	L &T/ Siemens/Technique
10	Power factor correction relay	Syntron/ Avomec/Sigma
11	Indicating Instruments	Automatic Electric/ Rishab
12	KWH Meters	L&T/HPL SOCOMEC
13	Current Transformers	Automatic Electric/ Kappa
14	Selector Switches	Salzer-L&T/ Kaycee
15	Change over switches	HH Elecon/HPL
16	11 KV VCB/RMU Panel	Crompton/ABB/Siemens/Areva
17	Power Transformers	Crompton/ Kirloskar/ABB/Siemens
18	HT Jointing Kits	Raychem/ Mahindra/Denson/Cabseal
19	DG Sets- Engine.	Kirloskar/Cummins/Caterpillar/Mitsubishi
20	Alternator	Kirloskar /Stamford./Crompton/Mitsubishi
21	LT Panels, Fidder Pillars etc.	Ambit, Trikolite/KEPL/Madhu elect./SPC/ Amptech/ USHA Power/Precision System Control
22	Power Capacitors	Crompton/Siemens Apcos/Khatou
23	HRC Fuse Base & HRC Fuses	L&T/GE/Schneider/HPL
24	Sound Proof Acoustic Enclosures	DG suppliers
25	Lighting Fittings & Luminaries	Crompton/Philips/Wipro/BAJAJ/Havell's
26	PVC insulated 1.1KV grade copper wires	Plaza/Pytex/National/Ralison/RKG/Finolex/Polycb / Batra-Henlay/Havells
27	Piano/Modular Type Sockets & Switches	Roma(Anchor)/Legrand/MK/Crabtree/ Philips/ Clipsal/North West
28	Steel/PVC Conduit	BEC/AKG/ATUL/STEEL KRAFT/RKG
29	Ceiling/Wall/Exhaust fans	Crompton /Almonard /Bajaj/Usha/Orient
30	External lights	Bajaj/ Philips/ Decon/K-Lite/Metal Coat

b)	SILICON SEALANT	DOWN CORNING, ALSTONE OR EQUIVALENT
13	POLYETHELENE BOARD	SUPREME OR EQUIVALENT
14 a.	ALUMINIUM EXTRUSIONS	JINDAL, HINDALCO, NARMADA, BHARUKA, INDAL, MAHAVIR OR EQUIVALENT
b.	STAINLESS STEEL	SALEM, JINDAL OR EQUIVALENT
c.	EXPANSION, FASTENERS	FISCHER, HILTI, ANCHORS, AXEL

S. No.	Details of Materials / Equipments	Manufacturer's Name
1	G.I./M.S pipes.	Jindal Hissar, Tata or equivalent
2	G.I. pipes fittings.	Unik or equivalent
3	G.M. / Forged brass valves	Zoloto / Leader or equivalent
4	Sluice Valves, Non return valve	Kirloskar , Micon, Weir BDK, Advanced or equivalent
5	Valves	Kartar/Zoloto/Leader /C& R/Advance or equivalent
6	`Y' strainer	Emerald Enterprises / Zoloto or equivalent
7	Level Controller & Indicator (Water)	Technika / Minilec or equivalent
8	Paints	Asian Paints
9	Pressure Gauge	H Guru. Gauges Bourdon, GIC or equivalent
10	Flexible Rubber Expansion Joint	Kanwal Easyflex, Resistoflex or equivalent
11	Pumps	Kirloskar, Sam Turbo, KSB, Kishor, Grundfos, Johnson or equivalent
12	Fire Fighting Equipments	Minimax, Newage or equivalent
13	Welding Rods	Advani/Victor or equivalent
14	GI Hangers	Chilly/GMGR or equivalent
15	Rubber hose pipe	Deep Jyoti or equivalent
16	Underground Pipe Protection	IWC or equivalent
17	UPVC/ PVC Pipes	Supreme, Jindal, Jain Pipes, Ori Plast or as Approved or equivalent
18	HDPE Pipe	Supreme, Jain Pipe, Apollo or equivalent
19	RCC Pipes	Hindusthan Hume Pipe or equivalent
20	Ball Valves	Audco, Zoloto or equivalent
21	Ball Cocks	Audco, Zoloto or equivalent
22	CI Manhole Cover	Necco or equivalent
23	PVC Tanks	Sintex or equivalent
24	Air Valve	Indian, Amatic or equivalent
25	Ductile Iron Pipes	Electrosteel or equivalent
26	CPVC Pipes & fittings	Astral, Fowguard, George Fischer or equivalent

** equivalent makes to be approved by Client/Engineer-in-charge prior to installation*

SL. NO.	ITEM	MAKE
15	FLOAT GLASS	MODI GUARD, SAINT GOBAIN, ASAHI, ATUL
16	CERAMIC TILES	NITCO, KAJARIA, SOMANY, JOHNSON, SUNHEART, VARMORA
17	VITRIFIED PORCELINE TILES	NAVEEN DIAMOND TILES, NITCO, JOHNSON, MARBITO BRAND, RAK, KAJARIA, VARMORA, CT TILES
18	INTERLOCK TILES/GRASS PAVER BLOCKS/ KERB STONE	DALAL TILES, UNISTONE, MODERN OR EQUIVALENT
19	TERRAZZO TILES	NITCO, MODERN, A-1, NTC, DALAL TILES OR EQUIVALENT AS PER ISI SPECIFICATION
20 a)	CEMENT CONCRETE TILES	UNISTONE, ULTRA, DALAL TILES OR EQUIVALENT
b)	HANDMADE CERAMIC TILES	RAJA, ARIHANT, JAIN
21	ROOF WATER PROOFING	NINA CONCRETE SYSTEM PVT. LTD, C R S ASSOCIATES AND ENGINEERS PVT.LTD, CREATIONS,PIDILITE
22	PAINT	NEROLAC, JOHNSON & NICHOLSON, BERGER, ASIAN PAINTS, SHALIMAR
23	TEXTURED COATING	UNITILE, SPECTRUM, HERITAGE OR EQUIVALENT
24	DOOR FITTINGS	GODREJ, DOORSET, OZONE, INDOBRASS
25	LOCKS AND HANDLES	EVERITE, GODREJ, HARRISON, INDOBRASS
26	NON METALLIC HARDENER COMPOUND	FOSROC, S TP, PIDILITE, CICO
27	ROLLING SHUTTER	RAMA, PRAKASH, SANJEEV OR EQUIVALENT AS PER CPWD SPECIFICATIONS.
28	DOOR CLOSER	DOORSET, EVERITE, GARNISH, INDOBRASS
29	FLOOR DOOR SPRING	D-LINE,OZONE,DOORSET,EVERITE,INDOBRASS
30	HDF LAMINATED BOARD	ARMSTRONG, BVG, EGO FLOORS, SQUARE FOOT, ACTION TESA
31	EXPANSION FASTENERS	HILTI, FIHSER, GKW, AXEL
32	FASTENERS	HILTI, FIHSER, GKW, AXEL
33	GYPSUM CEILING	INDIA GYPSUM, LAFARGE
34	CALCIUM SILICATE BOARD FALSE CEILING	AEROLITE, HYLUX
35	PATCH FITTING	DORMA, GEZE, OZONE OR AS APPROVED
36	WORK STATION AND MODULAR FURNITURE	GODREJ, BP ERGO, FEATHERLIGHT, WIPRO
37	BLINDS	VISTA, MAX, ARMSTRONG
38	ADHESIVE	FEVICOL, VEMICOL OR EQUIVALENT
39	FURNITURE HARDWARE	UNIQUE, HATTICH INDIA, EBCO, EARL BEHARI.
40	LACQUERED GLASS	SAINT GOBIN, ASAHI, ATUL
41	MELAMINE POLISH	ASIAN PAINT, BERGER, SHALIMAR

	ELECTRICAL WORKS LIST OF APPROVED MAKES	
1	Switch Fuse Unit (HRC Type)	Schnider/GE/L&T/Siemens/C&S/Havells/MDS
2	MCB's, MCCBs, RCCBs, ELCB's & MCB DBs	Legrand / ABB / L&T /Siemens / Havells / C&S / Schneider / GE / Hagger / Anchor / Standard / Action
3	LT XLPE Aluminium Armoured cables upto 1100v	Plaza/Skytone/ National/Ralison/PYTEX/Paragon/ KEI
4	HT XLPE Aluminium Armoured cables upto 11000V	Skytone/ National/INCAB/ Nicco
5	Air Circuit Breakers	Schneider/ GE /L & T/Siemens
6	Terminals	Elmex /Technoplast
7	Lugs	Dowells/ Ismal
8	Glands	Gripwell/ Comet
9	Indicating lamps	L &T/ Siemens/Technique
10	Power factor correction relay	Syntron/ Avomec/Sigma
11	Indicating Instruments	Automatic Electric/ Rishab
12	KWH Meters	L&T/HPL SOCOMEC
13	Current Transformers	Automatic Electric/ Kappa
14	Selector Switches	Salzer-L&T/ Kaycee
15	Change over switches	HH Elecon/HPL
16	11 KV VCB/RMU Panel	Crompton/ABB/Siemens/Areva
17	Power Transformers	Crompton/ Kirloskar/ABB/Siemens
18	HT Jointing Kits	Raychem/ Mahindra/Denson/Cabseal
19	DG Sets- Engine.	Kirloskar/Cummins/Caterpillar/Mitsubishi
20	Alternator	Kirloskar /Stamford./Crompton/Mitsubishi
21	LT Panels, Fidder Pillars etc.	Ambit, Trikolite/KEPL/Madhu elect./SPC/ Amptech/ USHA Power/Precision System Control
22	Power Capacitors	Crompton/Siemens Apcos/Khatou
23	HRC Fuse Base & HRC Fuses	L&T/GE/Schneider/HPL
24	Sound Proof Acoustic Enclosures	DG suppliers
25	Lighting Fittings & Luminaries	Crompton/Philips/Wipro/BAJAJ/Havell's
26	PVC insulated 1.1KV grade copper wires	Plaza/Pytex/National/Ralison/RKG/Finolex/Polycb / Batra-Henlay/Havells
27	Piano/Modular Type Sockets & Switches	Roma(Anchor)/Legrand/MK/Crabtree/ Philips/ Clipsal/North West
28	Steel/PVC Conduit	BEC/AKG/ATUL/STEEL KRAFT/RKG
29	Ceiling/Wall/Exhaust fans	Crompton /Almonard /Bajaj/Usha/Orient
30	External lights	Bajaj/ Philips/ Decon/K-Lite/Metal Coat

QAP for Civil Works, Check Lists & Formats

Pre- Concrete Check List

Structure No. Date & Time of Concrete
Location Grade of Concrete
Source of Concrete Brand of Cement

Sr. No	Description	Approved		Observations & Remarks
		Yes	No	
1	**ALIGNMENT / LEVEL CHECK**			
2	**GENERAL CLEANLINESS**			
3	**FORM WORK**			
	a) Shutters- Smooth & Cleaned Surface			
	b) Application of Mould Oil			
	c) The roads, Supports / Props provided			
4	**REINFORCEMENT CHECKING**			
	a) Size (as per drawing)			
	b) Spacing (As per drawing)			
	c) Starter Bar			
	d) Lapping of bars			
5	**CEMENT**			
	a) Weight of cement per cum			
	b) Theoretical cement consumption			
	c) Actual cement consumption			
6	**REINFORCEMENT COVER**			
7	**WEEP HOLES PROVIDED**			
	a) Not Required			
	b) Not Provided			
8	**CONSTRUCTION JOINT REQUIRED**			
9	**EQUIPMENT VERIFICATION**			
	a) No of needle vibrators deployed			
10	**CONCRETE PLACEMENT ARRANGEMENT**			
	A) Using Pump			
	a) Joint / Fixing Checked			
	B) Direct			
	a) Platform placed			
	b) clean chute provided			
	c) proper gradient provided			
11	**CONCRETE VOLUME REQUIRED**			
12	**NO. OF CUBES CASTED**			
13	**RFI SUBMITTED TO QA/ QC**			
14	**PROPER ACCESS ROAD PROVIDED**			
15	**LIGHTING ARRANGEMENT FOR NIGHT WORKING**			
	a) No of spot lights provided			
16	**CURING ARRANGEMENT**			
17	**SAFETY REQUIREMENTS**			

	a) Proper Barricading done			
	b) Cautionary sign boards provided			
	c) Lights & Genset Arrangement for night works			
	d) First Aid Box			
18	**MISC**			
	a) Supervisors			
	b) Labours			

Contractor Representative

Consultant Representative

NAME OF PROJECT _____

CONTRACTOR CONTRACT NO.		**CHECK LIST FOR CONCRETING** REF DRAWING NO _____ LOCATION BLOCK _____ FLOOR _____ AREA_____			
LAYOUT	☐ Alignment Checked	☐ Level of base Checked	☐ Dimensional Check (edges & diagonals)	☐ Starters	☐ Location of cu-outs & services
STAGING/ SCAFFOLDING	☐ Adequacy & rigidity of Props, stays,bracings, Conformity to scheme drawings	☐	☐		
FORMWORK	☐ Qty of forms and support ☐ Props adequate	☐ Vertical form surface in alignment & plumb	☐ Even surface ☐ Oil sprayed	☐ Gaps between shuttering are ☐ Properly closed.	☐ No space for sagging of ☐ Form work
REINFORCEMENT	☐ Cutting & bending as per Bar bending schedule (schedules attached)	☐ Adequate laps ☐ Welds	☐ Chair/cover blocks ☐ Placed as per scheme	☐ Binding wire not ☐ Touching shuttering	☐ Fixtures, inserts ☐ Conduits in position
	☐ Dowels & positioning ☐ Provided as per drg.	☐ Walkway for ☐ Labour provided			
PRE-CONCRETING	☐ Concreting Arrangements	☐ Approval of Construction joint	☐ Mixer/vibrator Condition & mixing	☐ Top level of Concerete marked	☐ Transporting & Placeing arrangement
POST-CONCRETING	☐ Compaction ☐ Checked	☐ Removal of laitance	☐ Post concreting Level/dimensions.	☐ Nos of cubes cast	
DESHUTTERING & CLEARING	☐ Curing days------- ☐ Water/compound	☐ Surface finish ☐ OK	☐ Concrete Test ☐ Results OK		

W.O. Item	UNIT	QTY.

SIGNATURE:							
CONTRACTOR	DATE	SITE ENGR	DATE	SITE INCHARGE	DATE	CONSULTANT	DATE

NAME OF PROJECT_____

CONTRACTOR CONTRACT NO.	**CHECK LIST FOR MASONRY WORK** REF DRAWING _____ LOCATIONBLOCK_____FLOOR_____AREA_____	

LAYOUT	☐ Alignment & wall Thickness checked `	☐ Brick on edge (top course)		
SCAFFOLDING	☐ Adequacy of props, Stays, platform	☐ Rigidity of base	☐ Movement space	☐ Approach to height
PRE-LAYING	☐ Working arrangements & service provisions checked	☐ Bricks as per specification	☐ Mortar grade & mix As specified	☐ Bricks moistened
LAYING	☐ Joint thickness & course Ht. As specified	☐ Joint alignment Checked	☐ Vertical joints Properly mortar filled from top	
	☐ Raking of joints Done (if applicable)	☐ Bearing plaster for Concrete		
CURING AND CLEARING	☐ Proper curing of const. Joint.	☐ Scaffolding removed (if required)		

W.O. Item	UNIT	QTY.

SIGNATURE:							
CONTRACTOR	DATE	SITE ENGR	DATE	SITE INCHARGE	DATE	CONSULTANT	DATE

NAME OF PROJECT_____

CONTRACTOR CONTRACT NO.	**CHECK LIST FOR PLASTERING WORK** LOCATION BLOCK _____ FLOOR _____AREA _____	

SCAFFOLDING	☐ Platform	☐ Stability	☐ Movement space	☐ Approach to Height	
SERVICE	☐ All chasing work Complete	☐ Fixing in position Using clamps etc.	☐ Patching Work complete	☐ All door/window frames Fixed in position	☐ Skirting to floors marked
SURFACE PREPARATION	☐ Clearing & raking of Surface	☐ Roughening Hacking done	☐ Fixing metal/lathe Chicken mesh	☐ Mortar level Guides made	☐ Surface moistened/ Cement slurry
PLASTERING	☐ Mix & w/p compound Checked as per specification	☐ Coating/thickness As specified	☐ Groove at joints Provided	☐ Corners & edges sharp & at right Angles lines & levels maintained	☐ Surface leveled with At straight edge
FINISHING	☐ Texture	☐ Curing Days----------	☐ Site cleared	☐	☐

CLEARANCE FROM AE (E)

W.O. Item	UNIT	QTY.

SIGNATURE:							
CONTRACTOR	DATE	SITE ENGR	DATE	SITE INCHARGE	DATE	CONSULTANT	DATE

NAME OF PROJECT_____

CONTRACTOR CONTRACT NO.	CHECK LIST FOR LAYING OF EXTERNA SEWER REF DRAWING NO _____ LOCATION	

Excavation	☐ Layout	☐ Slope/cutting as per Specifications	☐ Level	
Laying /RCC pipes	☐ Bed concrete as per Specifications	☐ RCC pipes as per Requirement	☐ Jointing of pipes	
	☐ Boxing	☐ Strata bore Dewatering (wherever required)		
Manholes	☐ Bricks as per specifications	☐ Mortarasper specifications	☐ Plastering	
	☐ End of pipes plugged			
Back fillings	☐ In layers			

W.O. Item	UNIT	QTY.

SIGNATURE:							
CONTRACTOR	DATE	SITE ENGR	DATE	SITE INCHARGE	DATE	CONSULTANT	DATE

NAME OF PROJECT_____

CONTRACTOR CONTRACT NO.	CHECK LIST FOR SUB GRADE LOCATION FLOOR NO._____	

LAYOUT	☐ Alignment of center line as drawings	☐ Marking of carriage way edges as per drawing		
SUB GRADE PREPARATION	☐ Initial cross sectional levels recorded	☐ Cleaning & grubbing of vegetation and top soil as specified	☐ Watering & rolling as specified	☐ Cross section levels recorded after rolling
FORMATION LEVEL (FILLING)	☐ Depth of filling upto formation Level ----------mtr.	☐ Nosof layers upto formation level ----------	☐ Fill material	☐ Spreading, watering & rolling of layers on layer no.
	☐ % compajction of soil (Proctor test)	☐ Camber/slope Provided as drawing	☐ Formationcrosssectional levels recorded	

W.O. Item	UNIT	QTY.

