Schedules

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SCHEDULE-A: Project Site

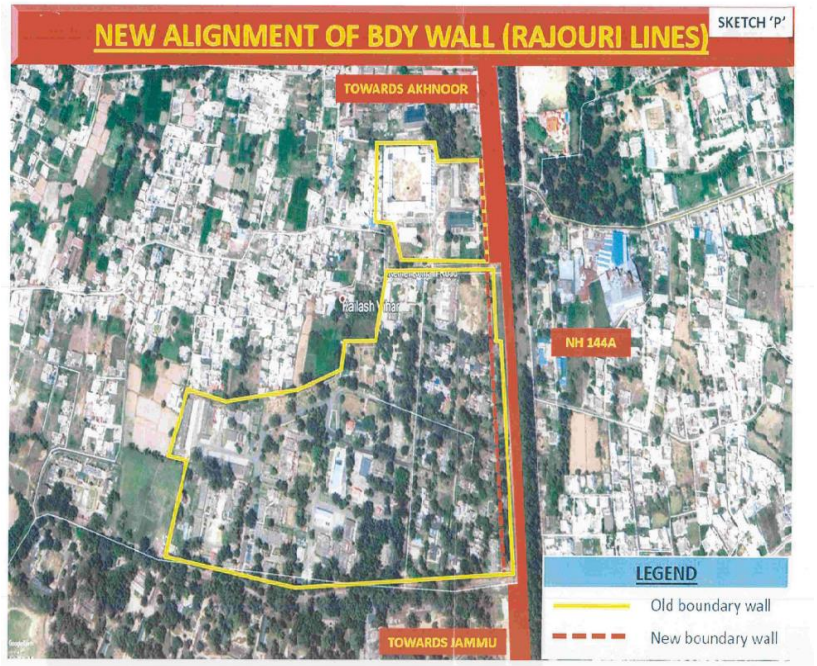
1 Background

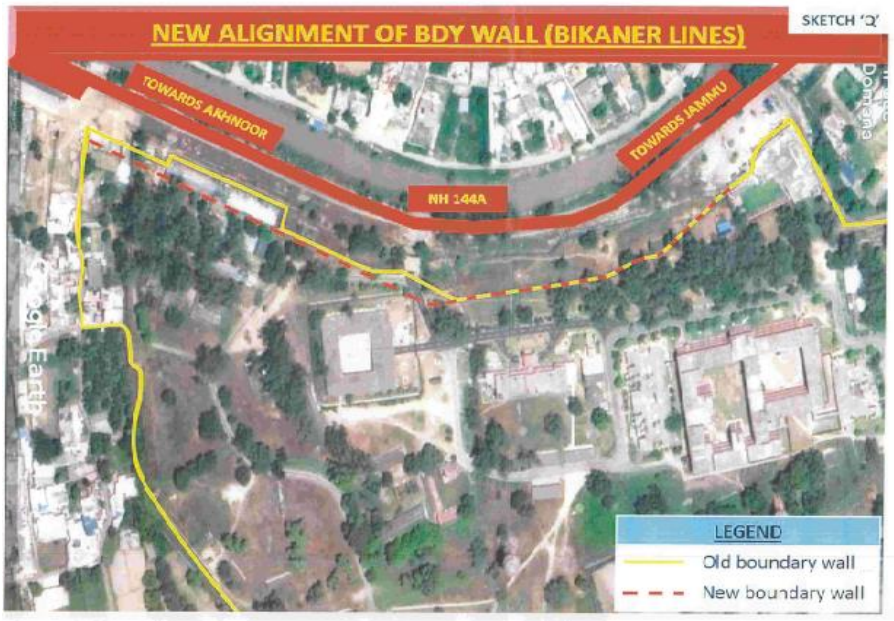
Ministry of Road Transport & Highways under its scheme for development of Military Infrastructure for Married/OTM accommodation including ancillary services in Jammu and Kashmir, has mandated NHIDCL as Central Executing Agency for development of Infrastructure at Jammu. Further, Military Infrastructure for Married/OTM accommodation including ancillary services at Jammu has been decided to be undertaken on EPC basis. The proposed Structure is to be constructed after demolishing the existing structure.

2 The Site

1.1 **Akhnoor** is a city and municipal committee, near city of Jammu in Jammu district of Indian union territory of Jammu and Kashmir. It lies 28 km away from Jammu city. Akhnoor is on the bank of the Chenab River, just before it enters the Pakistani Punjab. Its border location gives it strategic significance.