SIGNATURE:							
CONTRACTOR	DATE	SITE ENGR	DATE	SITE INCHARGE	DATE	CONSULTANT	DATE

LIST OF MANDATORY TESTS					
S. No.	**Description of Material**	**Test**	**Reference of IS Code / Specification for testing**	**Field / Laboratory test**	**Frequency of testing**
1	**Cement**	Physical & chemical properties	IS : 4031	Lab	Initial Test-01 test for each brand of cement. Subsequently, 01 test for 200 MT or part thereof for each brand. Cement should be of approved brand and each lot should be accompanied by manufacturer's test certificates
2	**Reinforcement steel**	Physical & chemical properties	IS :1786	Lab	Initial Test-01 test for each brand and each dia of reinforcement steel , Subsequently - One test for every 35 MT or part thereof. Reinforcement Steel should be of approved brand and each lot should be accompanied by manufacturer's test certificates
3	**Water**	PH value, chlorides, sulphates, alkalinity test, acidity test, suspended matter, organic matter and inorganic matter	IS:3025	Lab	Initial Test- Source approval at commencement of work and Subsequently- every six months or change of source.
4	**Coarse Aggregate - Building works**	Gradation	IS 2386 – I	Field / Lab	Minimum one test for every 50 cum or part thereof.
		Deleterious material	IS 2386 - II	Field / Lab	
		Specific Gravity	IS 2386 - III	Field / Lab	
		Crushing value	IS 2386 - IV	Field / Lab	
		impact value	IS 2386 - IV	Field / Lab	
		10% fine value	IS 2386 - IV	Field / Lab	
5	**Fine Aggregate- Building works**	Organic impurities	Appendix 'A 'of chapter 3 ,CPWD Specifications	Field	Minimum one test for every 50 cum or part thereof.
		Silt content	Appendix ' C 'of chapter 3 ,CPWD Specifications	Field	
		Bulking of Sand	Appendix 'D 'of chapter 3 ,CPWD Specifications	Field	
		Gradation	Appendix 'B 'of chapter 3 ,CPWD Specifications	Field / Lab	

6	**Coarse Aggregate - Road , Pavement works**	Gradation	IS 2386 – I	Field / Lab	One test for everyday's work.
		Flakiness and Elongation Index	IS 2386 – I	Field / Lab	Once for each source of supply and subsequently on monthly basis.
		Deleterious material	IS 2386 - II	Lab	One test for everyday's work.
		Water Absorption	IS 2386 - III	Lab	Regularly as required subject to a minimum one test a day. This data shall be used for correcting the water demand of mix on a daily basis
		Los Angeles Abrasion Value/Aggregate Impact value	IS 2386 - IV	Lab	Once for each source of supply and subsequently on monthly basis
		Soundness	IS 2386 - V	Lab	Before approving the aggregates and every month subsequently.
		Alkali aggregate reactivity	IS 2386 - VII, IS:456	Lab	Before approving the aggregates and every month subsequently.
7	**Fine Aggregate - Road ,Pavement works**	Gradation	IS 2386 – I	Field / Lab	One test for everyday's work.
		Deleterious material	IS 2386 - II	Lab	One test for everyday's work.
		Water Absorption	IS 2386 - III	Lab	Regularly as required subject to minimum two test per day. This data shall be used for correcting the water demand of mix on a daily basis.
		Silt Content	Appendix 'C' of chapter 3 ,CPWD Specifications	Field	Minimum one test for everyday's work.
8	**Slump Test - Building Works**		Appendix 'D' of Chapter 4, CPWD Specifications	Field	Minimum one test for every 20 cum of concrete or part thereof
9	**Slump Test - Pavement Works**		IS 1199	Field	One test per each dumper load at both Batching plant site and paving site initially when work starts. Subsequently, sampling may be done from alternate dumper.
10	**Cube Test**				
(i)	**Reinforced Cement Concrete - Building works**	7 days and 28 days Compressive strength	IS 516	Lab	One sample of six cubes for every 50 cum or part thereof
(ii)	**Dry Lean Concrete (DLC) - Pavement Work**	7 days compressive strength	IS 516	Lab	One sample of five cubes for every 150 cum or part thereof
(iii)	**Pavement Quality Concrete (PQC) - Pavement Work**	Compressive strength, flexure strength	IS 516	Lab	2 cube set samples and 2 beam set samples per 150 cum or part thereof for each day production.
11	**Earthwork**				
		Gradation/clay & sand content	IS 2720 -IV	Lab	2 tests per 3000 cum or part thereof for each source.
		Atterberg's limit	IS: 2720-V	Lab	
		California Bearing Ratio	IS 2720-XVI	Lab	

		Maximum dry density / OMC	IS 2720-VIII	Lab	
		Deleterious content	IS: 2720-XXVII	Lab	
		Free swelling Index	IS: 2720-XXXX	Lab	As and when required by Engineer
		Field density	IS: 2720-XXVIII	Field	(a) One set of 10 measurements for each layer per 3000 sqm of compacted area for embankment (b) One set of 10 measurements for each layer per 2000 sqm of compacted area of shoulder and sub-grade.
		Moisture content	IS: 2720-II	Field	2 tests per 1000 cum
12	**Granular Sub base**				
		Gradation	IS 2386- I	Field / Lab	Minimum 01 test per source and additional test after every 1000 cum
		Water absorption	IS 2386- III	Lab	Minimum 01 test per source and additional test as required by Engineer
		Wet Aggregate Impact Value test (if WA >2.0%)	IS 5640	Lab	As required by Engineer
		Aggregate Impact Value	IS 2386- IV	Lab	Minimum 01 test per source and additional test after every 2000 cum
		Atterberg's limit	IS 2720-V	Lab	Minimum 01 test per source and additional test after every 1000 cum
		Maximum dry density /OMC	IS 2720-VIII	Lab	Minimum 01 test per source and additional test as required by Engineer
		Moisture content prior to compaction	IS 2720-II	Field	Minimum 01 test every 400 cum
		Field Density	IS 2720-XXVIII	Field	one test per 2000 Sqm or part thereof
		Deleterious material	IS: 2720-XXVII	Lab	Minimum 01 test per source and additional test as required by Engineer
		CBR	IS 2720-XVI	Lab	Minimum 01 test per source and additional test as required by Engineer
13	**Water Bound Macadam**				
		Gradation	IS 2386- I	Field / Lab	Minimum 01 test per source and additional test after every 500 cum
		Aggregate Impact Value	IS 2386- IV or IS5640	Lab	Minimum 01 test per source and additional test after every 500 cum
		Combined Flakiness and Elongation Indices	IS 2386- I	Lab	Minimum 01 test per source and additional test after every 500 cum
		Atterberg's Limit (Screening, Binding Material)	IS 2720-V	Lab	Minimum 01 test per source and additional test after every 500 cum or part thereof
		Water absorption	IS 2386-III	Lab	Minimum 01 test per source and additional test as required by Engineer
		Sulphur Content, Water Absorption, Chemical Stability, Density for Crushed Slag (if used)	To comply with requirements of Appendix of BS : 1047	Lab	As required by Engineer
		Soundness test (if WA >2.0%)	IS 2386-V	Lab	As required by Engineer
14	**Wet Mix**	Gradation	IS 2386 – I	Field / Lab	Minimum 01 test per source and

	Macadam				additional test after every 500 cum
		Water Absorption	IS 2386-III	Lab	Minimum 01 test per source and additional test as required by Engineer
		Soundness (if WA > 2.0%)	IS 2386-V	Lab	As required by Engineer
		Atterberg's limit of portion of aggregate passing 425 micron sieve	IS 2720 - V	Lab	Minimum 01 test per source and additional test after every 500 cum or part thereof
		Aggregate Impact value	IS 2386- IV or IS 5640	Lab	Minimum 01 test per source and additional test after every 500 cum
		Maximum Dry Density / OMC	IS 2720 - VIII	Lab	Minimum 01 test per source and additional test as required by Engineer
		Combined Flakiness and Elongation Indices	IS 2386 – I	Lab	Minimum 01 test per source and additional test after every 500 cum
		Moisture content	IS 2720-II	Field	Minimum 03 tests per day
		Field Density	IS 2720 – XXVIII	Field	One set of three test per 2000 sqm or part thereof
15	**Prime /Tack Coat**				
		Quality of Binder	IS 73, IS 217, IS 8887	Lab	No. of samples per lot and tests as per IS 73, IS 217, IS 8887as applicable
		Binder Temperature for Application	As per MORTH specifications	Field	At regular close interval
		Rate of Spread of Binder	As per MORTH specifications	Field	Minimum 03 tests per day
16	**Dense Bituminous Macadam / Bituminous Concrete**				
		Mix grading	IS 2386- I	Lab	One set for individual constituent and mixed aggregates from dryer for each 400 tonnes of mix subject to a minimum of two tests per day per plant
		Plasticity Index	IS 2720-V	Lab	One test for each source and whenever there is change in the quality of aggregate.
		water absorption	IS 2386-III	Lab	One test for each source and whenever there is change in the quality of aggregate.
		Soundness (if WA>2%)	IS 2386-V	Lab	One test for each source and whenever there is change in the quality of aggregate
		Impact value / Abrasion value	IS 2386-IV	Lab	One test per 350 cum of aggregates for each source and whenever there is change in the quality of aggregates
		Combined flakiness and elongation Indices	IS 2386- I	Lab	One test per 350 cum of aggregates for each source and whenever there is change in the quality of aggregates
		Stripping value	IS 6241	Lab	Initially one set of 3 aggregate representative specimen and then for each change in quality of aggregate
		Stability and Void Analysis of Mix	ASTM: D-1559	Lab	Three tests for stability, flow value, density and void contents for each 400 tonnes of mix subject to minimum of two tests per day per plant

		Retained Tensile test (if retained Coating <95%) / Moisture Susceptibility Mix	AASHTO T283	Lab	one test for each mix type whenever there is change in quality or source of coarse or fine aggregate
		Binder Content	IRC: SP 11 Appendix 5	Field	Minimum 2 tests per day
		Field Density	IRC: SP 11 Appendix 5	Field	One test per 700 sqm
		Quality of Binder	IS 1201 to IS 1220	Lab	number of samples per lot (as in IS 73) and tests as per IS 73
		Temp Control at the time of laying and compaction		Field	At regular interval
17	**Brick work / brick tiles / sewer brick/Burnt clay perforated building Bricks**				
		Dimension	Appendix A, B, C & D of Chapter 6 of CPWD Specifications	Lab	Minimum one test for every 50000 bricks or part thereof
		Compressive strength		Lab	
		Water Absorption		Lab	
		Efflorescence		Lab	
18	**Stone work**				
		Water absorption	IS 1124	Lab	Minimum one test for every 200 sqm / 100 cum or part thereof
		Transverse Strength	IS 1121 - II		
		Resistance to wear	IS 1706		
		Durability	IS 1126		
19	**Marble**				
		Moisture absorption	IS 1124	Lab	Minimum one test for every 100 sqm or part thereof
		Hardness test	Mho's Scale		
		Specific Gravity	IS 1122		
20	**Granite**				
		Moisture	IS 1124	Lab	Minimum one test for every 100 sqm or part thereof
		Specific Gravity	IS 1122		
21	**Structural Steel (other than PEB)**				
		Tensile strength	IS 1599	Lab	Minimum one test for every 20 tonnes or part thereof per source and also manufacturer's test certificates for each consignment should be accompanied.
		Bend Test			
22	**Steel Tubular pipes**				
		Tensile test	IS 1608	Lab	Minimum one test for every 8 tonne or

		Bend Test	IS 2329		part thereof per source and also manufacturer's test certificates for each consignment should be accompanied.
		Flattening Test	IS 2328		
23	**M 50 Grade Cement Concrete Paver Blocks**				
(i)	**M-50 Grade Pre-Cast Concrete Paving Blocks**	Compressive Strength	As per Technical Specifications	Field / Lab	a) 16 paving blocks for everyday production. If, however, the average strength of the first 04 blocks tested is not less than 54 N/sqm, the sample shall be deemed to comply and the remaining 12 blocks from the sample need not be tested.
					b) If blocks are procured from outside and not manufactured at project site 01(one) test of 16 blocks per 10,000 nos. paving blocks or part thereof
		Dimensions	As per Technical Specifications	Field / Lab	a)16 paving blocks for everyday production b) If blocks are procured from outside and not manufactured at project site 01(one) test of 16 paving blocks per 10,000 nos. paving blocks or part thereof
(ii)	**Sand for Bedding Layer**				
		Percentage of Deleterious material	IS 2386	Lab	Minimum one test for every 50 cum or part thereof
		Particle Size Distribution	As per Technical specification	Field / Lab	
		Silt Content	As per Appendix 'C' of Chapter 3 of CPWD Specifications	Field	
		Moisture Content	IS 2720	Field	
(iii)	**Sand for Joint Filling**	Particle Size Distribution	As per Technical specification	Field / Lab	Minimum one test for every 50 cum or part thereof
Note:-	**For items not covered above may be dealt with as per the technical specifications in the contract.**				

1. Site Order Book				
Date	**Instructions issued on the Inspection of work with Signature and designation**	**Contractor / contractor's representative acknowledgement with Signature, Name & Date**	**Compliance report by contractor / contractor's representative with Signature, Name & date**	**Final remark Engineer with S designation**
2	**3**	**4**	**5**	**6**

2. Hindrance Register

Sl. No.	Nature of Hindrance	Date of Occurrence	Date of clearance	Period	Over lapping period if any	Weight age of hindrance	Net effective days of hindrance	Remarks and references	Sign. of Site Engineer with date	Contractor / contractor's representative Signature with Name & date
1	2	3	4	5	6	7	8	9	10	11

3. Drawing Register

Sl. No	Drg. No. and revision no. if any	Date of receipt	Details of DRG	Date of Issue to Contractor	Acknowledgement of contractor	Signature of Site Engineer with date
1	2	3	4	5	6	7

4 Cement Register

Sl. No.	Date of Receipt	Source of Receipt	Bill/ Challan no.	Manufacture Test Certificate reference	Quantity Received (bags)	Progressive Total of Receipts (Bags)	Date of Issue	Qty. Issued (Bags)	Qty. Returned at the end of the Day (Bags)	Net Qty issued (Bags	Progressive Total of issue (Bags)

5 Steel Register

Sl. No	Date of Receipt	Source of Receipt & Ch. No. /Bill No.	Qty Received (MT)	Cum Qty Received (MT)	Date of Issue	Qty issued (MT)	Cumulative qty issued (MT)	Balance at the end of the Day (MT)	Iten wo wh cor

6. Sieve Analysis of Stone Aggregate Nominal Size

Sl. No.	Date	Weight of sample in gms	Size of Sieves	Weight retained on each Sieve	%age of weight retained	Cumulative %age of weight Retained	%Age of weight passing	Specified %age of weight Passing	Sign. Of contractor with date	Sign. Of Site Engineer with date	Remarks/action taken
1	2	3	4	5	6	7	8	9	10	11	12

Note: Size of Sieve should be as per CPWD manual/BIS specification

7. Silt Contents of Fine Sand/Coarse Sand

Sl. No.	Date	Source of material	Height of Silt after Setting (V-1)	Height of sand after setting (V-2)	%age Silt Content V1/V2x100	Acceptability as per specification	Sign. Of Site Engineer with date	Sign. Of contractor with date	Location where sand used	Remarks/action taken
1	2	3	4	5	6	7	8	9	10	11

8. Slump Test

Sl. No.	Date of Testing	Item of work and location	Vibrators used Yes / No	Quantity of water added per bag of cement (Liters)	Height of specimen after removal of mould in (mm)	Slump (mm)	Acceptability of result or action taken	Sign. Of Site Engineer with date	Sign. of contractor with date	Remarks
1	2	3	4	5	6	7	8	9	10	11

9. Cube Test

Sl. No.	Date of Collection	Grade of Mix	Mark of Specimen	7 days Test Result				28 days Test Result				Required specified strength	Approx. qty represented by	Item of work from where the	Sign. Of Site Engineer with date	Contractor / contractor's representative Signature with Name & date
				Date of Testing	Load in KN	Compressive strength (KN / mm2)	Average compressive strength (KN / mm2)	Date of Testing	Load in KN	Compressive strength(KN / mm2)	Average compressive strength (KN / mm2)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

10. Density Test by Core Cutter Method

MDD as per lab test W5……..

Sl. No	Location (C.H.) / Area Represented by the Test	Core Cutter Nos.	Weight of Core Cutter + Weight of Soil (in gram) (W1)	Weight of Empty Core cutter (in gram) (W2)	Weight of Wet Soil (in gram) W= W1-W2	Volume of Core Cutter (in CC) V	Bulk Density (gram/cc) W3= W/V	Moisture Content of compaction layers (M)	Dry Density gram/cc W4 = W3/ (1+M)	Degree of compaction W4/W5	Acceptability limit	Sign. of Site Engineer with date	Contractor / contractor's representative Signature with Name & date
1	2	3	4	5	6	7	8	9	10	11	12	13	14

11. Test for Thickness and Density of the Compacted Layer (By Sand Replacement Method)

for Asphalt Concrete / Bitumen Macadam / CC Pavement

Lab Test Density in gms/CC ……..

Sl. No	Date of Test	Qty. represented by the test	Location of holes	Thickness of Layer		Weight of materials removed from the carpet Hole	Initial weight of sand taken in Cylinder	Weight of sand filling in cone of cylinder	Weight of sand remaining in cylinder	Predetermined bulk density of sand	Density = $\frac{A.d.}{W-(W1+W2)}$	Remarks / Acceptability	Sign. Of Site Engineer	Contractor / contractor's representative Signature with Name & date	Action Taken
				Individual (mm)	Average (mm)	A gm	W gm	WI gm	W2 gm	d gm/CC	gm/CC				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

12. Density Test Register for Soil ---- By Sand Replacement Method

Unit Wt. of Standard Sand in grams/CC (W6) = …….

Lab Test MDD in gms/CC (W10) = …….

Sl. No	Date of Test	Qty. represented by the test	Location of holes	Thickness of Layer (mm)		Wt. of Material from the hole	Moisture Content %age	Initial weight of sand taken in the Cylinder before filling in hole in gms	Wt. of sand after filling in hole in gms	Wt. of sand in hole & cone in gms	Wt. of sand in cone in gms	Wt. of sand in hole in gms	Volume of hole in CC	Bulk Density in gms/CC	Dry Density in gms/CC	Degree of compaction	Remarks / Acceptability	Sign. Of Site Engineer with date	Contractor / contractor's representative Signature with Name & date	Action Taken
				Individual	Average	(W) gms	(Y)	(W1)	(W2)	(W3)= W1-W2	(W4)	W5 = (W3-W4)	(W7)= W5/W6	(W8)=W/W7	(W9)= W8/Y	W9/W10 x100	W9/W10 x100			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

13. Test of the Brick / Brick Tiles for Compressive Strength

Sl. No	Date of collection of sample	Date of testing	Wt. (in Kg)	No. of Specimen	Size in cm/Area in cm2	Compressive Strength obtained for individual bricks in Kg. per Cm2	Average Strength in Kg/Cm2	Specified Compressive Strength in Kg/Cm2	Acceptability	Sign. Of Site Engineer with date	Contractor / contractor's representative Signature with Name & date	Action Taken / Remark
1	2	3	4	5	6	7	8	9	10	11	12	13

14 Inspection Register

Sl. No	Date and time	Officer's Name and designation	Items inspected and specific defects noticed & action to be taken	Signature	Defects taken to Site Order Book/letter written			Final action / result
					Site Order Book Page no. / letter no.	Date	Sign. of Site Engineer / PMC	

Bill Performa

Name of work :

LOI No.

Name of Contractor :

Date of Start :

Date of Preparation of Bill :

S N	Item No.	Description of Items	Unit	Qty as per Agt.	Rate as per Agt.	Qty as per Pre. Bill	Qty as per this Bill	Cumulative Qty.	Amt. as per Previous Bill	Amt. as per this Bill	Cumulative Amount
1											
2											
3											
4											
5											
						Total of Schedule A					
						Add Enhancement or Rebate @					
						Grand Total of Schedule A					

Quality Assurance Plan				
S.N.	**Material**	**Test to be carried out**	**Contractor Role**	**SMFPIL Role**
1	100 mm thick Poly urethane foam(PUF) or as per any thickness designed by bidder conforming to industrial standards	Physical & Lab Test	• To be procured from approved make • Submission of OEM's Test Certificate for each Lot • One Lab Test for every 2000 Sq. Mtr • The tests to be conducted are enlisted in Annexure A	• Review of OEM's Test Certificate • Review of Lab Test Report
2	100mm Bare PUF Slabs or as per any thickness designed by bidder conforming to industrial standards	Physical & Lab Test	• To be procured from approved make • Submission of OEM's Test Certificate for each Lot • One Lab Test for every 2000 Sq. Mtr • The tests to be conducted are enlisted in Annexure A	• Review of OEM's Test Certificate • Review of Lab Test Report
3	All other PUF panels of varied thickness as applicable and design considerations conforming to industrial standards	Physical & Lab Test	• To be procured from approved make • Submission of OEM's Test Certificate for each Lot • One Lab Test for every 2000 Sq. Mtr • The tests to be conducted are enlisted in Annexure A	• Review of OEM's Test Certificate • Review of Lab Test Report
4	PUF doors	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate and technical compliance sheet to the tender technical specifications	• Review of OEM's Test Certificate
5	Overhead sectional door	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate and technical compliance sheet to the tender technical specifications	• Review of OEM's Test Certificate

6	Dock leveler	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate and technical compliance sheet to the tender technical specifications • Load testing at site during commissioning confirming to loads as per tender technical specifications.	• Review of OEM's Test Certificate • Review of site test report
7	Dock seals retractable type	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate and technical compliance sheet to the tender technical specifications	• Review of OEM's Test Certificate
8	Racking and material handling equipment and pallets and storage bins/crates etc.	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate • The Reach truck/stackers and racking storage system should be tested for load carrying capacity at the highest level of loading confirming to the loading parameters as per tender specifications during commissioning. • The battery accessories (as applicable) for all material handling equipments and all standbys should be tested as on then in the commissioning.	• Review of OEM's Test Certificate • Review of site test report
9	Milk Chilling, Storage and All Refrigeration equipment's, Accessories & Controls	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate • Commissioning certificate to be submitted as given in Annexure-B	• Review of OEM's Test Certificate • Review of Commissioning Certificate

10	Electrical Panel & Accessories	Physical Inspection at site OEM's Test Report	• To be procured from approved make • Submission of OEM's Test Certificate	• Review of OEM's Test Certificate

Annexure A-

As per tender documents all mentioned below parameters for OEM Test certificate and Lab test are required to confirm all parameters in line for PUF panels:

1-Density Test

2-Thickness of GI Sheet

3-Thickness of PUF

4-Epoxy Primer on both sides (thickness)

5- Polyester Top Coat (thickness)

6- Zinc Coating

7- Thermal Conductivity

8- Yield Strength of GI sheet

9- Tensile Strength of GI sheet

Annexure B-

All refrigeration machinery and equipments shall be tested for COP (Coefficient of performance) at the time of commissioning for 3 times as per the pull down time of chambers or on a shift basis as applicable. These tests shall cover for all compressors, evaporator (all indoor units), condenser, Water chillers etc including all accessories.

Bill of Quantities

Annexure A-Estimation of Construction Works & Pre Engineering Building

FORMATS

SCHEDULE – 1

ELIGIBILITY CRITERIA DOCUMENT

1.	Name of Company/Firm	
	Registered Address	
	Website & Email Address	
	Telephone Number	
	Fax Number	
2.	Description of the company giving detail of activities	
3.	Number of years of experience as a General Contractor	
4.	Number of years of experience as a Sub-Contractor	
5.	Names of members of Board of Directors	
6.	Names of principals who sign documents on behalf of the company	
7.	Attach a Company organization chart	
8.	Previous names of the company with the dates of changes (if any)	
9.	Previous partners with dates of changes(if any)	
10.	State if a member of any contractor's association/organization.	
11.	In which field of SITC/Engineering do you claim specialization & Interest.	

Encl.:

1) Attach attested copies of original documents:
a) Applicant's legal status.
b) Principal place of business.
c) The place of Incorporation (for applicants who are Corporation), the place of registration and nationality of the owners (for applicants who a rein partnerships or individually owned firms).
2) Power of attorney or authority to sign duly attested by Magistrate 1st Class.
3) Latest brochures and technical literatures.

Authorized Signatory with official seal

SCHEDULE – 2
ELIGIBILITY CRITERIA DOCUMENT

FINACIAL CAPABILITY

a) Summary of assets and liabilities on basis of the audited financial statements of the last three financial years.

ITEM	DESCRIPTION	2016-2017	2017-2018	2018-2020
1.	Total Assets			
2.	Current Assets			
3.	Total Liabilities			
4.	Current liabilities			
5.	Net worth (1-3)			
6.	Working Capital (2-4)			
7.	Annual Turn over			
8.	Services related turn over			
9.	Profit before taxes			
10.	Profit after Taxes			

Note:

a) Attach attested copies of the audited financial statements of the last three financial years.
b) Details of services related turnover

Name and Address of the Bank providing Credit line

c) Specify proposed sources of financing to meet the cash flow demands of the project, net of current commitments:

SOURCE OF FINANCING	AMOUNT
1.	
2.	
3.	

4.	

Firms owned by individuals, partnerships, may submit their balance sheets certified by the registered Chartered Accountant, and supported by copies of tax returns, if audits are not required by the laws of their countries of origin.

NOTE: (The following information is mandatory)

i) The average annual financial turnover during the last 3 years ending 31st March of previous financial year should clearly be indicated.

ii) The applicant should have positive net worth. This will be judged from audited balance sheet of the last financial year ending on a date not prior to 24 months from the due date of submission of this document.

Authorized Signatory with official seal

SCHEDULE - 3

ELIGIBILITY CRITERIA DOCUMENT

Assessed Available Bid capacity

The applicant must fulfil the criteria of...

Working Bid Capacity> Total estimated **cost of work(s) at the time of bidding**. Contractors should calculate the bid capacity as per given formula.

WBC = 2AN – B

A=	Average Annual Turnover of the bidder for last three financial years from similar nature of projects
B=	Value of the existing commitments and ongoing works of the bidder (lead member of the Consortium) to be completed during next 6 months (period of completion of works as per bid)
N=	No. of years prescribed for completion of works for which bids are invited i.e. 0.5 in this case.

Authorized Signatory with official seal

SECHUDLE – 4
ELIGIBILITY CRITERIA DOCUMENT

WORK EXPERIENCE

LIST OF RELEVANT PROJECTS OF VALUE OF PACKAGE (FOR WHICH PREQUALIFICATION IS SOUGHT), COMPLETED/STILL CONTINUING, DURING THE LAST TEN YEARS

Name of Employer / Client	Name, Location, Nature & Description of Work	Contract Price in Indian Rs.	% of Participation of the Company	Contractual Date of Commencement	Contractual Date of completion of Work	Actual Date of Start of Work	Actual Date of Completion of work	Reasons for Delay in Completion, if any	Value of work completed till the last date of submission of bid supported with certificate from employer/ client

Note :-
1. Certificates from the employers are to be attached in respect of the information furnished.
2. Attach photographs of completed Projects.
3. Attach additional photo copied pages, if required.
4. Works to be listed separately as per the similarity.
5. Attach performance certificates as per the value of work as defined in this document. There should not be an unsatisfactory performance of the applicant.

Authorized Signatory with official seal

SCHEDULE – 5
ELIGIBILITY CRITERIA DOCUMENT

LIST OF CURRENT PROJECTS

PROJECT TITLE	WORKS INVOLVED	HAFED	CONTRACT VALUE	DATE OF COMMENCEMENT OF WORKS	DUE DATE OF COMPLETION	%AGEWISE COMPLETION	EXPECTEDDATE OF COMPLETION

Note :- Works to be listed separately as per the similarity.

Authorized Signatory with official seal

SCHEDULE – 6

ELIGIBILITY CRITERIA DOCUMENT

INFORMATION REGARDING CURRENT LITIGATION OR ABANDONMENT OF WORK BY APPLICANT

i)	a) Is the applicant currently involved in any arbitration/litigation to the contract works.	**Yes / No**
	b) If yes, give details	
ii)	a) Has the applicant or any of its constituent partners been debarred/expelled by any agency in India during the last 5 years due to any reason	**Yes / No**
	b) If yes, give details	
iii)	a) Has the applicant or any of its constituent partners failed to complete any contract work in India during the last 5 years due to any reason.	**Yes / No**
	b) If yes, give details	
iv)	Applicant shall submit an affidavit with an undertaking that the applicant / associates have not been blacklisted by any Govt. Agency / State Government/ Central Government offices if any of the State in India.	

Note:- If any information in this schedule is found to be incorrect or concealed, participation of applicant will be summarily rejected at any time. The applicant is supposed to fill-up the correct details of arbitration/litigation during last five years with their outcome.

Details of dispute	Year	Award for or against applicant	Name of HAFED, cause of litigation and matter of dispute	Current value of disputed amount	Actual awarded amount

Signature with Seal of the Company
(Name of the Authorized Signatory)
Title / Designation

SCHEDULE – 7
ELIGIBILITY CRITERIA DOCUMENT
AFFIDAVIT

1. I, the undersigned duly authorized on behalf of company/firm/do hereby certify that all the statements made in the required attachments are true and correct to the best of my knowledge.

2. The undersigned hereby authorize(s) and request(s) any bank, person, firm or Corporation to furnish pertinent information deemed necessary and requested by the HAFED to verify this statement or regarding my(our)competence and general reputation.

3. The undersigned understands and agrees that further qualifying information may be requested and agrees to furnish any such information at the request of the HAFED.

(Signed by an Authorized Officer of the Firm)

Name and Title of Officer

Name of the Firm

Date
Encl.: Requisite Power of Attorney duly attested by Magistrate – 1st Class.

SCHEDULE – 8
ELIGIBILITY CRITERIA DOCUMENT

ADDITIONAL INFORMATION

Following additional information supported with attested copies, may be supplied along with your application:

1. Registration of company, partnership deed, Article of Association, Registration under Labour Law, Registration under GST etc

2. EPF No., PAN No. etc.

3. Details of available site testing equipments.

4. Details of possession of Electrical License from Chief Electrical Inspector of the State for execution of High Tension line network.

Please add any further information, which you consider to be relevant to the evaluation of your application. If you wish to attach other documents please list below, otherwise state “not applicable”.

Authorized Signatory with official seal

Format of Bank Guarantee for Bid Security
(BANK GUARANTEE ON NON-JUDICIAL STAMP PAPER OF Rs.100)

BID SECURITY (BANK GUARANTEE)

WHEREAS, _____ *[name of Bidder]* (hereinafter called "the Bidder") has submitted his Bid dated _____ *[date]* for the (**insert the name of the works)** (hereinafter called "the Bid").

KNOW ALL PEOPLE by these presents that We _____ *[name of bank]* of having our registered office at _____ (hereinafter called "the Bank") are bound unto _____(hereinafter called "the Employer") in the sum of Rs._____[1](Rupees _____ _____ ____ _____) for which payment well and truly to be made to the said Employer the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this _____ day of _____ 2018.
THE CONDITIONS of this obligation are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;
or

(2) If the Bidder having been notified of the acceptance of his bid by the Employer during the period of Bid validity:

(a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

(b) fails or refuses to furnish the Performance Security, in accordance with the Instruction to Bidders; or

(c) does not accept the correction of the Bid Price pursuant;

we undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without any protest or demur or any objection, whatsoever on our part and without any first claim or reference to the Contractor, without the Employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date _____ days after the deadline for submission of Bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date.

DATE _____ SIGNATURE OF THE BANK _____

WITNESS _____ SEAL _____

_____
[signature, name, and address]

The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Section 1 (II).

Instruction for furnishing Bank Guarantee

- The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per stamp duty applicable at the place where the tender has emanated. The non-judicial stamp paper should be in name of the issuing bank.
- This bank guarantee/ all further communication relating to the bank guarantee should be forwarded to HAFED Office, Panchkula only.
- The full address along with the Telex/Fax No. and email address of the issuing bank to be mentioned.

PERFORMANCE BANK GUARANTEE

To

_____ [name of Employer]
_____ [address of Employer]

WHEREAS _____ [name and address of Contractor] (hereafter called "the contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute _____ [name of Contract and brief description of Works] (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of _____ [amount of guarantee]* _____ (in words), such sum being payable in the types and proportions of currencies in which the Contract Price is Payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____[amount of guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we waive notice of any such change, addition or modification.
The Bank guarantee for performance security shall remain in force as given in the Bid Document shall be valid up to 3 months beyond the expiry of the Defects Liability Period.

Signature and Seal of the guarantor_____
Name of Bank_____
Address _____
Date_____

* An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract including additional security for unbalanced Bids, if any and denominated in Indian Rupees.

BANK GUARANTEE FOR ADVANCE PAYMENT

To

_____ [name of Employer]
_____ [address of Employer]
_____ [name of Contractor]
_____ [name of Contract]

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub-clause 51.1 ("Advance Payment") of the above mentioned Contract,_____

[Name and address of Contractor] (Hereinafter called" the Contractor") shall deposit with _____ [name of Employer]a bank guarantee to guarantee his proper and faithful performance under the said Clause of the Contract in an amount of _____[amount of Guarantee]*_____[in words].

We, the _____[bank of financial institution], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to _____[name of Employer] on his first demand without whatsoever right of obligation on our part and without his first claim to the Contractor, in the amount not exceeding_____[amount of guarantee]*_____[in words].

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between_____ [name of Employer]and the contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

The guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until_____ [name of Employer] receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and Seal: _____
Name of Bank/Financial Institution:_____
Address: _____
Date: _____

---

* An amount shall be inserted by the Bank of Financial Institution the amount of the Advance Payment, and denominated in Indian Rupees.

INDENTURE FOR SECURED ADVANCES
FORM 31

(for use in cases in which the contract is for finished work and the contractor has entered into an agreement for the execution of a certain specified quantity of work in a given time)

This indenture made the _____ day of _____, 20____ BETWEEN _____ (hereinafter called the contractor which expression shall where the context so admits or implies be deemed to include his executors, administrators and assigns) or the one part and the Employer of the other part.

Whereas by an agreement dated _____ (hereinafter called the said agreement) the contractor has agreed.

AND WHEREAS the contractor has applied to the Employer that he may be allowed advanced on the security of materials absolutely belonging to him and brought by him to the site of the works the subject of the said agreement for use in the construction of such of the works as he has undertaken to executive at rates fixed for the finished work (inclusive of the cost of materials and labour and other charges.)

AND WHEREAS the Employer has agreed to advance to the Contractor the sum of Rupees _____ on the security of materials the quantities and other particulars of which are detailed in Accounts of Secured Advances attached to the Running Account bill for the said works signed by the Contractor on _____ and the Employer has reserved to himself the option of making any further advance or advances on the security of other materials brought by the Contractor to the site of the said works.

Now THIS INDENTURE WITNESSETH that in pursuance of the said agreement and in consideration of the sum of Rupees _____ on or before the execution of these presents paid to the Contractor by the Employer (the receipt where of the Contractor doth hereby acknowledge) and of such further advances (if any) as may be made to him as a for said the Contractor doth hereby covenant and agree with the President and declare as follows:

(1) That the said sum of Rupees _____ - so advanced by the Employer to the Contractor as aforesaid and all or any further sum of sums advanced as aforesaid shall be employed by the Contractor in or towards expending the execution of the said works and for no other purpose whatsoever.

(2) That the materials details in the said Account of Secured Advances which have been offered to and accepted by the Employer as security are absolutely the Contractor's own propriety and free from encumbrances of any kind and the contractor will not make any application for or receive a further advance on the security of materials which are not absolutely his own property and free from encumbrances of any kind and the Contractor indemnified the Employer against all claims to any materials in respect of which an advance has be made to him as aforesaid.

(3) That the materials detailed in the said account of Secured Advances and all other materials on the security of which any further advance or advances may hereafter be made as aforesaid (Hereafter called the said materials) shall be used by the Contractor solely in the execution of the said works in accordance with the directions of the Engineer.

(4) That the Contractor shall make at his own cost all necessary and adequate arrangements for the proper watch, safe custody and protection against all risks of the said materials and that until used in construction as aforesaid the said materials shall remain at the site of the said works in the Contractor's custody and on his own officer authorized by him. In the event of the said materials or any part thereof being stolen, being stolen, destroyed of damaged of becoming deteriorated in a greater degree than is due to reasonable use and wear thereof the Contractor will forthwith replace the same with other materials of like quality of repair and make good the same required by the Engineer.

(5) That the said materials shall not be any account be removed from the site of the said works except with the written permission of the Engineer of an officer authorized by him on that behalf.

(6) That the advances shall be repayable in full when of before the Contractor receives payment from the Employer of the price payable to him for the said works under the terms and provisions of the said agreement. Provided that if any intermediate payments are made to the Contractor on account of work done than on the occasion of each such payment the Employer will be at liberty to make a recovery from the contractor's bill for such payment by deducting there form the value of the said materials than actually used in the construction and in respect of which recovery has not been made previously, the value of this purpose being determined in respect of each description of materials at the rates at which the amounts if the advances made under these presents were calculated.

(7) That if the Contractor shall at any time make any default in the performance or observance in any respect of any of the terms and provisions of the said agreement or of these presents the total amount of the advance or advances that may still be owing of the Employer shall immediately on the happening of such default be repayable by the Contractor to be the Employer together with interest thereon at twelve percent per annum from the date or repayment and with all costs, charges, damages and expenses incurred by the **Employer** in or for the recovery thereof or the enforcement of this security or otherwise by reason of the default of the Contractor and the Contractor hereby covenants and agrees with the **Employer** to reply and pay the same respectively to him accordingly.