1.2 The proposed site for the Military Infrastructure is abutting 4 villages of Jammu namely Ambaran, Ranjan & Chak Singha, Dharwal and Dawana and Jandial.





1.3 The details of existing structures and Site is given at Annexure-I of Schedule-A.

1.4 The dates of handing over the Site to the Contractor are specified in Annex-II of this Schedule-A.

Annexure I

(Schedule-A)

Site

1 Site

The proposed site for the Military Infrastructure is abutting 4 villages of Jammu namely Ambaran, Ranjan & Chak Singha, Dharwal and Dawana and Jandial.

Road near Site Location

2 Land

The site is a bunch of flat rectangular patch of land.

3 Existing Structures on the Site

Location 1: **Ambaran Village**

Detail of existing Ancillary Structure

SN	Type of Assets	QTY
MES ASSETS		
1	Boundary Wall (Re- construction with integrated perimeter security system)	1000 Mtr
2	Sentry Post with Guard	01 Nos
4	Steel Gate	06 Nos
5	Tower Post	02 Nos
6	Fencing	400 mtr
OPS WKS ASSESTS		
1	Security Post	05 x Ante ANE
2	Officer mess area	01 Nos
3	Inter Connectivity (03 km distance with min width of 3.5m – 4m)	03 Km (width of 3m – 4m)

Details of Services and Amenities

SN	Type of Assets	QTY
SERVICES AND AMENITIES		
1	Water supply network	35 mtr (Dia 03”) 100 mtr (Dia 10”) 550 mtr (Dia 06”)
2	2 Pole structure	02 Nos
4	Security light pole	48 Nos
5	HT 11 KV Feeder	600 mtr
6	Security light	48 Nos

Location 2: **Ranjan & Chak Singha Village**

Detail of existing Building Structure

SN	Type of Assets	QTY
1	Married Accomodation	76 Quarters
2	Boundary Wall road	525 meters
3	Regimental Building	03 Nos
4	Road	300 meters
5	Garbage bin	04 numbers
6	Sentry Post with Guard room	02 Numbers
7	Vocational Training Building	365.07 Sqm
8	Vocational Training Building (Open Sheds)	121.92 Sqm
9	Vocational Training Building (Basket Ball Court)	01 Number
10	OR's Institute	116.58 Sqm
11	Boundary Wall (Re-construction site)	510 meters
12	Jafri Compound Wall	175 meters
13	Steel Gate	02 Nos
14	Water Supply Network	-
15	Sewage Disposal Network	-
16	Security Light	-
17	Integrated Perimeter Security System	200 meter

Details of Utility

SN	Type of Assets	QTY
1	LT Over head feeder including pole, cross arms, insulators, stay etc.	300 Rm
2	LT underground cable of size 10 sqmm x 4 core	1.1 Km
3	HT underground cable of size 95 sqmm 3 core including end joints, PCC covers, sand etc incl cable protection pipe under roads	03 Nos
4	Two Pole structure complete with earthing, GOD etc	6 Each
5	CI/DI Pipe line of size 150 mm dia	500 RM
6	GI pipe line of size 50/40/25/20 mm	600 RM
7	Shifting of Transformer including connected accessories, LT Panel, cable, fencing	1 Each set of job
8	CI/DI pipe line of size 100 mm dia	400 RM
9	HT 11 KV over head feeder including pole, cross arm, insulators, stay, earthing etc	2.15 KM

Location 3: **Dharmal & Damana Village**

Detail of existing Building Structure at Dharmal (Rajouri Lines)

SN	Type of Assets	Components
1	Building No P-16	1000 Mtr
2	Building No T-95	01 Nos
3	Building No P-09	06 Nos
4	Building No P-97	02 Nos
5	Post No – 06 (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
6	P-89 (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
7	P-85-1 (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
8	Building No P-96 (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
9	Sentry Post at Brigade Main Gate (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
10	Building No P-86-1 (Sentry Post along with Guard room and Toilet)	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
11	RP Post at main gate of chenab bridge	Size 5'x6'x12'
12	Brigade Main Gate	Size 9.5'x19'
13	Gate near Post 4	Size 4.5'x17.5'
14	Iron Gate	Size 5'x3.5'
15	Main Gate, New APS	Size 6m x 3m (added with concertina coil and green CGI sheet)
16	Building No P-20 (Toilet Block)	Size 10'x10'x12'
17	Boundary Wall, Old APS, Damana	Length – 120 Mtr and Height – 08' (added with long angles, concertina coil and Green CGI Sheets)
18	Boundary Wall	Length – 320 Mtr and Height – 08' (added with 4' height concerlina coil on top)
19	Boundary Wall, New APS, Damana	Length – 135 Mtr and Height – 09' (added with 3' height concerlina coil on top)
20	Black Top (Tarmac Road)	Length – 375 Mtr and Width – 3.75 Mtr
21	Septic Tank near P-86	Size – 27.5'x16.5' Capacity – 100 Men
22	Septic Tank near P-09	Size – 27.5'x16.5' Capacity – 100 Men
23	Drainage Near T-95 & T-97 Block	Length 85 Mtr Width 2.5' Height 3'