(8) That the Contractor hereby charges all the said materials with the repayment to the Employer of the said sum of Rupees _____ and any further sum of sums advanced as aforesaid and all costs, charges, damages and payable under these presents

PROVIDED ALWAYS and it is hereby agreed and declared that notwithstanding anything in the said agreement and without prejudice to the power contained therein if and whenever the covenant and the money owing shall not be paid in accordance there with the **Employer** may at any time thereafter adopt all of any of the following courses as he may deem best:

(a) Seize and utilize the said materials or any thereof in the completion of the said works on behalf of the contractor in accordance with the provisions in that behalf contained in the said agreement and the amount due to the contractor with the value of work done as if he had carried it out in accordance with the said agreement and at the rates thereby provided. If the balance is against the contractor, he is to pay same to the **Employer** on demand.

(b) Remove and sell by public auction the sized materials or any part thereof and our of the moneys arising from the sale retain all the sums aforesaid repayable or payable to the **Employer** under these presents and pay over the surplus (if any) to the Contractor.

(9) That except in the event of such default on the part of the contractor as aforesaid interest on the said advance shall not be payable.

(10) That in the event of any conflict between the provisions of these presents and the said agreement the provisions of these presents shall prevail and in the event of any dispute of difference arising over the construction of effect of these presents the settlement of which has not been here-in-before expressly provided for the same shall be referred to the Employer whose decision shall be final and the provision of the Indian Arbitration Act for the time being in force shall apply to any such reference.

FORMAT FOR POWER OF ATTORNEY FOR LEAD MEMBER OF CONSORTIUM POWER OF ATTORNEY

(Only applicable for JV/ Consortium)

Whereas the Awarder of India (AWARDER) has invited applications from interested parties for Whereas, the member of the Consortium are interested in bidding for the Project and implementing the Project in accordance with the terms and conditions of the tender document (DNIT) and other connected documents in respect of the Project.

Whereas, it is necessary under the DNIT Document for the members of the Consortium to designate one of them as the Lead Member with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium's bid for the Project.

NOW THIS POWER OF ATTORNEY WITNESSE THAT:

We, M/s. , M/s. and M/s. (the respective names and addresses of the registered office) do hereby designate M/s.(name and address of the registered office) being one of the members of the Consortium, as the Lead Member of the Consortium (name and address of the registered office) being one of the members of the Consortium, to do on behalf of the Consortium, all or any of the acts, deed or things necessary or incidental to the Consortium's bid for the Project, including submission of application / Proposal, participating in conference, responding to queries, submission of information / documents and generally to represent the Consortium in all its dealings with AWARDER, any other Government Agency or any person, in connection with Project until culmination of the process of bidding and thereafter till the Concession Agreement is entered into with AWARDER.

We hereby agree to ratify all acts, deeds and things lawfully done by Lead Member our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

Dated this the day of[year] (Executants)

(To be executed by all the members of the Consortium) Notes:

• The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executants (s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

• Also, wherever required, the executants (s) should submit for verification the extract of the charter documents and documents such as a resolution / power of attorney in favor of the Person executing this Power of Attorney for the delegation of power hereunder on behalf of the executants (s)

FORMAT FOR POWER OF ATTORNEY FOR SIGNING OF APPLICATION
(Applicable for all bidders including JV)

(On Stamp paper of relevant value)

POWER OF ATTORNEY Know all men by these presents, we(name and address of the registered office) do hereby constitute, appoint and authorize Mr. / Ms. (name and address of residence) who is presently employed with us and holding the position of as our attorney, to do in our name and on our behalf, all such acts, deeds and things necessary in connection with or incidental to our bid for the project envisaging Bid for _____.at HAFED Mega Food Park, Rohtak including signing and submission of all documents and providing information / responses to HAFED, representing us in all matters before HAFED, and generally dealing with HAFED in all matters in connection with our bid for the said Project.

We hereby agree to ratify all acts, deeds and things lawfully done by our said attorney pursuant to this Power of Attorney and that all acts, deeds and things done by our aforesaid attorney shall and shall always be deemed to have been done by us.

Dated this the Day of ....., …… For _____

(Signature)
(Name, Title and Address)
Signing on behalf of the Bidder/ Lead Member in case of Consortium

Accepted …… (Signature)
(Name, Title and Address of the Attorney)

Agreement Form

Agreement

This agreement, made the _____ day of _____ between _____ (name and address of Employer) [hereinafter called "the Employer"] and _____ (name and address of Contractor) hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that the Contractor execute

_____

(name and identification number of Contract) (Hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a cost of Rs.

_____

NOW THIS AGREEMENT WITNESSTH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to tem in the conditions of contract hereinafter referred to and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein conformity in all aspects with the provisions of the contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be ready and construed as part of this Agreement viz.
   - i) Letter of Acceptance
   - ii) Notice to proceed with the works;
   - iii) Contractor's Bid
   - iv) Condition of Contract : General and Special
   - v) Contract Data
   - vi) Additional condition
   - vii) Drawings
   - viii) Bill of Quantities and
   - ix) Any other documents listed in the Contract Data as forming part of the Contract.

In witnessed whereof the parties there to have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____ was hereunto affixed in the presence of:

Signed, Sealed and Delivered by the said _____
_____

in the presence of :

Binding Signature of Employer _____

Binding Signature of Contractor _____

Witnesses of Employer	Witnesses of Contractor
1	1
2	2

Section-7

BILL OF QUANTITIES/DNIT

Sr. No.	Description	Unit	Estimated Lump-sum Cost (Rs. in Crores)
1	Planning, Design, Fabrication, Supply, Erection, Testing, Commissioning and Trial Run (3 Months) including Civil, PEB, MEP, Firefighting Works for Milk Chilling Unit (10000 LPD), Storage Facility For Milk (10 MT) And Cold Storage (300 MT), Complete In all Respect On Turnkey Basis, with annual maintenance and technical operations of three years , with annual maintenance and technical operations of three years At HAFED Mega Food Park, Primary Processing Center Yamunanagar, Haryana	**JOB**	**Rs. 8.22 Crores**

Note:

1. The item wise price of goods to be supplied shall be on F.O.R. site basis inclusive of GST, applicable taxes, duties, freight etc. The item wise price shall also include the charges for packing and forwarding, transportation, transit insurance and all other local costs incidental to delivery of the goods to their final destination, storage insurance and safe custody at site.

2. The bidder should submit the bill of quantities/ individual price break-up of each item, clearly mentioning the item description, makes, model nos., quantities, rate, amount, GST and all applicable Tax if any and total price in numbers as well as in words. Failing to submit the individual price break-up in the asked format shall not be taken into account for evaluation and shall not be considered for award.

3. Bidders must quote their prices for all the three parts. In case the bidder omits any part(s), their bid will be considered as incomplete and treated as non-responsive.

4. Individual price break-up of each item shall be finalized by Competent Authority of HAFED for billing purpose.

5. The item wise price of goods to be supplied shall be on FOR site basis inclusive of applicable taxes & duties. The item wise price shall also include the charges for packing and forwarding, transportation, transit insurance and all other local costs incidental to delivery of the goods to their final destination, storage insurance and safe custody at site.
6. In case of discrepancy between unit price and total price, unit price shall prevail.

7. The item wise quoted price should inclusive of service cover/incidental services during defect liability period of 2 years.

FORM FOR PRICE BID

I/We hereby tender for the execution of the works for the Haryana State Cooperative Supply and Marketing Federation Limited (here in after referred to as HAFED) specified in the underwritten memorandum within the time specified in such memorandum.

Single percentage rates are to be quoted in the box specified below in figures as well as in words above/below applicable on Lump cost mentioned as Estimated cost in Tender documents.

We quote our rates _____ (in figures) above/below which will be applicable on the LS Amount provided in DNIT	We quote our rates _____ (in words) above/below which will be applicable on the LS Amount provided in DNIT

And in accordance, in all respects, with the specifications drawings and instructions in writing referred to in Section 1 to 9 of this document and with such materials as are provided by the Implementing Agency in all other respect in accordance with such conditions so far as applicable. The contract shall be divided in four part (i. SITC Supply Installation Testing and Commissioning, ii. AMC, iii. Operations, iv. Civil & PEB).

Enter both the rates in figures as well as in words, only in the space provided above. In the event of variation of rate in figures and words, the lower value only shall be considered. Only single percentage on all items of DNIT/BOQ is to be entered. In case more than one percentage is entered, the tender will liable to be rejected.

MEMORANDUM

(a)	General Description	Planning, Design, Fabrication, Supply, Erection, Testing, Commissioning and Trial Run (3 Months) including Civil, PEB, MEP, Firefighting Works for Milk Chilling Unit (10000 LPD), Storage Facility For Milk (10 MT) And Cold Storage (300 MT), Complete In all Respect On Turnkey Basis, with annual maintenance and technical operations of three years , with annual maintenance and technical operations of three years At HAFED Mega Food Park, Primary Processing Center Yamunanagar, Haryana
(b)	Estimated Cost	Rs. 822.00 Lakhs
(c)	Earnest Money	Rs. 8.22 Lakhs
(d)	Security to be deducted	5% of all bills (including earnest money)
(e)	Time allowed for completion of capital work	06 (Six) Months

Signature of Contractor

If, this tender is accepted, I/We hereby agree to abide by and fulfill all the terms and provisions of the said conditions of contract annexed hereto so far as applicable or in default thereof forfeit to and pay to the Federation or its successors in office the sums of money mentioned in the said conditions.

The Bank Guarantee of Rs. _____ lakhs is being submitted as EMD for this Bid, the full value of which is to be absolutely forfeited by the Federation or its successors in office without prejudice to any other rights or remedies of the said Federation or its successors in office, if I/We fail to commence the works specified in the above memorandum or otherwise the Bank Guarantee of Rs. _____ Lakhs shall be retained by the Federation on account of the security deposit. Should I/We withdraw or modify the tender within the period of bid validity, my/our earnest money will stand forfeited to the said Federation.

(Signature of the Contractor)

Price Schedule

(To be filled by the technical qualified bidders and submitted in hard copy in sealed envelope to HAFED on the date of financial bid opening)

Planning, Design, Fabrication, Supply, Erection, Testing, Commissioning and Trial Run (3 Months) including Civil, PEB, MEP, Firefighting Works for Milk Chilling Unit (10000 LPD), Storage Facility For Milk (10 MT) And Cold Storage (300 MT), Complete In all Respect On Turnkey Basis, with annual maintenance and technical operations of three years , with annual maintenance and technical operations of three years At HAFED Mega Food Park, Primary Processing Center Yamunanagar, Haryana

Part –I: SITC (Supply Installation, Testing & Commissioning) of Milk Chilling Unit (10000 LPD), Storage Facility For Milk (10 MT) And Cold Storage (300 MT, Trial Run and Civil, MEP, Freighting works

S. NO.	ITEM DESCRIPTION	MAKE	MODEL NO.	QUANTITY	RATE	AMOUNT	PACKING FORWARDING	INSURANCE	GST	FREIGHT	TOTAL

Part II: Annual Maintenance of three years after completion of Defect Liability Period

S. NO.	Per Month Cost for 36 months	

Part III: Technical Operations of three years

S. NO.	Per Month Cost for 36 months	

Part IV: Civil & PEB Works

S. NO.	Cost above/ below the estimated cost in the BoQ	

Authorized Signatory with official seal

SECTION – 8

Deviation Statement Forms Technical Deviation Statement

(TO BE SUBMITTED AND ATTACHED IN TECHNICAL BID)

Format A: Technical Deviation Statement

(1) The following are the particulars of deviations from the requirements of the tender specifications:

CLAUSE REFERENCE	DEVIATION	JUSTIFICATION	REMARKS

The technical specifications furnished in the bidding document shall prevail over those of any other document forming a part of our bid, except only to the extent of deviations furnished in this statement.

Dated:

Signature and seal of the Manufacturer / Bidder

NOTE:

- Where there is no deviation, the statement should be returned duly signed with an endorsement indication **"NO DEVIATIONS"**

FORMAT-B: Bidding Terms Deviation Statement Form

(2) The following are the particulars of deviations from the requirements of the bidding conditions / terms:

CLAUSE REFERENCE	DEVIATION	JUSTIFICATION	REMARKS

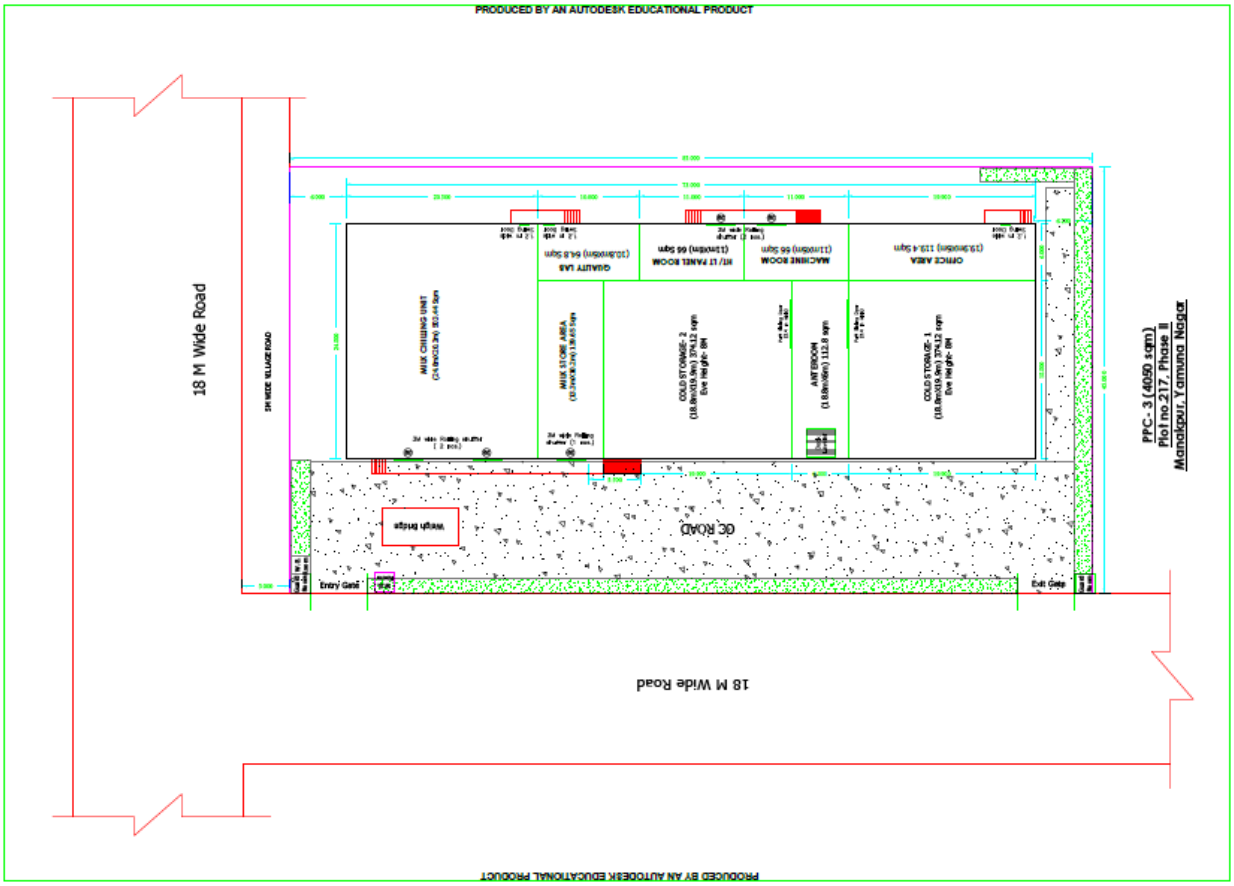
Dated: Signature and seal of the

Manufacturer / Bidder

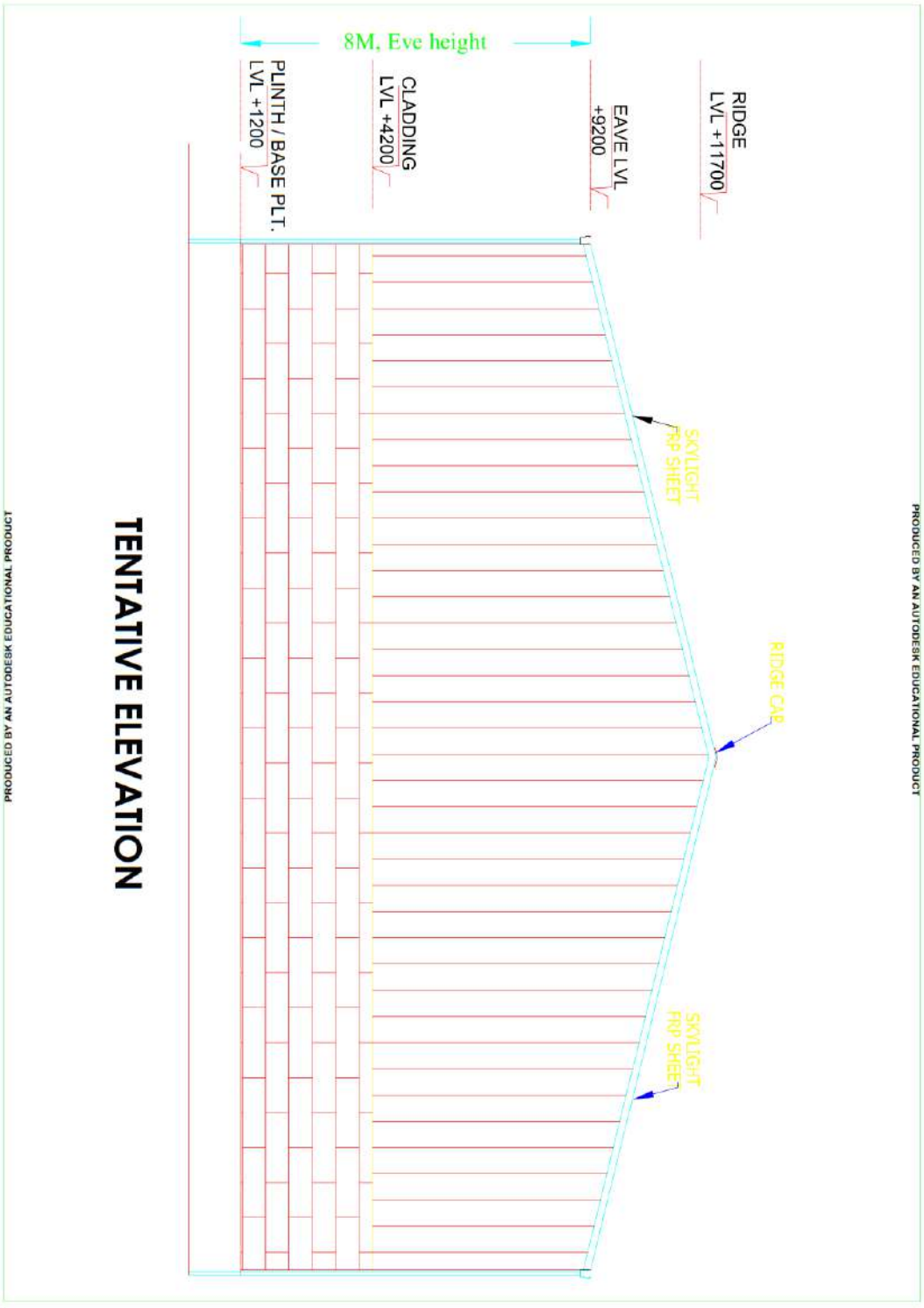
NOTE:

(1) Where there is no deviation, the statement should be returned duly signed with an endorsement indication **"NO DEVIATIONS"**

SECTION- 9 (Layout and Indicative BoQ for Construction works)



The layout is for indicative purpose. The bidders are advised to propose their own design fulfilling the capacity and government norms.