Detail of existing Building Structure at Damana (Bikaner Lines)

SN	Type of Assets	Components
1	Building No T-54	Size 10x5x5 Mtr Roof with ACC Sheets
2	Building No T-55	Size 10x5x5 Mtr Roof with ACC Sheets
3	Building No T-17	Size 122'x25'x12' Roof with ACC Sheets
4	Building No T-14	Size 122'x25'x12' Roof with ACC Sheets
5	Building No T-99D	Size 5x3x2.5 Roof with ACC Sheets
6	Building No T-99C	Size 5x3x2.5 Roof with ACC Sheets
7	4 x Sentry Post along with Guard Room and Toilet	Sentry Post – 8'x8'x16', four men guard room, Toilet and bathroom
8	02 x Iron Gate (RP Gate)	Double Door – 17.5'x7' Iron Plate – 6mm Single Door – 4.7'x7' Iron Plate – 6mm Column – 03 Size – 1.6'x2'x8'
9	Hybrid Fence Wall	Length – 434 Mtr (Concertina Coil with Y angle wire mesh)
10	Tapps Bio Toilet	Size – 8'x4'x8' (Four Seater with 2 Biodigester)
11	02 x Septic Tank	Size 12'x15' (100 men capacity)

Details of Utility

SN	Type of Assets	Components
NFC OFC (48+8 Fiber)		
1	NFC OFC 48+8 Fiber	280 Mtrs
2	HDPE Pipe	280 Mtrs
3	Joint Enclosure	02 Nos
4	Route Marker	02 Nos
JFC (20 Pair 9 mm)		
1	JFC 20 Pair 9 mm	2500 Mtrs
2	Bricks	8200 Mtrs
3	GI Pipe	150 Mtrs
4	TSF-II Jointing Kit	06 Nos
5	DP Box 20 Pair	02 Nos
6	Route Marker	13 Nos
JFC (10 Pair 5 mm)		

1	JFC 10 Pair 5 mm	13000 Mtrs
2	Bricks	42640 Nos
3	GI Pipe	210 Mtrs
4	TSF-I Jointing Kit	26 Nos
5	DP Box 10 Pair	04 Nos
6	Route Maker	65 Nos
JFC (20 Pair 9 mm)		
1	JFC 20 Pair 9 mm	1200 Mtrs
2	Bricks	3936 Nos
3	GI Pipe	75 Mtrs
4	TSF-II Jointing Kit	03 Nos
5	DP Box 20 Pair	04 Nos
6	Route Maker	06 Nos
JFC (50 Pair 9 mm)		
1	JFC 50 Pair 9 MM	800 Mtrs
2	Bricks	2624 Nos
3	GI Pipe	30 Mtrs
4	TSF-III Jointing Kit	03 Nos
5	DP Box 100 Pair	02 Nos
6	Route Maker	04 Nos
OFC (24 Fiber)		
1	OFC 24 Fiber	900 Mtrs
2	HDPE Pipe	900 Mtrs
3	Joint Enclosure	02 Nos
4	Route Marker	05 Nos
5	GI Pipe	30 Mtrs

Location 4: **Jandial Village**

Details of Effected Defence Assets

SN	Type of Assets	QTY
1	Outer Security Wall	110 Mtrs
2	Inner Security Wall	85 Meters
4	Security Post	02 Nos
5	Inner Barbed wire Security fencing	-
6	Temple	01 Nos

Annexure -II

(Schedule-A)

The date of handing over the Site to the Contractor

The 90% of the area shall be handed over to the Contractor on the Appointed Date and remaining 10% within one month.

SCHEDULE-B: Scope of Work for the Project

1 General

1.1 The objective here under is to develop Equal value asset Military Infrastructure for Married/OTM accommodation including ancillary services in the Jammu with assistance from MoRTH.

1.2 An allied objective is to bring private operators into the mainstream by allowing them entry into the Military Infrastructure, so that all Military personals can have access to proper Infrastructure facility and avail of the ancillary services created in the Military Infrastructure such as drainage system, septic tank, Bio Toilet, service road, utility installation etc .

1.3 The Contractor should develop a State-of-the-Art Military Infrastructure with better facilities for military personals and commercial facilities thereby creating a landmark facility with iconic exteriors/ facade. The proposed infrastructure shall be planned and designed as an iconic/ landmark building with contemporary innovative design on the lines of post modernism and design elements such as colonial style using fins, pergolas, glass facia etc. The exterior/ facade of the building could be in combination of glass/ metal/ tile/ fusion of materials and theprovision of blocking arrangement shall be preferably used.

1.4 Specifications and standards shall be followed as given in schedule 'D'

2 Broad Scope of Work

2.1 The development of Military Infrastructure includes construction of the following components per illustrative drawings at Schedule-I at Ranjan & Chak Singha village, Jandial village, Dharmal and Damana village and Ambaran village:

(i) Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District

(ii) Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District.

(iii) Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District

(iv) Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K

(v) 6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu

(vi) 02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K.

(vii) Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K.

(viii) Ancillary Work in Akhnoor village, Chak Singh Jammu District.

2.2 The Contractor shall ensure that the Military Infrastructure is constructed in accordance with the design approved by the NHIDCL and in conformity to the Standards and Technical Specifications setforth in EPC Agreement and the Applicable Laws.

2.3 The Project shall be designed and constructed in conformity with the Specifications and Standards specified in Schedule-D.

2.4 The Construction works for the Military Infrastructure to be undertaken by the Contractor shall include all the construction works as per the EPC Agreement and catering to future requirements which shall include the following:

(i) The scope of works inter alia includes the detailed design, detailed engineering, preparation of all related good for construction drawings concerned and construction of the Military Infrastructure and other ancillary facilities required as per plan provided in Schedule-I.

(ii) Drainage and Storm water facilities like covered sewerage system and proper plumbing system in either of the buildings.

(iii) Design and construction of supporting infrastructure facilities related to Solid Waste Management, Rain Water Harvesting, Water Supply and Sanitation, Communication System.

(iv) Design and construct any ancillary facility and/or structure required for proper functioning of the Military residential infrastructure.

(v) The Contractor shall maintain the Project, including all repairs, Maintenance, rectification, restoration works, in accordance with the provisions of the Agreement, Applicable Laws and Applicable Permits, in conformity with the requirements set forth in Schedule-K.

(vi) The Contractor shall be responsible for demolishing the existing structures as per Construction Plan submitted to the Authority as per Clause 4.1 of the Agreement.

(vii) Green measures such as solar heater, energy efficient electrical and mechanical equipment, water saving toilet fixtures, rainwater harvesting, sewerage treatment plant/ effluent treatment plant, horticulture etc. are also to be provided.

(viii) Parking management & passenger information system is to be installed in each of the building.

(ix) Contractor shall barricade entire area and ensure noise control essentially being a military area.

2.5 Distribution of area is as tabulated below.

SN	Facilities	Designated Plinth Area (Sqm)
1	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District	532.99

2	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District	392.98
3	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District	532.99
4	Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K	312.61
5	6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu	673.82
6	02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K	499.55
7	Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K	532.99
8	Ancillary Work in Akhnoor village, Chak Singh Jammu District	Varies

Contractor while designing the Military Infrastructure should follow the above area provisions only. In the interest of work 5% deviation in consultation with authority is permissible and the cost shall be deemed to be included in Schedule 'H'.

3 Investigation, Planning, Designing for Entire Scope of Work

The Civil/Structural Design & Drawings (whether RCC or Structural Steel or composite) expressly (but not limited to) includes the following: -

(a) Studying the Architectural Concept/preliminary Design, Structural Design Philosophy, submittingproposed structural design framework of each building/floor/area and obtaining approval of Employer. Due care to be taken for integrating the structural drawings with the Architectural Drawings & with all MEP Services & Elevation features etc.