TENTATIVE ELEVATION

Indicative Cost Summary of Construction Works- Refer Annexure A

Tentative BoQ of Civil, MEP, PEB works of PPC at HAFED MFP, Manakpur, Yamunanagar		
Summary of Estimated Cost		
Sr. No.	**Description**	**Amount (Rs.)**
Bill No. 01	Civil Works	2,44,02,738.66
Bill No. 02	Electrical Works	24,18,238.00
Bill No. 03	Plumbing Works	15,86,697.97
Bill No. 04	PEB Works	61,79,217.50
Bill No. 05	FIRE FIGHTING WORK	36,18,798.49
	Total	**3,82,05,690.63**

Estimate for the Civil work of Construction of PPC Building in HAFED MFP, Manakpur, Yamunanagar							
Civil Works							
S. No	**Item Source**	**Item Ref.**	**Description**	**Unit**	**Quantity**	**HSR 2021 & DSR-2018 Rate (Rs.)**	**Amount (Rs.) I/C CP**
			CIVIL WORKS				
			EXCAVATION				
1	HSR	4.12.1	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. All kinds of soil	Cum	2453.0	94.00	2,30,582.00
2	HSR	4.32	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	Cum	2107.0	67.00	1,41,169.00
3	NS	4.33	Excavating, supplying and filling of local earth (including royalty) by mechanical transport upto a lead of 1 km also including ramming and watering of the earth in layers not exceeding 20 cm in trenches, plinth, sides of foundation etc. complete.	Cum	388.0	158.00	61,304.00
4	HSR	4.38.1	Supplying chemical emulsion in sealed containers including delivery as specified. Chlorpyriphos/ Lindane emulsifiable concentrate of 20%	Per ltr	1031.5	194.00	2,00,111.00

a		4.39	Providing and injection chemical emulsion for PRE-CONSTRUCTIONAL antitermite treatment (excluding the cost of chemical emulsion) and creating a chemical barrier under and around the column pits, wall trenches, basement excavation, top surface of plinth filing junction of wall and floor, alongwith the external perimetre of building, expansion joints surrounding of pipes and conduite etc, complete (plinth area of the building at ground floor only shall be measured) using Chlorpyriphos/ Lindane emulsifiable concentrate of 20%	Sq Mt	2063.0	281.00	5,79,703.00
5	NS	NS	Supplying and filling in plinth with Jamuna sand under floors, including watering, ramming, consolidating and dressing complete.	Cum	188.00	852.82	1,60,330.16
							-
6	HSR	6.1.4	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level :1:3:6 (1 Cement : 3 coarse sand (zone-III) : 6 graded stone aggregate 20 mm nominal size)	Cum	365.0	3,881.00	14,16,565.00
							-
7	HSR	6.1.2	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1: 2 :4 (1 Cement :2 Coarse sand (zone-III) : 4 graded stone aggregate 20mm nominal size)	Cum	14.0	4,376.00	61,264.00
							-

8	HSR	6.25.1	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. **All works upto plinth lvl.** (Note :- Cement content considered in this item is @ 330 kg/cum. Less cement used as per design mix is recoverable. However no extra payment shall be made if excess cement is used as per design mix).	Cum	453.0	5,277.00	23,90,481.00
							-
9	HSR	6.25.2	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. **All works above plinth level upto floor IV level**. (Note :- Cement content considered in this item is @ 330 kg/cum. Less cement used as per design mix is recoverable. However no extra payment shall be made if excess cement is used as per design mix).	Cum	65.0	5,318.00	3,45,670.00
10		6.26.1	Providing M-30 grade concrete instead of M-25 grade BMC/ RMC. (Note:- Cement content considered in M-30 is @	Cum	518.0	60.00	31,080.00
11	HSR	10.115	Two coats of bitumen painting 20/30 penetration @ 1.65 Kg./Sqm.	Sqm	65.0	44.04	2,862.60

12	HSR	6.29.1	Centering and shuttering including strutting, propping etc. and removal of form work for : **Foundations, footings, bases for columns**	Sqm	1002.0	158.00	1,58,516.00
13	HSR	6.29.3	Centering and shuttering including strutting, propping etc. and removal of form work for : **Columns, piers, abutments, pillars, posts and struts**	Sqm	484.0	384.00	1,85,856.00
14	HSR	6.30.5	Centering and shuttering including strutting, propping etc. and removal of form for : **Lintels, beams, plinth beams, girders, bressumers and cantilevers**	Sqm	2536.0	297.00	7,53,192.00
15	HSR	6.29.2	Centering and shuttering including strutting, propping etc. and removal of form work for : **Retaining walls, return walls, walls (any thickness) including attached pilasters, buttresses, plinth and string courses fillets, kerbs and steps etc.**	Sqm	810.00	319.00	2,58,390.00
16	HSR	6.30.3	Centering and shuttering including strutting, propping etc. and removal of form for : **Suspended floors, roofs, landings, balconies and access platform**	Sqm	82.0	364.00	29,848.00
17	HSR	6.33.6	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	81848.0	69.00	56,47,512.00
18	HSR	6.34.6	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	6480.0	69.00	4,47,120.00
			BRICK WORK IN CEMENT MORTAR				-
19	HSR	7.21.1	Brick work with common burnt clay non-modular bricks of class designation 7.5 in foundation and plinth in: **Cement mortar 1:4 (1 cement : 4 coarse sand)**	Cum	218.0	5,549.00	12,09,682.00
							-

20	HSR	7.23.1	Brick work with common burnt clay machine moulded perforated bricks of class designation 12.5 conforming to IS: 2222 in superstructure above plinth level up to floor four level in cement mortar 1:6 (1 cement : 6 coarse sand) : **With non-modular bricks**	Cum	173.0	436.85	75,575.05
							-
21	HSR	7.28.1	Half brick masonry with common burnt clay non-modular bricks of class designation 7.5 in superstructure above plinth level up to floor IV level. : **Cement mortar 1:3 (1 cement :3 coarse sand)**	Sqm	35.0	728.00	25,480.00
			FLOORING				-
22	HSR	10.63.2	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 : **Size of Tile 600x600 mm**	Sqm	135.0	985.00	1,32,975.00
							-
23	HSR	10.67.2	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	9.0	994.00	8,946.00
							-

24	HSR	10.37.1	Providing and fixing of Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) : **25mm thick**	Sqm	19.0	988.00	18,772.00
25	HSR	10.38	Providing and fixing of Kota stone slabs 20 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.	Sqm	5.0	1,036.00	5,180.00
26	HSR	10.43	Extra for Kota stone/ sand stone in treads of steps and risers using single length up to 1.05 metre. **(labour rate only)**	Sqm	20.0	14.00	280.00
27	HSR	10.42	Extra for pre finished nosing in treads of steps of Kota stone/ sand stone slab. (labour rate only)	Meter	50.0	78.00	3,900.00
28	HSR	10.57	Providing and laying Ceramic glazed floor tiles of size 300x300 mm (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in colours such as 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 pointing the joints with white cement and matching pigment etc., complete.	Sqm	18.0	541.00	9,738.00
							-

29	HSR	10.58	Providing and fixing 1st 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.		141.0	537.00	75,717.00
30	HSR	11.39	Washed stone grit plaster on exterior walls height upto 10 metre above ground level, in two layers, under layer 12 mm cement plaster 1:4 (1 cement : 4 coarse sand), furrowing the under layer with scratching tool, applying cement slurry on the under layer @ 2 kg of cement per square metre, top layer 15 mm cement plaster 1:1/ 2:2 (1 cement: 1/2 coarse sand : 2 stone chipping 10 mm nominal size), in panels with groove all around as per approved pattern, including scrubbing and washing the top layer with brushes and water to expose the stone chippings ,complete as per specification and direction of Engineer-in-charge (payment for providing grooves shall be made separately).	Sqm	882.0	443.00	3,90,726.00
31	HSR	11.40.0	Forming groove of uniform size in the top layer of washed stone grit plaster as per approved pattern using wooden battens, nailed to the under layer, including removal of wooden battens, repair to the edges of panels and finishing the groove complete as per specifications and direction of the Engineer-in-charge :				-
a	HSR	11.40.1	15 mm wide and 15 mm deep groove	Meter	763.0	23.00	17,549.00
a	HSR	11.44	Extra for using white cement in place of ordinary cement in the top layar of the item of washed stone girt plaster	Sqm	882.00	71.00	62,622.00
							-

b	NS	NS	Extra for using marble stone chips & Marble power instead of stone chips & Coarse sand in top layar 15mm thick washed stone grid plaster 1: 1/4:1/ 4 (1 Cement, 1/4 Marble power :1/4 Coarse snad, 2 marble chips & 2 Stone chipping 10 mm nominal size) complete as per specification and direction of Engineer-in- charge.	Sqm	882.00	54.10	47,716.20
							-
32	HSR	11.1.1	6 mm cement plaster of mix : 1:3 (1 cement : 3 fine sand)	Sqm	36.0	112.00	4,032.00
33	HSR	11.5.2	12 mm thick cement plaster : 1:3 (1 cement: 3 fine sand) on walls.	Sqm	1858.6	151.00	2,80,651.84
34	HSR	11.6.1	15 mm cement plaster on the rough side of single or half brick wall of mix : **1:4 (1 cement: 4 fine sand)**	Sqm	118.0	162.00	19,116.00
35	HSR	9.10.1	Painting top of roofs with bitumen of approved quality @ 17kg per 10 sqm impregnated with a coat of coarse sand at 60 cudm per 10 sqm, including cleaning the slab surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil complete : **With residual type petroleum bitumen of grade VG -10**	Sqm	34.0	93.00	3,162.00
36	HSR	9.12.1	10cm thick (average) mud phaska of damped brick earth on roofs laid to slope consolidated and plastered with 25 mm thick mud mortar with bhusha @ 35 kg per cum of earth and gobri leaping with mix 1:1 (1 clay : 1 cow-dung) and covered with machine moulded tile bricks, grouted with cement mortar 1:3 (1 cement : 3 fine sand) mixed with 2% of integral water proofing compound by weight of cement and finished neat : **With machine moulded common burnt clay non-modular brick tiles of class designation 12.5, conforming to IS 2690**	Sqm	34.0	551.00	18,734.00

37	HSR	9.18	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.	Nos	6.0	151.00	906.00
38	HSR	9.17.1	Providing gola 75x75 mm in cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 10 mm and down gauge), including finishing with cement mortar 1:3 (1 cement : 3 fine sand) as per standard design : **In 75x75 mm deep chase**	Rmt	24.0	115	2,760.00
39	HSR	9.55.5	Supplying and fixing in position 60 cm long G.I. pipe class 'B' spouts in chajjas and cantilevers : **50 mm internal dia** (Provision only)	Each	2.0	303	606.00
40	HSR	9.57.3	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.				
a		(b)	150mm dia pvc pipe (6kg pressure)	Mtr	150.0	264.00	39,600.00
41	HSR	9.58.5.3	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.				
a		(b)	150mm dia pvc bend	Each	20.0	128.00	2,560.00
42		11.60.1	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	2073.4	58.00	1,20,255.83

43		11.69.2	Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content. : **With water thinnable cement primer on wall surface having VOC content less than 50 grams/litre**	Sqm	2073.4	26.00	53,907.79
44	HSR	11.71.1	Wall painting on a cement plaster surface with acrylic emulsion paint of approved brand and manufacture to give an even shade : two or more coats on new work	Sqm	2073.4	64.00	1,32,696.09
45	HSR	11.78	Painting two coats excluding priming coat with synthetic enamel paint in all shades on new wood work or metallic or plastered or concrete surfaces to give an even shade.	Sqm	211.9	36.00	7,630.18
46	HSR	32.47.1	Providing and fixing mineral fibre false ceiling tiles at all heights of size 595X595mm of approved texture, design and pattern. The tiles should have Humidity Resistance (RH) of 99%, Light Reflectance ≥ 85%, Thermal Conductivity k = 0.052 - 0.057 w/m K, Fire Performance as per (BS 476 pt - 6 &7)in true horizontal level suspended on interlocking T-Grid of hot dipped all round galvanized iron section of 0.33 mm thick (galvanized @120 gsm) comprising of main T runners of 15x32 mm of length 3000 mm, cross T of size 15x32mm of length 1200 mm and secondary intermediate cross T of size 15x32 mm of length 600 mm to form grid module of size 600x600 mm suspended from ceiling using galvanized mild steel item (galvanised@80gsm) 50 mm long 8mm outer diameter M-6 dash fasteners, 6 mm diameter fully threaded hanger rod up to 1000 mm length and L-shape level adjuster of size 85x25x2 mm, spaced at 1200 mm centre to centre along main 'T'. The system should rest on periphery walls /partitions with the help of GI perimeter wall angle of size24x24X3000 mm made of 0.40 mm thick sheet, to be fixed to the wall with help of plastic rawl plug at 450 mm centre to centre & 40 mm long dry wall S.S. screws. The exposed bottom portion of all T- sections used in false ceiling support system shall be pre-painted with polyester baked paint, for all	Sqm	119.4	1,488.00	1,77,667.20

			heights. The work shall be carried out as per specifications, drawings and as per directions of the engineer-in-charge. : **With 16 mm thick beveled tegular mineral fibre false ceiling tile (NRC 0.55 to 0.6**				
			JOINERY				
47	HSR	12.157.1.3	PProviding and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) : **Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)**	Kg	822.0	352.00	2,89,344.00

48		12.157	Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top, bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) :				
		12.157.2.3	For shutters of doors, windows & ventilators including providing and fixing hinges/ pivots and making provision for fixing of fittings wherever required including the cost of EPDM rubber / neoprene gasket required (Fittings shall be paid for separately) : **Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)**	Kg	822.0	403.00	3,31,266.00
49		12.158.2	Providing and fixing 12 mm thick prelaminated particle board flat pressed three layer or graded wood particle board conforming to IS: 12823 Grade l Type ll, in panelling fixed in aluminum doors, windows shutters and partition frames with C.P. brass / stainless steel screws etc. complete as per architectural drawings and directions of engineer-in-charge. Pre-laminated particle board with decorative lamination on both sides	Sqm	20.0	776.00	15,520.00
50	HSR	12.159.2	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber / neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge . (Cost of aluminium snap beading shall be paid in basic item):				-

a		(b)	With float glass panes of 5 mm thickness (weight not less than 12.50 kg/sqm)	Sqm	65.4	907.00	59,317.80
51		12.160.1	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body / plate with double spring mechanism and door weight upto 125 kg, for doors, including cost of cutting floors, embedding in floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in- charge : **With stainless steel cover plate minimum 1.25 mm thickness**	Each	4.0	1,871.00	7,484.00
52		12.162.3	Providing and fixing stainless steel (SS 304 grade) adjustable friction windows stays of approved quality with necessary stainless steel screws etc. to the side hung windows as per direction of Engineer-in-charge complete : (355 X 19 mm)	Each	24.0	233.00	5,592.00
							-
53		12.164	Providing and fixing Brass 100mm mortice latch and lock with 6 levers without pair of handles (best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	Each	10.0	316.00	3,160.00
54		12.166.2	Providing and fixing aluminium casement windows fastener of required length for aluminium windows with necessary screws etc. complete : **Powder coated minimum thickness 50 micron aluminium**	Each	50.0	58.00	2,900.00
55		12.167.2	Providing and fixing aluminium round shape handle of outer dia 100 mm with SS screws etc. complete as per direction of Engineer-in-charge : **Powder coated minimum thickness 50 micron aluminium**	Each	20.0	68.00	1,360.00

56		12.169.1	Filling the gap in between aluminium frame & adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete. : **Upto 5mm depth and 5 mm width**	Meter	200.0	39.00	7,800.00
57		12.173	Providing and fixing bright finished 100 mm mortice lock with 6 levers without pair of handles of approved quality for aluminium door, with necessary screws etc complete as per direction of Engineer- in-charge.	Each	20.0	486.00	9,720.00
							-
58	HSR	12.143	Providing and fixing Fiber Glass Reinforced plastic (FRP) Door Frames of cross-section 90 mm x 45 mm having single rebate of 32 mm x 15 mm to receive shutter of 30 mm thickness. The laminate shall be moulded with fire resistant grade unsaturated polyester resin and chopped mat. Door frame laminate shall be 2mm thick and shall be filled with suitable wooden block in all the three legs. The frame shall be covered with fiber glass from all sides. M.S. stay shall be provided at the bottom to steady the frame.	Mtr	14.9	553	8,212.05
							-
59	HSR	12.144.2	Providing and fixing to existing door frames- 30 mm thick Fiberglass Reinforced Plastic (F.R.P.) flush door shutter in different plain and wood finish made with fire retardant grade unsaturated polyester resin, moulded to 3 mm thick FRP laminate all around, with suitable wooden blocks inside at required places for fixing of fittings and polyurethane foam (PUF)/Polystyrene foam to be used as filler material throughout the hollow panel, casted monolithically with testing parameters of F.R.P. laminate conforming to table - 3 of IS: 14856, complete as per direction of Engineer-in-charge.	Sqm	6.0	3,202.00	19,212.00
							-

60	HSR	13.37.1	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths, interlocked together through their entire length and jointed together at the end by end locks, mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete, including the cost of providing and fixing necessary 27.5 cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to IS: 4454 - part 1 and M.S. top cover of required thickness for rolling shutters.-				-
a		(b)	80x1.25 mm M.S. laths with 1.25 mm thick top cover	Sqm	105.0	1,962.00	2,06,010.00
							-
61	HSR	13.38	Providing and fixing ball bearing for rolling shutters.	Each	5.0	317.00	1,585.00
							-
62	HSR	13.39.1	Extra for providing mechanical device chain and crank operation for operating rolling shutters- Exceeding 10.00 sqm and upto 16.80 sqm in the area	Sqm	105.0	924.00	97,020.00
63		13.4	Extra for providing grilled rolling shutters manufactured out of 8 mm dia M.S. bar instead of laths as per design approved by Engineer-in- charge, (area of grill to be measured).	Sqm	20.0	571.00	11,420.00
			External Development				
64	**HSR**	6.1.4	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : **1:3:6 (1 Cement : 3 coarse sand (zone-III) : 6 graded stone aggregate 20 mm nominal size)**	Cum	306.0	3,881.00	11,87,586.00