(b) Design on appropriate software like STAAD-Pro/ETABS and drawing on a software like Auto CAD including fabrication drawings, shop drawings, bar bending schedule etc. of each and every component of buildings/spaces within Scope of work on suitable scale (6 no. of sets of each drawing), including but not limited to:

(i) Diaphragm wall with soil anchors for bulk excavation.
(ii) Sheet piling if required to safeguard existing trees
(iii) Foundation Drawings/Details & Schedule, whether raft or strip footing
and/orcombination of footings/Pile footing (if required).
(iv) Column Drawings/Schedule with capital and flat slabs.
(v) Suspended floors, roofs, landings, balconies and access platform.
(vi) Shelves (Cast in situ/pre-cast);
(vii) Lintels, beams, plinth beams, girders, bressumers and cantilevers;
(viii) Columns, Pillars, Piers, Abutments, Posts and Struts;
(ix) Stairs (including landings)
(x) Curved floor plates in plan

(xi) Shafts;
(xii) Vertical and horizontal fins individually or forming box louvers band, facias and eavesboards.
(xiii) All steel structures in landscape/building such as projection, pergolas, trellis, porch etc.
(xiv) Centering & shuttering using steel/wooden form work/with all due fitments as necessary.
(xv) All steel structure including 2 hr fire protection using fire paint.
(xvi) Mechanical, Electrical & Piping works
(xvii) Any other work required to complete the scope of work

Materials and construction systems has been selected to be consistent with the requirements of a „lifeof the building" as defined in Table 1 of IS 875: "Code of practice for design loads of building and construction". This category relates to "Important buildings and structures" and recommends a specified design life of 50 years of all structures.

Planning and design of all services shall comply the requirements stipulated in NBC-2016, latest BIS codes, super ECBC norms as per ECBC-2017. In case of any conflict among ECBC, and scope of work, superior provision is to be adopted. Decision of accepting officer regarding superior provisions shall be final and binding. Brief of architectural norms, structural design parameters, and MEP services as under:-

- **Concept planning**: Based on scope of work and preliminary drawings, contractor shall develop, elevations and sections for the buildings and detailed site layout plan (master plan showing road, path, culvert, drains, arboriculture, landscaping and other services) including all services and schedule of finishes, complying the requirements stipulated in NBC-2016, latest BIS codes, super ECBC norms & as per ECBC-2017, any local authority where applicable and any other relevant statutory requirements, keeping in view MES scales of Accommodation (SOA), Scales of furniture, E-in- C"s Br. Technical Instructions, CE Udhampur Zone"s Zonal Specifications issued by DG MAP, E-in-C"s Br. letter No. 21368/P&S/Phase-2/61/MAP dt 10 Sep 2009. The contractor shall develop 3D views & 3D walkthrough and power point presentation of conceptual plan.

The Analysis and design of structure shall be carried out as per latest codes published by BIS. Some of these are IS : 456, IS : 875, IS : 1893, IS : 13920, IS : 3370, IS : 800 and NBC. The seismic zone to be considered is zone IV as per IS : 1893 & Basic wind speed as 39 m/sec (IS : 875 part-3).The design of the civil structure will comply with the requirements of the following:

- National Building Code
- Local Building Regulations
- Bureau of Indian standard codes
- International codes as applicable
- Any other regulation as per requirements

The following structural parameters shall be adopted for design and any variation / improvementis to be approved by concerned CWE:

- The proposed buildings are to be constructed having rectangular configuration withSpecial moment resisting RCC framed arrangement and to be analyzed and designed for earthquake by static analysis as well as dynamic analysis as stated in IS : 1893- 2016, Importance factor is to be taken as 1.5 for the officers DUs. Importance factor for the other buildings shall be taken as per IS code. Structures are to be analyzed as space frames and design to be carried out using latest version of standard software like STAAD Pro/ ETABS.

- **RCC Structure** :
  (i) Design of RCC elements shall be carried out using Limit State Method as per IS 456.
  (ii) As per Table 3 of IS 456: 2000, the environmental exposure condition can be classified

as "moderate."

(iii) The fire resistance of the structure is to be taken as minimum of 2 hours.
(iv) RCC (Design Mix): M30 grade (minimum) of concrete shall be adopted.
(v) Reinforcement: FE 500D (TMT).
(vi) No lapping of bars is allowed for diameter of bars greater than 16 mm, mechanical couplers as per IS : 16172 shall be used.
(vii) Main reinf of beam shall not be bent up and hence shear reinf shall be in the form of vertical stirrups only.