65	**HSR**	6.24.1	Providing and laying in position ready mixed M-25 grade concrete for reinforced cement concrete work, using cement content as per approved design mix, manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work, including pumping of R.M.C. from transit mixer to site of laying , excluding the cost of centering, shuttering finishing and reinforcement, including cost of 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 the Engineer-in-charge.:**All works upto plinth level**	Cum	510.0	5,620.00	28,66,200.00
66		6.26.3	Extra for providing richer mixes up to plinth and at all floor levels.: **Providing M-40 grade concrete instead of M-25 grade BMC/ RMC.(Note : Cement content considered in M-40 is @**	Cum	510.0	179.00	91,290.00
67	HSR	6.39.1	Providing and fixing at or near ground level precast cement concrete in kerbs, edgings etc. as per approved pattern and setting in position with cement mortar 1:3 (1 Cement : 3 coarse sand), including the cost of required centering, shuttering complete.: 1:1½:3 (1 Cement: 1½ coarse sand(zone-III) : 3 graded stone aggregate 20 mm nominal size).	cum	54.0	4,958.00	2,67,732.00
68	HSR	13.42.1	Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approved steel primer. M.S. Tube	Kg	400.0	106.00	42,400.00

69	NS	NS	Providing and laying C.C. pavement of mix M-30 with ready mixed concrete from batching plant. The ready mixed concrete shall be laid and finished with screed board vibrator , vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge. (The panel shuttering work shall be paid for separately). to give an even shade :	Cum	283.0	5601.38	15,85,190.54
70	NS	NS	Providing and cuttting groove 10/5mm & to be filled with FIBEAL JSP 700 of Fibrex or equivalent make in a groove. Ensure that the groove or expansion joint to be treated should be free from all contaminants, dirt, dust, debris and unsound material in order to attain proper bonding. Moisture content should be less than 4%-6%. Apply masking tape on both edges of the groove or expansion joint in a straight line fashion.	Cum	1100.0	110.00	1,21,000.00
71	HSR	13.28	Structural steel work in girders or stanchions built up one joint or channel sections welded including cutting and fixing all gusset plate bolts nuts welding rods etc complete with flange plates heads sole plates angle connections etc with hoisting and erecting in positition				
		a	With one R.S Joint	Kg	10272.4	74.00	7,60,156.13
72		6.13	Making plinth protection 50mm thick of cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) over 75mm thick bed of dry brick ballast 40 mm nominal size, well rammed and consolidated and grouted with fine sand, including necessary excavation, levelling & dressing & finishing the top smooth.	Sqm	52.2	357.00	18,635.40
			AREA DEVELOPMENT				

73	HSR	24.1	Preparation of sub grade, including trenching, rough dressing of spoil final dressing of earth, to given levels and camber, watering, rolling with road roller, and compacting the bed	100 sqm	2040.0	0.92	1,876.80
74		NS	Providing and laying of compacted Granular Sub Base Grading-I, in two layers including preparation and compaction complete as per MORT&H specification Clause 401.	cum	306.0	1100.00	3,36,600.00
			TOTAL				**2,44,02,738.66**

Electrical Works

S.No	Item Source	Item Ref.	Description	Unit	Quantity	HSR & DSR E & M-2018 Rate (Rs.)	Amount (Rs.) I/C CP
1			**MAIN PANEL**				
	Market Rate	MR	Supply with all standard accessories & fixtures including testing at Factory & at Site. Receiving, unloading, Storing,	Set	1	76,840.00	76,840.00

			Shifting, installing, commissioning of incoming & outgoing cable at site location				
			INCOMER				
-			1No. 100A TPN MCCB (25KA)				
			METERING & INDICATION				
-			1 set of R,Y,B phase indicating lamps with 6Amp SP MCB (3nos)				
			CT Operated Dual resistor Multifunction meter 3 nos				
			BUS-BAR				
-			1 Set of 200A, TPN Aluminium Bus Bar with colour coded PVC Sleeves				
			OUTGOINGS				
-			8 Nos. 63A 4 pole C Curve				
			Supply of weatherproof 20/32A SPN Metal Clad Socket with DP 16/32 DP MCB				
2			**Industrial Socket Outlets**				
	DSR E & M 2018		Supply, installation, testing & commissioning of weather proof type (IP 65) industrial type plug and socket outlet with MCB's (10 KA motor duty) mounted In a factory fabricated enclosure including termination, earthing etc as required				
		DSR18(E &M) 2.18	20/32A metal clad SPN Socket outlet controlled by 16/20/32A DP MCB.	Set	4	1,232.00	4,928.00
3			CABLES, SUB MAINS & CABLE TRAYS:				
			LT Cables:				
			Supply, installation, testing and commissioning of following sizes of PVC sheathed PVC/ XLPE insulated Aluminium armd. conductor/ copper armd conductor power/ multi-core control armoured cable of 1.1 KV grade on surface or in existing cable tray /masonry ducts/ hume pipe/ trench with fixing hardware etc as required.				
			Aluminium Conductor Armoured Cables:				
a	HSR	HSR	3 ½ core 50 sqmm PVC Al cable	RM	180	203.07	36,552.60

		31.25 (xxvii)					
4			Cable Termination:				
			Supply and making end termination with brass double compression glands for the following PVC/XLPE insulated PVC sheathed 1100 V grade cable including cost of crimping lugs/ferrules, compression glands, solder, cable sockets, insulation tap etc complete as required.				
			Aluminium conductor armoured cables				
a	HSR	HSR 31.28(iii)	3 ½ core 50 sqmm PVC Al cable	Set	6	38.20	229.20
		20.106	Supply, erection, testing & commissioning in LT cables PVC aluminum armoured / copper cable including cost of thimbles, lugs for making connection underground covered with sand and bricks / in trench / in pipe on steel bridges (detail of cable sizes & length to be provided be clearly mentioned) for making following connection complete as per directions of Engineer-in-charge				
a	HSR	20.106.1	from transformer to LT panel 1100 V grade 3.1/2 core 10 Sq. mm XLPE or for motor side 3 core aluminum 2x6 sq.mm XLPE	RM	180	180.00	32,400.00
5			Cable Trays:				
	DSR E & M 2018	DSR18(E &M) 4.1.8	Supplying and installing following size of perforated painted with powder coating M.S. cable trays with perforation not more than 17.5%, in convenient sections, joined with connectors, suspended from the ceiling with M.S. suspenders including bolts & nuts, painting suspenders etc as required.				
		a	300 mm wide x 62.5mm depth x 2.0mm thickness	RM	100	599.00	59,900.00
6			GI Pipe				
	DSR E & M	DSR2018 (E & M)	Supply and installation of following sizes of `B' class GI pipe for cable sleeves in recess/ on surface/Ground complete with				

	2018	14.13.2	all accessories pull boxes where ever required, G.I. fish wire, fixing hardware etc. including the chasing of wall/floor, and plastering the chased portion, digging the trench and back filling, making good the damages, sealing of pipe entry etc as required.				
			Providing, laying and fixing following dia GI pipe (medium class) in ground complete with GI fittings including trenching (75cm deep) and refelling etc as required - 80 mm dia	RM	75	803.00	60,225.00
7			WIRING				
a	DSR 2018(EM)	1.3.3	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 C)				
		(a)	Group C	Each	100	1213	1,21,300.00
b	DSR 2018 (EM)	1.12	Wiring for light/ power plug with 2X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit along with 1 No. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Mtr	600	200.00	1,20,000.00
c	DSR 2018 (EM	1.13	Wiring for light/ power plug with 4X4 sq. mm FRLS PVC insulated copper conductor single core cable in surface/ recessed medium class PVC conduit alongwith 2 Nos. 4 sq. mm FRLS PVC insulated copper conductor single core cable for loop earthing as required.	Mtr	600	308.00	1,84,800.00
d	DSR 2018 (EM)	1.14	Wiring for circuit / submain wiring alongwith earth wire with the following sizes of FR PVC insulated copper conductor single core cables in surface/recessed PVC conduit complete as required				-
		1.14.3	2 X 4 sq. mm + 1 X 4 sq. mm earth wire - Ground Floor	Mtr	600	200	1,20,000.00
8			SUBMAIN WIRING				
a	DSR	1.14.9	4 X 6 sq. mm + 2 X 6 sq. mm earth wire	Mtr	600	394	2,36,400.00

	2018(EM)						
b	DSR 2018(EM)	1.14.10	4 X 10 sq. mm + 2 X 6 sq. mm earth wire	Mtr	600	543	3,25,800.00
		23.8.10	Providing and fixing GI concealed sheet metal boxes with inner and outer face plate including concealing the box in wall and fixing in position with inner plate and face plate with all labour and material required for the job complete in all respects.				
		23.8.10.1	1 & 2 Modules including combined plate for Telephone and data	Each	10	92	920.00
		23.8.10.2	3 Modules	Each	10	125	1,250.00
		23.8.10.3	4 Modules	Each	20	138	2,760.00
		23.8.10.4	6 Modules	Each	20	182	3,640.00
		23.8.10.5	8 Modules	Each	30	229	6,870.00
		23.8.10.6	12 Modules	Each	20	278	5,560.00
9	HSR	23.8.11	Providing and fixing modular type accessories of approved make in existing box including fixing and making necessary connections, complete in all respect.				
		23.8.11.1	5 amp 1 way switch	Each	50	40	2,000.00
		23.8.11.2	5 amp 2 way switch	Each	40	73	2,920.00
		23.8.11.3	15 amp 1 way switch	Each	50	81	4,050.00
		23.8.11.4	5 amp Socket	Each	50	81	4,050.00
		23.8.11.5	15 amp 6 pin Socket	Each	30	122	3,660.00
		23.8.11.6	Bell Push	Each	1	75	75.00
		23.8.11.7	step type Fan Regulator 2 modules 300 watt	Each	12	253	3,036.00
		23.8.11.10	Blanking plate	Each	50	18	900.00
10			CONDUITS				
	HSR	HSR 31.58	Supplying and fixing of following sizes of FRLS PVC conduit along with the all accessories in surface/recess including cutting the wall and making good the same in case of recessed conduit as required or clamping with steel truss complete with				

			junction boxes as required				
a			PVC pipe of 32mm dia	Mtr	250	45.00	11,250.00
11			VERTICAL/MULTITIER DISTRIBUTION BOARD				
			Supply & Installation, testing & commissioning of following surface/reccesed Distribution Board (I.P-42 Protection), fabricated out of 16SWG, CRCA sheet indoor type, dust & vermin proof, hinged complete with bus bar, Internal connection, numbering,earthing, painting complete as required.				
			Make-ABB/Schneider				
			8W SPN DB				
	DSR E & M 2018	Basic Rate DSR 2018 (E&M) 1737	2+10 way, SPN, double door, MCB DB	Set	10	936.00	9,360.00
i			Incoming :				
-	DSR E & M 2018	Basic Rate DSR 2018 (E&M) 1710	6 amps to 32 amps ratings , TPN MCB “C” curve 10KA breaking capacity	Nos	40	776.00	31,040.00
ii			Outgoings :				
-	DSR E & M 2018	Basic Rate DSR 2018 (E&M) 1707	6 amps to 32 amps ratings , SPN MCB “C” curve 10KA breaking capacity	Set	40	362.40	14,496.00
12			LIGHT FIXTURES				
			Supply following type of light fixtures with installation arrangement & proper support etc. complete as required. (Light Fixture Hang From the ceiling Height upto 11mtr or as per site requirement)				
a	Marke	MR	High bay Led 100W 240 v 0.440 A PF >0.95 THD <10 CT	Each	34	11,760.00	3,99,840.00

	t Rate		5700K CRI >70 10000 lm				
b	Marke t Rate	MR	supply and fixing of 1'X1' 24 WAtt LED light of Rossete /philips complete	Each	10	7,000.00	70,000.00
		MR	72 watt LED with lens S/2 litting with having min. Of 7200 lumens & lumen efficence100 LPW, fitting should be IP/66/65 irrgress protection with interval lurge protection of min 5 KV Make- BAJAJ/Philips/Crompton /Halomix/ Jaquar/Surya Roshni		20	9,395.11	1,87,902.20
13			EARTHING PITS & LIGHTENING CONDUCTOR				
		24.1	Earthing and Lightening Arrestor				
		24.1.1	Earthing with GL earth pipe 4.5 m long and 40 mm dia with masonry enclosures on the top etc. (but without charcoal or coke and salt) as required.	Each	6	2,736.00	16,416.00
		24.1.2	Extra for using salt and char coal/coke for pipe earth electrode as required.	Each	6	642.00	3,852.00
a	HSR	24.1.4	Earthing with G.I. earth plate 600 mmx 600 mm x 6 mm thick including accessories and providing masonry enclosures with cover plate having locking arrangement and watering pipe etc. (but without charcoal or coke and salt) complete as required.	Each	6	8,202.00	49,212.00
b	HSR	24.1.16	Supply and erection of 25mm dia 1.5 metre long lightning GI. tube rod tapered into a point at the top with 16cm x 16cm x 3mm thick G.I. base plate and necessary nuts and bolts with washers.	Lot	6	884.00	5,304.00
c	HSR	24.1.9	Providing and fixing 25 mm x5 mm copper strip in 40 mm dia G.I. pipe from earth electrode as required.	RM	40	719.00	28,760.00
14			External light				
	HSR	24.4.8	Supply of Hot Dip Galvanized octagonal pole of 3mm thickness, with base plate including cost of nut and bolts , earthing studs, Integral Cable termination arrangement 5 mm thick Bakellite base plate on suitable welded MS/GI bracket 32 A four way connector 2 no 10 A SP MCB , end cover and all accessories as supplied by the manufacture	Each			
		24.4.8.5	7 Mtr Long pole with top dia 75 0mm and bottom dia 150 mm	Each	20	8,487.00	1,69,740.00

			with base plate of size 300 x 300 x 20 mm				
			Total Electrical Works				**24,18,238.00**

PEB WORKS

Providing and installing Pre Engineered Building (PEB) comprising of pre-fabricated steel portals with rod / angle bracings as per drawing. 26 G Colored Galvalume 0.5mm thick TCT wall sheeting. 26 G Bare Galvalume 0.5mm thick TCT (Total Coated Thickness) roof sheeting with daylight panel on 2% of Roof Area & turbo vents for ventilation. All primary and secondary members with Red Oxide primer and synthetic enamel paint. And The shed shall be supplied with all necessary fittings, fasteners, EPDM gaskets / washers & flashings & rain water pipes (0.5mm thick colour coated galvalume sheet). The pre-fab shed wok should be carried out by a specialized approved agency having in house manufacturing facility and having ISO : 9001 certification for both manufacturing and contracting. The design and engineering and supply and installation shall be in the scope of the vendor.

S.No.	Description of Item	Qty	Unit	Supply Charges		Erection Charges		
				Rate	Amount	Rate	Amount	Final Cost
1	**Structural Steel -** Primary & Secondary Steel complete with primer & 2 coats of synthetic enamel paint (applied at site)	39000	Kg.	76.00	29,64,000.00	8.50	3,31,500.00	**32,95,500.00**
2	**Roofing** - HI RIB SMP 0.50 Galvalume with screws	1859	Sq.mtr.	405.00	7,52,895.00	50.00	92,950.00	**8,45,845.00**
3	**Insulation - 50**mm thick 16 kg/m3 density Alum Foil	1900	Sq.mtr.	150.00	2,85,000.00	20.00	38,000.00	**3,23,000.00**
4	**Cladding** - HI RIB SMP 0.50 Galvalume with screws	1384	Sq.mtr.	405.00	5,60,520.00	50.00	69,200.00	**6,29,720.00**
5	**Day Light Panels** - Polycarbonate 2.00mm	52.56	Sq.mtr.	950.00	49,932.00	50.00	2,628.00	**52,560.00**
6	**Turbo Ventilators 600mm**	20	Nos.	4,000.00	80,000.00	500.00	10,000.00	**90,000.00**
	Total				**46,92,347.00**		**5,44,278.00**	**52,36,625.00**
	ADD 18% GST							**9,42,592.50**
	Total							**61,79,217.50**

Estimate for the plumbing work of Construction of PPC Building in Mega Food Park at Indl. Estate, Manakpur							
PLUMBING WORKS							
S.No	**Item Source**	**Item Ref.**	**Description**	**Unit**	**Quantity**	**HSR & DSR-2018 Rate (Rs.)**	**Amount (Rs.) I/C CP**
1	HSR	22.24	Providing and fixing white vitreous chinaware pedestal type water closet (European type) with seat and lid, 10 litre low level white vitreous chinaware flushing cistern & C.P. flush bend with fittings & C.I. brackets, 40 mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required :				
		22.24.1	W.C. pan with ISI marked white solid plastic seat and lid	Each	3	4,317.00	12,951.00
2	HSR	30.13.(i)	EXTRA OVER item nos. 30.3 to 30.6 FOR PROVIDING AND FIXING BEST INDIAN MAKE PLASTIC HYGENIC SEAT with lid complete instead of hollow Black or white plaster seat and lid.(i) White plastic seat (Solid). [HSR 30. 13 (i)].	Each	3	193.00	579.00
3	HSR	22.42	Providing and fixing toilet paper holder :				
		22.42.2	vitreous chinaware- white	Each	3	248.00	744.00
4	HSR	22.10	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps, 32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require:				
	b	22.1.1	White vitreous chinaware Wash basin size 630x450 mm with a pair of 15 mm C.P. brass pillar taps	Each	3	1994	5,982.00

1	HSR	22.14.1.1	Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete. (semi girid pipe): 32 mm dia	Each	3	45	135.00
	HSR	22.17.1	Providing and fixing 40mm i/d chromium plated trap with chromium plated pipe to wall with walflange completed for use with sinks: With Bottle Trap (Indian make)	Each	8	869	6,952.00
2	HSR	22.35	Providing and fixing G.I. inlet connection for flush pipe connecting with W.C. pan.	Each	3	79	237.00
3	HSR	22.26.4	Providing and fixing white vitreous chinaware flat back half stall urinal of size 580x380x350 mm with white PVC flushing cistern, with fittings, standard size C.P. brass flush pipe, spreaders with unions and clamps (all in C.P. brass) with waste fitting as per IS : 2556, C.I. trap with outlet grating and other couplings in C.P. brass, including painting of fittings and cutting and making good the walls and floors wherever required :				
a		i	Range of three half stall urinals with 10 litre P.V.C. automatic flushing cistern-white	Each	3	9,093.00	27,279.00
4	HSR	30.40	Providing and Fixing 25mm thick marble backs for different type of urinals (b) viterous China Ware partition wall (I) small sze 680x 330mm				
a		b(I)(i)	White	Each	3	833.80	2,501.40
5	HSR	22.119.2	Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fittings arrangement of approved quality and colour. : 600 mm long towel rail with total length of 645 mm, width 78 mm and effective height of 88 mm, weighing not less than 190 gms.	Each	2	353.00	706.00

6	HSR	30.62	Providing and fixing in position 40 mm diameter GI waste pipe embedded in wall or lead waste pipe (weighing 4.46 kg /m and 3.0mm thick) up to floor level as required by the engineer in charge including cost of union and plumber joints.	each	12	491.94	5,903.28
7	HSR	22.10.1.3	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 shink with drain board				
a		a	510x1040 mm bowl depth 200 mm	each	1	4,026.00	4,026.00
8	HSR	22.210.4	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shade with 6 mm thick hard board backing : 				
a		a(ii)	Rectangular shape 1500x450 mm	each	3	1,253.00	3,759.00
###	HSR	22.81.1	Cutting chases in brick walls in cement or in floorfor embedding GI or HCI PIPELINE AND making good the same to its original conditions.:				
a		b	150 mm dia.	metre	3	9.00	27.00
###	HSR	22.20.1	Provinding and fixing in position C.I. plain Nahani Trap conforming to I.S.I. specifications and of self cleaning design with C.P. brass hinged grating with frame complete				
a		b	With 75 mm internal diameter outlet	each	3	1,353.00	4,059.00
###	HSR	22.92.2	Making connection of G.I. distribution branch with G.I. main of following sizes by providing and fixing tee, including cutting andthreading the pipe etc. complete : 50 to 80 mm nominal bore	each	3	834.00	2,502.00

###	HSR	22.105.1	Providing and fixing C.P. brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gms.				
a		c	15 mm nominal bore	each	3	504.00	1,512.00
###	HSR	22.106.1	Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards and weighing not less than 690 gms.				
a		a	15 mm nominal bore	each	3	440.00	1,320.00
###	HSR	22.38	Providing and fixing 8 mm dia C.P. / S.S. Jet with flexible tube upto 1 metre long with S.S. triangular plate to Eureopean type W.C. of quality and make as approved by Engineer - in - charge.				
a		b(iii)		each	3	238.00	714.00
###	HSR	22.107.1	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved make conforming to IS:8931.				
a		a	15 mm nominal bore.	each	3	500.00	1,500.00
###	HSR	22.12.1	Providing and fixing CP Brass Single lever telephonic wall mixer of quality & make as approved by Engineer in charge.				
a		b	15 mm nominal dia	each	3	5,164.00	15,492.00
###	HSR	22.51.1.1	Providing and fixing soil, waste and vent pipes :				
a		a	(100 mm dia) Sand cast iron S&S pipe as per IS: 1729	metre	105	816.00	85,680.00

		22.54.1	Providing and fixing M.S. holder bat clamp of approved design to sand cast iron/ cast iron (spun) pipes comprising of M.S. flat brackets made of 50x5 mm flat of specified shape, projecting 75 mm outside the wall surface and fixed on wall with 4Nos., 6mm dia expansion hold fasteners, including drilling necessary holes in brick wall/ CC/ RCC surface and the cost of bolts etc. The pipes shall be fixed to the already fixed brackets with the help of 30 mm x1.6 mm galvanised M.S. flats of specified shape and of total length 420 mm and shall be fixed with M.S. nuts, bolts, & washers of size 25x6 mm, one bolts on each side of the pipe.				
		b	Total bracket length 580mm of approved shape and design for single 100 mm dia pipe	each	20	175.00	3,500.00
###	HSR	30.91a	Providing and fixing in position H.C.I. specials for soil, waste, vent or anti-syphonage pipes to I.S.I. marked including cutting and wastage etc. cutting holes in walls roofs or floors etc. and making good to its original condition but exluding cost of lead jointing. (100 mm dia ID pipe). [HSR 30.91 (a)].				
a		22.57.1.1	Providing and fixing heel rest sanitary bend : Sand cast iron S&S as per IS - 1729- 100 mm dia	each	6	407.00	2,442.00
b		22.58.1.1	Providing and fixing double equal junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete : 100x100x100x100 mm- Sand cast iron S&S as per IS - 1729	each	6	847.00	5,082.00
		22.60.1.1	Providing and fixing single equal plain junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete.: 100x100x100x100 mm- Sand cast iron S&S as per IS - 1729	each	6	493.00	2,958.00
c		22.55.1.1	Providing and fixing bend of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete. : 100 mm dia : Sand cast iron S&S as per IS - 1729	each	6	373.00	2,238.00

d		22.56.1.1	Providing and fixing plain bend of required degree. : 100 mm dia : Sand cast iron S&S as per IS - 1729	each	20	305.00	6,100.00
g		22.76.1.1	Providing and fixing collar :: 100 mm dia : Sand cast iron S&S as per IS - 1729	each	12	291.00	3,492.00
###	HSR	22.166.2.1	Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. 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 : **150 x 100 mm size P type :**	each	6	1,834.00	11,004.00
###	HSR	22.85	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. : internal work- exposed on wall				
a		22.85.6	50 mm nominal outer dia Pipes	metre	100	637.00	63,700.00
b		22.85.5	40 mm nominal outer dia Pipes	metre	15	421.00	6,315.00
c		22.85.4	32 mm nominal outer dia Pipes	metre	15	305.00	4,575.00
d		22.85.3	25 mm nominal outer dia Pipes	metre	40	228.00	9,120.00
e		22.85.2	20 mm nominal outer dia Pipes	metre	50	178.00	8,900.00
f		22.85.1	15 mm nominal outer dia Pipes	metre	40	128.00	5,120.00

		22.87	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: External work				
		22.87.1	15 mm nominal outer dia Pipes	metre	10	100.00	1,000.00
		22.87.2	20 mm nominal outer dia Pipes	metre	20	144.00	2,880.00
		22.87.3	25 mm nominal outer dia Pipes	metre	20	198.00	3,960.00
		22.87.4	32 mm nominal outer dia Pipes	metre	40	267.00	10,680.00
		22.87.5	40 mm nominal outer dia Pipes	metre	50	367.00	18,350.00
		22.87.6	50 mm nominal outer dia Pipes	metre	50	582.00	29,100.00
		22.87.7	62.50 mm nominal outer dia Pipes	metre	10	1,209.00	12,090.00
		22.87.8	75 mm nominal outer dia Pipes	metre	10	1,558.00	15,580.00
		22.87.9	100 mm nominal outer dia Pipes	metre	10	2,221.00	22,210.00
		22.87.10	150 mm nominal outer dia Pipes	metre	5	4,633.00	23,165.00
26	HSR	22.78	Providing lead caulked joints to sand cast iron/centrifugally cast (spun) iron pipes and fittings of diameter :				
		22.78.1	100 mm	each	20	238	4,760.00
		22.78.2	75 mm	each	15	205	3,075.00
		22.78.3	50 mm	each	10	171	1,710.00
###	HSR	22.98	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :				
a		22.98.1	25 mm nominal bore	each	4	400.00	1,600.00
		22.98.2	20 mm nominal bore	each	4	371.00	1,484.00
		22.98.3	32 mm nominal bore	each	2	477.00	954.00
		22.98.4	40 mm nominal bore	each	2	558.00	1,116.00

		22.98.5	50 mm nominal bore	each	2	719.00	1,438.00
		22.98.6	65 mm nominal bore	each	1	1,246.00	1,246.00
		22.98.7	80 mm nominal bore	each	1	1,864.00	1,864.00
		22.99	Providing and fixing gun metal non- return valve of approved quality (screwed end) :				
		22.99.1.1	25 mm nominal bore - Horizontal	each	1	387.00	387.00
		22.99.1.2	25 mm nominal bore - Vertical	each	1	410.00	410.00
		22.99.2.1	32 mm nominal bore - Horizontal	each	1	525.00	525.00
		22.99.2.2	32 mm nominal bore - Vertical	each	1	582.00	582.00
		22.99.3.1	40 mm nominal bore - Horizontal	each	1	652.00	652.00
		22.99.3.2	40 mm nominal bore - Vertical	each	1	812.00	812.00
		22.99.4.1	50 mm nominal bore - Horizontal	each	1	950.00	950.00
		22.99.4.2	50 mm nominal bore - Vertical	each	1	1,041.00	1,041.00
###	HSR	22.179.0	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 coarse sand : 3 graded stone aggregate 20 mm nominal size), foundation concrete 1:5:10 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: **With common burnt clay non-modular bricks of class designation 7.5**				
		22.179.1.1	Inside dimensions 455x610 mm and 45 cm deep for single pipe line :	each	3	4,384.00	13,152.00

a		22.179.2.1	Inside dimensions 500x700 mm and 45 cm deep for pipe line with one or two inlets :	each	3	5,050.00	15,150.00
b		22.179.3.1	Inside dimensions 600x 850 mm and 45 cm deep for pipe line with three or more inlets :	each	3	5,797.00	17,391.00
		22.180.0	Extra for depth beyond 45 cm of brick masonry chamber : With common burnt clay non-modular bricks of class designation 7.5				
###		22.180.1.1	For 455x610 mm sizer	Mtr	3	4,271.00	12,813.00
a		22.180.2.1	For 500x700 mm size	Mtr	3	4,653.00	13,959.00
b		22.180.3.1	For 600x850 mm size	Mtr	3	5,409.00	16,227.00
###	HSR	22.181	Providing and placing on terrace (at all floor levels) polyethylene water storage tank, IS : 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.	litre	2,000	7.00	14,000.00
###	HSR	30.110b	Providing and fixing in position automatic brass ball valves in tanks. (b) With Plastic Ball (ii) 20 mm internal diameter. [HSR 30.110 (b) (ii)].	each	2	229.3	458.60
	HSR	22.164.0	Providing and laying cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design :				
###		22.164.1	100 mm diameter S.W. pipe	metre	50	491	24,550.00

a		22.164.2	150 mm diameter S.W. pipe	metre	75	601.00	45,075.00
b		22.164.3	200 mm diameter S.W. pipe	metre	195	700.00	1,36,500.00
		22.164.4	250 mm diameter S.W. pipe	metre	50	810.00	40,500.00
	HSR	22.163.0	Providing, laying and jointing glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 fine sand) including testing of joints etc. complete :				
		22.163.1	100 mm diameter	metre	50	230.00	11,500.00
		22.163.2	150 mm diameter	metre	75	351.00	26,325.00
		22.163.3	200 mm diameter	metre	195	443.00	86,385.00
		22.163.4	250 mm diameter	metre	50	652.00	32,600.00
		22.163.5	300 mm diameter	metre	10	895.00	8,950.00
###	HSR	22.205.1	Constructing brick masonry road gully chamber 50x45x60 cm with bricks in 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 non-modular bricks of class designation 7.5	each	2	3,723.00	7,446.00
a		22.207.1	Constructing brick masonry road gully chamber 110x50x77.5 cm with bricks in cement mortar 1:4 (1 cement : 4 coarse sand) including 500x450 mm precast R.C.C. horizontal grating with frame and vertical grating complete as per standard design : With common burnt clay non-modular bricks of class designation 7.5	each	2	7,101.00	14,202.00
			TOTAL FOR PHE WORKS (PLUMBING)				**1019911.28**
			PART-2				
			RCC Pipe				

	HSR	21.96.1	Providing lowering, cutting jointing and testing RCC pipe class NP3 as per IS-458-2003 which Spigot & socketted joints manufactured with ISI marked sulphate Resistance Cement as per ISI 12330 with rubber rings ISI marked antitermite as required at site, into trenches, for all depths and laying out the same to correct alignment and cutting of concrete bed and sides of trenches, if required, jointing with rubber rings in trenches and jointing with 1:1 1/2 cement sand mortar and with end dowels filled with 1:1 1/2 cement sand mortar and finishing the joints cutting and finishing the cut surface to a uniform finish etc. as fully described in HSR item No. 29.38, 29.44, 29.45 & 29.46 including cartage loading and unloading complete in all respects. the internal diametric of the sewer being				
		21.96.1	350mm	cum	50.00	1101	55,050.00
							55,050.00
			Part -3				
			Detailed Estimate- Rain water harvesting pit				
1	HSR	33.6	Boring/drilling bore well of required dia for casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/ bore log, including hire & running charges of all equipments, tools, plants & machineries required for the job, all complete as per direction of Engineer-in-charge, upto 90 metre depth below ground level.				
(a)	HSR	33.6.1	All types of soil				
	HSR	33.6.1.1	300 mm dia	metre	120.0	339.00	40,680.00

2	HSR	33.8	Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS: 12818, including required hire and labour charges, fittings & accessories etc. all complete, for all depths, as per direction of Engineer -in-charge.				
(a)	HSR	33.8.3	200 mm nominal size dia	metre	100.0	905.00	90,500.00
3	HSR	33.12	Supplying, filling, spreading & leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	cum	4.8	1023.00	4,941.09
4	HSR	33.13	Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.	cum	4.8	1023.00	4,941.09
5	HSR	33.14	Supplying, filling, spreading & leveling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -in-charge.	cum	4.8	1326.55	6,407.24
6	HSR	33.15	Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading & sizes as per actual requirement, all complete as per direction of Engineer-in-charge.	cum	4.8	1147.00	5,540.01

7	HSR	33.19	Development of tube well in accordance with IS : 2800 (part I) and IS: 11189, to establish maximum rate of usable water yield without sand content (beyond permissible limit), with required capacity air compressor, running the compressor for required time till well is fully developed, measuring yield of well by "V" notch method or any other approved method, measuring static level & draw down etc. by step draw down method, collecting water samples & getting tested in approved laboratory, i/c disinfection of tubewell, all complete, including hire & labour charges of air compressor, tools & accessories etc., all as per requirement and direction of Engineer-in-charge.	Hrs	24.00	619.00	14,856.00
8	HSR	33.16.2	Providing and fixing suitable size threaded mild steel cap or spot welded plate to the top of bore well housing/ casing pipe, removable as per requirement, all complete for borewell of:				
(a)		33.16.2	150 mm dia	each	2.0	180.00	360.00
9	HSR	33.17	Providing and fixing M.S. clamp of required dia to the top of casing/ housing pipe of tubewell as per IS: 2800 (part I), including necessary bolts & nuts of required size complete.				
(a)		33.17.2	150 mm clamp	each	2.0	1173.00	2,346.00
10	HSR	33.18	Providing and fixing Bail plug/ Bottom plug of required dia to the bottom of pipe assembly of tubewell as per IS:2800 (part I).				
(a)	HSR	33.18.2	150 mm dia	each	2.0	232.00	464.00
11	HSR	22.201.3	Providing and fixing in position pre-cast R.C.C. manhole cover and frame of required shape and approved quality: H D - 20				
12	HSR	22.201.3.	Circular shape 560 mm internal diameter (H D - 20)	each	1.0	1471.50	1,471.50

		1					
			SH-1: E A R T H W O R K				
13	HSR	4.12.1	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. All kinds of soil	Cum	78.45	94.00	7,374.30
14	HSR	6.2 c	Extra for every 7.5 metres additional lead beyond 15 metres, but upto60 metres by manual mean	100 CUM	156.90	22.65	3,553.79
			SH-2: C O N C R E T E W O R K				
		6.1	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level				
17	HSR	6.1.6	1:4:8 (1 Cement : 4 coarse sand (zone-III) : 8 graded stone aggregate 40 mm nominal size)	Cum	1.58	3,549.00	5,589.68
			SH-3: REINFORCED CEMENT CONCRETE				
		6.29	Centering and shuttering including strutting, propping etc. and removal of form work for :				
19	HSR	6.29.1	Foundations, footings, bases for columns	Sqm	16.47	158.00	2,602.26
20	HSR	6.29.2	Retaining walls, return walls, walls (any thickness) including attached pilasters, buttresses, plinth and string courses fillets, kerbs and steps etc.	Sqm	138.80	319.00	44,277.20

		6.33	Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth level.				
21	HSR	6.33.6	Thermo-Mechanically Treated bars of grade Fe-500D or more.	kg	2,431	69.00	1,67,739.00
		6.2	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 four level, excluding the cost of centering, shuttering and finishing:				
22		6.2.1	1:1½:3 (1 cement : 1½ coarse sand (zone-III) : 3 graded stone aggregate 20 mm nominal size).	cum	22.10	4,891.00	1,08,093.55
			GROSS TOTAL				**5,11,736.69**
			TOTAL FOR PHE WORKS (PLUMBING)				**15,86,697.97**

Package - PPC HAFED FIRE FIGHTING		
Summary of Estimated Cost		
Sr. No.	**Description**	**Amount (Rs.)**

Bill No. 01	Tank Civil Works	4,91,496.49
Bill No. 02	FIRE FIGHTING	28,81,572.00
Bill No. 03	Electrical	2,45,730.00
	Grand Total	**36,18,798.49**

NAME OF PROJECT :- PPC HAFED
SUMMARY OF COST FOR FIRE FIGHTING WORK

S. No.	DESCRIPTION	MR Amount (Rs.)	In Electrical scope
1	SUB HEAD - I - (PUMPING EQUIPMENTS)	11,27,515.00	
2	SUB HEAD - II - (HYDRANTS SYSTEM)	4,37,403.00	
3	SUB HEAD - III - (PIPING, VALVES AND ACCESSORIES)	6,79,678.00	
4	SUB HEAD - IV - (FIRE EXTINGUISHERS)	46,976.00	
5	SUB HEAD - V - (MOTOR CONTROL PANELS)		2,45,730.00
6	SUB HEAD -VI - (SPRINKLERS ACCESSORIES)	4,90,000.00	
7	APPROVALS	1,00,000.00	
	TOTAL	**28,81,572.00**	**2,45,730.00**

NAME OF PROJECT :- PPC HAFED					
DETAILED ESTIMATE FOR FIRE FIGHTING EQUIPMENT , RING					
Item No	**Description Of Item**	**Qty.**	**Unit**	**Rate (Rs)**	**Amount (Rs)**

		SUB HEAD - I - (PUMPING EQUIPMENTS)				
	DSR _AOR 2019	**FIRE FIGHTING SYSTEM**				
1	1	**Fire Pumps and Accessories**				
		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.				
	1.8	1620 lpm at 70 m Head	1	Set	330204.00	330204.00
		Note: Contractor shall include in his rates for providing pressure switches, pressure guages, wiring, cabling from pressure switch to panel etc. complete as required to operate the system automatic/manual. Pump shall be protected against running dry.				
2	DSR _AOR 2019 / 2	Supplying, Installation, Testing and Commissioning of **diesel engine driven main fire pumping set** complete in all respect as required suitable for automatic operation and consisting of following:				
		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.				
	2.8	1620 lpm at 70 m Head	1	Set	590426.00	5,90,426.00
		Note: Contractor shall include in his rates for providing pressure switches, pressure guages, wiring, cabling from pressure switch to panel etc. complete as required to operate the system automatic/manual. Pump shall be protected against running dry.				
3	DSR _AOR 2019 / 3	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.				
	3.2	180 lpm at 70 m Head	1	Set	102391.00	1,02,391.00
		Note: Contractor shall include in his rates for providing pressure switches, pressure guages, wiring, cabling from pressure switch to panel etc. complete as required to operate the system automatic/manual. Pump shall be protected against running dry.				

5	**MR**	Fabricating, Supplying, Installation, Testing and Commissioning **Air Vessel** of continuous welded construction with flanged discharge header on the top of each riser fabricated out of 10 mm thick dished ends and 8 mm thick MS sheet, Air Release Valve complete with suitable drain arrangement with 25 mm dia gun metal wheel valve complete with all accessories etc. as required of the following sizes:				
5.1		1.2 Meter high and 250 mm dia.	1	Each	35875.00	35875.00
6	**MR**	Fabricating, Supplying, Installation, Testing and Commissioning **Air Vessel** of continuous welded construction with flanged discharge header in pump house fabricated out of 10 mm thick dished ends and 8 mm thick MS sheet, Air Release Valve, complete with drain arrangement with 25 mm dia gun metal wheel valve complete with all accessories etc. as required of the following sizes:				
6.1		2 Meter high and 450 mm dia suitable to operate Jockey Pump, Main Fire Pump & Diesel Engine Driven Fire Pump	1	Each	45000.00	45000.00
7	**MR**	Supply, Installation, testing and commissioning of pressure switches for Hydrant / Diesel Engine Driven Pump / Jockey Pumps, diaphragm type, adjustable range from 0-9 bar and a regulation range of 0.1 1.5 bar direct mounted SNAP acting type made from die cast aluminium with epoxy powder coated finish and SS316 diaphragm and other wetted parts, including necessary wiring upto control panel & other materials as required as per specifications.	3	Each	7873.00	23619.00
		TOTAL				**1127515.00**
		SUB HEAD - II - (HYDRANTS SYSTEM)				
1	**MR**	Supplying and fixing **Single Headed Internal Hydrant Valve** oblique pattern with instantaneous Stainless Steel coupling of 63 mm dia with cast iron wheel ISI marked, conforming to IS : 5290 (Type A), with 80 mm dia flanged inlet, with ABS cap and chain complete with all accessories etc. as required.	4	Each	4500.00	18000.00

2	**MR**	Supply, Installation, Testing and Commissioning of 100% synthetic **flax canvas** Non-percolating FIRE hose (Type A), I.S.I marked 63mm dia x 15m long with stainless steel male & female couplings (ISI marked) bound & riveted to hose pipes with copper rivets and copper wire as required.	4	Each	5025.00	20100.00
4	**MR**	Supplying and Fixing **First Aid Hose Reel**, wall mounting swinging type complete with drum & bracket of MS construction, spray painted in Post office Red, confirming to IS 884/1995 with upto date amendments, complete with the following as required.				
(a)		36 Meter long 20 mm dia water hose Thermoplastic (Textile reinforced) Type - 2 as per IS : 12585				
(b)		25 mm dia ball valve & nozzle.				
(c)		Drum and brackets for fixing the equipments on wall.				
(d)		Connection from riser with stop valve (gun metal) & M.S. Pipe	4	Each	7481.00	29924.00
5	**MR**	**SITC weather proof M.S cabinet size 1200 mm x 2100 mm x 600mm**				
		Supplying, installation, testing and commissioning of weather proof M.S cabinet size 1200 mm x 2100 mm x 600mm deep fabricated from 1.6mm thick M.S. sheets and M.S angle 40mmx40mmx6mm complete with glass, locking arrangements to accommodate the following: -				
a)		Gunmetal single headed Hydrant valve - 1 No.				
b)		Fire Hoses 63mm, 15 M long with accessories - 2 Nos.				
c)		Short branch - 1 No.				
d)		First Aid hose Reel - 1 No.				
e)		Fire Extinguisher - 2 Nos.				
f)		Fireman's Axe - 1 No.				
g)		Pressure Gauge - 1 No.				
		The cabinet shall be painted with one coat of primer and 2 coats of synthetic enamel paint of approved shade.	4	Each	5500.00	22000.00
6	**MR**	Providing and fixing **single gunmetal suction collecting head** as per IS: 904-1983, hose coupling (draw out connection) with female outlet as per 903 complete with 150 mm dia. G.I. Suction pipe (with puddle flange) with a foot valve with strainer complete as per drawings.	1	Each	5251.00	5251.00

9	**MR**	Supplying and fixing vane type water **flow switch** suitable for installation on 50 mm to 150 mm dia line for a service pressure upto 20 kg/sq. cm. of Potter / System sensor /Angus	4	Each	3732.00	14928.00
10	**MR**	Supplying and fixing 4 way 63 mm instantaneous **Fire Brigade Inlet Connection (FBIC)** comprising of gunmetal body and gunmetal instantaneous male inlet coupling confirming to IS:904 with plug and cap with chain as required with nuts & bolts and high pressure rubber gasket, suitable for 150 mm dia MS pipe connection etc. complete as required.	1	Each	8500.00	8500.00
	3.0	Supply, Installation testing & commissioning of Black Mild Steel Class 'C' (Heavy Duty) pipes conforming to IS : 1239 Part-I including cutting, threading, welding & all fittings like flanges, tees, elbows, bends junctions, reducers, ball valves etc. welded or screwed joints, clamps structural steel supports (as per TAC norms) or as required/ directed at site including cutting & making good the walls, floors, RCC work etc cutting chases & filling the same with cement concrete 1:3:6 (1 cement :3 coarse sand :6 graded stone aggregate 20 mm nominal size) (For Internal work).INCLUDING PAINTING				
	a)	25 mm dia (Nominal Bore)	300	RM	300	90000
	b)	32 mm dia (Nominal Bore)	50	RM	345	17250
	c)	40 mm dia (Nominal Bore)	50	RM	410	20500
	d)	50 mm dia (Nominal Bore)	50	RM	600	30000
	e)	65 mm dia (Nominal Bore)	50	RM	750	37500
	f)	80 mm dia (Nominal Bore)	50	RM	900	45000
50	g)	100 mm dia (Nominal Bore)	50	RM	1325	66250
	5.0	Providing and applying two coat of 4 mm thick 'PYPKOTE' antirust protection including primer and lap of 25 mm on M.S. pipe in trenches or complete including surface preparation coating and wrapping shall be confirm to ISI 10221 including conducting required Test.				

	b)	80 mm dia	20	RM	200	4000
	c)	100 mm dia	10	RM	220	2200
	d)	150 mm dia	20	RM	300	6000
		TOTAL				**437403.00**
		SUB HEAD - III - (PIPING, VALVES AND ACCESSORIES)				
		SLTC of M.S. pipe on surface				
1.	**MR**	Supplying, laying, fixing, testing and commissioning of following sizes (NB) of ISI marked heavy class M.S. pipes including cutting, threading, welding etc. and providing all fittings e.g. elbows, reducers, clamps, hangers, flanges, gaskets, nuts, bolts and washers etc. including painting of pipes and fittings with red paint over a coat of ready mixed primer, both of approved quality and shade including cutting holes and chases in brick or RCC walls/ slabs and making good the same etc. complete in all respect as required.				
		Note:-The Pipes of sizes 150 mm & below shall be M.S. 'C' class as per IS : 1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia. and from minimum 7mm thick MS sheet for pipes of 400 mm dia and above.				
1.3		200 mm dia	5	Metre	1800.00	9000.00
1.4		150 mm dia	428	Metre	1250.00	535000.00
1.5		110 mm dia	10	Metre	1100.00	11000.00
3	**MR**	Supplying, Installation, Testing and Commissioning of **Butterfly valves of PN 1.6** rating of following sizes with nitrile Bronze / G.M. seat duly ISI marked and stainless steel stem with lever/gear operation and cast iron body in powder coated finish for fire fighting application complete in all respects confirming to IS: 13095 as required.				
3.1		150 mm dia	1	Each	4500.00	4500.00
3.2		100 mm dia	6	Each	2600.00	15600.00

3.3		80 mm dia	1	Each	2200.00	2200.00
4	**MR**	Providing, Installation, Testing and Commissioning of double flanged cast iron **Non-Return Valve,** PN 1.6 of following sizes confirming to IS : 5312 complete with rubber gasket, Gl bolts, nuts, washers etc. as required.				
4.1		100 mm dia	2	Each	3500.00	7000.00
5	**MR**	Providing, Installation, Testing and Commissioning of **Gun Metal / Bronze Ball Valves** with brass body chrome plated of following sizes as required.				
5.1		50 mm dia	2	Each	2085.00	4170.00
5.2		40 mm dia	2	Each	1416.00	2832.00
6	**MR**	Supplying and Fixing **Orifice Plate** made of 6 mm thick, upto 200 mm outer dia. stainless steel with orifice (internal dia.) of required size in between flange & landing valve of external and internal hydrant to reduce pressure to working pressure of 3.5 Kg / cm^2 complete as per specifications as required.	4	Each	659.00	2636.00
7	**MR**	Supply, Installation, Testing and Commissioning of 150 mm dia Bourden type, Stainless Steel dial type **Pressure Gauge** including brass isolation valve and siphon pipe having calibration of 0 - 16 Kg / cm^2	4	Each	471.00	1884.00
8	**MR**	Supplying, Installation, Testing and Commissioning of CI body flanged (both ends) type serviceable suction / **Y strainer** with (stainless steel / brass mesh) conforming to relevant IS specifications amended upto date complete including providing and fixing nuts, bolts, washers, gaskets etc. complete as required.				
8.1		150 mm dia	2	Each	9057.00	18114.00
9	**MR**	Supplying and Fixing of Fire Man's axe with heavy insulated rubber as per standard conforming to IS 926	4	Each	490.00	1960.00

11	**MR**	Providing & fixing double flanged Metallic expansion with M.S. fixed flanges (PN-1.6) joint (suitable for system test pressure) of standard length as per manufacturers specs including rubber gaskets, flanges, nuts, bolts and washers complete as required as per specifications.				
11.1		65 mm dia	1	Each	3326.00	3326.00
11.1		80 mm dia	1	Each	4258.00	4258.00
11.2		150 mm dia	2	Each	6133.00	12266.00
12	**MR**	Providing & fixing controlled percolation fire hose pipe (as per IS:8423) of 63 mm dia and 15 meter length rated for burst pressure of 3.5 Kg/sqcm. The hose shall be tested for flame resistance test in accordance to IS:8423. Hose shall be complete with ISI marked SS male & female coupling (IS:903) bound & riveted to hose pipe with copper rivets & 1.5 mm copper wire as required as per specifications. (Location : External fire hydrant)	4	Each	2803.00	11212.00
13	**MR**	Providing and fixing weather proof lockable cabinet of size not less than 0.9 x 0.6 x 0.5 mtr made out of MS sheet 2mm thick having central opening and 6 mm thick glazed glass doors (Two nos.) suitably marked on the outside with the letters "FIRE HOSE" including necessary locking arrangement and shall be painted with one coat of primer and two coats of synthetic enamel paint of approved shade as required as per specifications.	2	Each	4240.00	8480.00
14	**MR**	Supply, Installation, Testing and Commissioning **External Yard Hydrant Stand Post** comprising of MS pipe 80 mm dia (heavy duty C class) from existing ring main to about 1 meter above ground level and Single Headed Yard Hydrant Valve with 80 mm dia flanged inlet, instantaneous SS coupling of 63 mm dia with cast iron wheel ISI marked, conforming to IS : 5290 (Type A), with ABS cap and chain etc. complete with all accessories as required.	4	Each	6060.00	24240.00

		TOTAL				**679678.00**
		SUB HEAD - IV - (FIRE EXTINGUISHERS)				
1	**MR**	Supply, installation, testing and commissioning of ISI marked (IS:15638) portable chemical fire extinguisher, water (gas pressure) type capacity 9 litres with gun metal cap and nozzle and complete in all respects including initial fill and wall suspension brackets as required as per specifications.	4	Each	2467.00	9868.00
2	**MR**	Providing and fixing fire extinguisher of carbon dioxide type consisting of brand new high pressure steel cylinder bearing IS: 7285 mark and having the approval of controller of explosives Nagpur, wheel type valve bearing IS:3224 mark internal discharge tube, 1 meter long high pressure discharge hose, non conducting horn, suspension bracket, fully charged bearing IS: making fixed to wall as directed.				
2.1		4.5kg capacity cylinder	4	Each	6458.00	25832.00
3	**MR**	ABC type extinguisher with cylinder fully charged with 4 Kg. capacity.	4	Each	2819.00	11276.00
		TOTAL				**46976.00**
E		**SUB HEAD - V - (MOTOR CONTROL PANELS)**				
1		**Control Panel**				
	DSR_ AOR 2019/ 5	Fabrication, Supplying, Installation, Testing and 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, inter-connection, having switchgears and accessories mounting and internal wiring, earth terminals, numbering etc. complete in all respect, suitable for operation on 415 V, 3 phase, 50 Hz. AC supply with enclosure protection class IP 42 as required.				
	5.6	**COMMON PANEL IN FIRE PUMP HOUSE**				

		250A, 50kA 4 Pole MCCB, Ics=100% Icu rating				
		Digital Voltmeter 0-500V with selector switch				
		Digital Ammeter (0-250 A) with selector swtich & CTs				
		LED type RYB phase indicating lamps, ON, OFF, trip				
		indicating lamps				
		Set of Copper Bus Bar 300A				
i)		**OUTGOING (Note : All outgoing feeders for pumps should have digital Ammeter with selector switches, and LED type ON, OFF, trip indicating lamps)**				
		Main Fire Pump				
ii)		125 A, 50kA TPN MCCB, Ics=100% Icu, with fully automatic Star/Delta starter suitable for 60 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.				
iii)		**Jockey Pump**				
iv)		63 A, 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.				
v)		**Diesel Engine Control.**				
vi)		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				
		Fire panel as above	1	Set	245730.00	245730.00
		TOTAL				**245730.00**
		SUB HEAD-VI (SPRINKLERS ACCESSORIES)				
	1	Providing and fixing 15 mm gunmetal **sprinkler head** with quartz bulb and set to operate at specified temperature pendent/ upright/ side wall /quick response as per instruction fixed with **loctite.** Temperature of operation 68 deg.C K-80				
	a.	Normal response Pendent type/ upright type	100	Nos	300.00	30,000.00
	a.	Normal response Pendent type	100	Nos	350.00	35,000.00
	b.	Normal response Side wall type	100	Nos	350.00	35,000.00
	c.	Extended throw normal response Side wall type.	40	Nos	750.00	30,000.00
	2	Providing & fixing 25mm dia. UL listed gunmetal inspector test and drain valve with integral sight glass connected to drain line complete in all respects.	20	Nos	450.00	9,000.00

	3	Providing and fixing electrically operated **flow indicating switches** model System Sensor in sprinkler branch line on each floor with necessary junction box installed in accessible place (Wiring from switches to panel and stair case pressurization not included)				0.00
	a.	100/65/50 mm dia.	20	Nos	7000.00	1,40,000.00
	4	Providing and fixing **gunmetal installation valve** with turbine type automatic alarm to be connected with control valve , drain valve, test valve and piping as per manufacturer's specifications complete in all respects.				0.00
	a.	150 mm dia.	4	Nos	45000	1,80,000.00
	5	Providing and fixing UL/Fm listed powder coated finish Escutcheon plate complete including fixing in position on pipe and ceiling complete in all respects. (Size=15NB)	50	Each	200	10,000.00
	6	Providing and fixing UL/Fm listed SS braided flexible pipe with accessories complete with all accessories specified in technical specifications(Size=15B)				0.00
		a. 780mm long	10	Each	900.00	9,000.00
		b. 1000mm long	10	Each	1200.00	12,000.00
		TOTAL				**490000.00**
		APPROVALS				
		Providing NOC/approvals from statutory authorities including preparation of shop drawings, approval drawings, report etc as may be required for approval.	1	LS	100000.00	1,00,000.00

PPC HAFED TANK ESTIMATE						
					CIVIL WORK	
S. No	**HSR**	**Description of Items**	**Unit**	**Rate**	**Qty.**	**Amount In Figure**
1		**SH-1: E A R T H W O R K**				
1	6.6	Earth work in excavation in foundations, trenches, etc. in all kinds of soils, not exceeding 2 meters depth including dressing of bottom and sides of trenches, stacking the excavated soil, clear from the edge of excavation and subsequent filling around masonry, in 15 cm layers with compaction, including disposal of all surplus soil, as directed within a lead of 30 meters.	100 Cum	5512.10	104.72	5,772.27
2		**SH-2: C O N C R E T E W O R K**				
		Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work up to plinth level : 1:4:8 (1 Cement : 4 coarse sand : 8 graded stone aggregate 40 mm nominal size)				
1	10.39	Cement concrete 1:4:8 with stone aggregate 40mm nominal size in foundation and plinth	Cum	2,100.65	4.28	8,986.58
3		**SH-3: REINFORCED CEMENT CONCRETE**				
		Centering and shuttering including strutting, propping etc. and removal of form for :				

1	9.13	Shuttering for faces of concrete foundations and foundation beams (vertical or battering)	sqm	145.20	110.00	15,972.00
2	9.6	Centring and shuttering for faces of walls, partitions, retaining Walls, well steining and the like (vertical or battering) including attached pilasters, buttresses etc. when curved.	Sqm	287.57	220.00	63,265.40
3		Steel reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding all complete upto plinth & above plinth level.				
(a)	18.22	Cold twisted deformed(ribbed or TOR steel bars) for RCC work where not included in the complete rate of RCC including bending binding and placing in position complete	QTL	5,213.43	2,728.00	1,42,222.37
4	10.67	Design mix cement concrete of grade M-30 with minimum cement contents 420 kg per cum in foundation and plinth.	cum	4,116.89	24.80	1,02,098.87
4		**SH-4: WATER PROOFING**				
1	22.20.1	Providing and laying APP (Atactic Polypropylene Polymer) modified prefabricated five layer 3 mm thick water proofing membrane, black finished reinforced with non-woven polyester matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 litre/sqm by the same membrane manufacture of density at 25°C, 0.87-0.89 kg/ litre and viscocity 70-160 cps. Over the primer coat the layer of membrane shall be laid using Butane Torch and sealing all joints etc, and preparing the surface complete. The membrane parameter : Joint strength in longitudinal and	sqm	425.35	80.00	34,028.00

		transverse direction at 23°C as 650/ 450N/5cm. Tear strength in longitudinal and transverse direction as 300/250N. Softening point of membrane not less than 150°C. Cold flexibility shall be upto -2°C when tested in accordance with ASTM, D - 5147 : 3 mm thick.				
5		**SH-8: FINISHING WORK**				
1	15.11	15 mm thick cement plaster 1:5 on the rough side of single of half brick wall	Sqm	94.51	80.00	7,560.80
	14.92	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 a)Size of ceramic glazed tiles 200 x 300mm	sqm	475.41	220.00	1,04,590.20

	M r	C.I. cover with frame (heavy duty) 610 x 610 mm internal dimensions.	Nos	3,500.00	2.00	7,000.00
		Total				**4,91,496.49**