- **Steel Structure/ Structural steel** :
  (i) All structural steel shall be designed as per IS : 800, using Limit State Method.
  (ii) All structural steel shall conform to IS : 2062.
  (iii) The Square Hollow Sections (SHS)/ Rectangular Hollow Sections (RHS) shall be used of grade YST 310 as per IS: 4923. Structural steel shall be of 350 MPa conforming to grade E350A/BO/BR as per IS : 2062. The minimum thickness of plate shall be 6 mm.
  (iv) All anchor bolts shall be of grade 10.9 conforming to IS : 1367 and of minimum size 12 mm. The cover to anchor bolts shall be 40 mm or 1.5 times the diameterof bolt, whichever is more.
  (v) Suitable provisions shall be made to design and construct special provisions of insert plates, anchor fasteners, Cutout, etc

- **Liquid Retaining/storage RCC structures** : All liquid retaining/ storage RCC structures shall be leak proof and shall be designed as per IS: 456 and IS : 3370. In all liquid retaining structures, PVC water bars shall be provided at each construction joint. All grouts shall be non-shrink grout. In addition, concrete for such structures shall be waterproof concrete. For water tanks and underground sumps, crack width shall be limited to 0.2 mm as per Clause 35.3.2 of IS 456:2000. Minimum concrete grade shall be M30 for water tanks. Reinforcement for water retaining structure shall be Fe 500 D CRS/HCR Bars.

- No reduction in Live Load {as stated at Para 3.2 of IS ; 875 (Part –II)} is to be considered for design of structure.

- Expansion & contraction due to change in temperature of the materials of a structure shall be considered in design. Provision shall be made either to relieve the stress by provision of expansion/contraction joints in accordance with IS : 3414 or design the structure to carry additional stresses due to temperature effects as appropriate to the problem.

- Building Walls/Frame panels shall be constructed with sub class „B" bricks, kiln burnt, locally available, best quality conforming to the samples kept in CWE/GE"s office. Bricks shall have minimum compressive strength of **100** Kg/Sqcm.

- Other design parameters will be as per relevant BIS codes.

- The retaining wall, if required and all other sub structure members, if any will be designed based on the soil parameters specified in the soil report.

- The specified design life of the structure is to be taken as 50 years for all buildings.

Third Party vetting of Design and Drawing and its report.

(a) The vetting of following documents shall be got done from any IIT/NIT.

(i) Input data/structure file.

(ii) Design Basis Report and list of codes and BIS publication referred for the design.
(iii) Design calculations.
(iv) Structural drawings

(b) The above vetted documents should be signed by authorized signatory on behalf of the Institute and not by professor/individual of the Institute in personal capacity. Necessary MOU will be submitted to this HQ.
(c) The third party vetting the designs/drawings shall also be liable for ensuring that the designs and drawings produced are in compliance with laid down standards, regulations and sound engineering practices.
(d) A certificate that all design parameters and other design details have been thoroughly checked and are in compliance to standards, codes, regulations in respect of safety, soundness and economy shall be obtained from the vetting agency.
(e) The vetting agency shall also be liable and answerable for any design deficiencies detected during design life of the building and may be called upon to address such issues, if any.

DESIGN PARAMETERS OF CIVIL WORKS

- **Topographical survey**: Carrying out Digital Topographic land survey with Total Electronic Station of high precision, making position of each physical feature on the ground true to their position like building, sewer lines/storm water drains, manholes and sump wells, water bodies, large size rocks, GI & CI lines, fully grown trees having girth more than 30 cm, overhead HT/LT electric lines, transformers, substation, OHT, Tube wells, electric & Telephone cables and poles, roads, paths, existing permanent/ temporary structures, fencing boundary walls/lines gates, drain etc i.e. height of inaccessible structure like HT lines, OHT etc., preparing the contour plan of suitable contour intervals depending upon the topography of the terrain & preparing drawing in A-1 size, recording reduced levels of points of abrupt changes at suitable intervals, fixing temporary Bench Marks (TBM) and marking them on ground with paint as required, calculation of area and other details of surveyed pockets with submission of three Nos coloured drawing along with one soft copy on compact disk (CD) to the 1: 1000 or suitable scale & plotting on Auto CA. Based on this survey, various levels for buildings, road/ path/ culverts, storm water drains, sewage network, security wall, landscaping and other relevant services will be decided by the contractor.
- **Engineering Data for foundation**: Soil investigation report of proposed work is enclosed as per Schedule I" for reference and guidance only. The contractor will decide about the type of foundation, depth etc. based on his independent detailed soil investigation of the site for various buildings, utility and ancillary buildings. Detailed geo-technical investigation report will be submitted in triplicate to Authority's Engineer.
- **Site clearance and Development**: Based on the topographical survey, complete site development and clearance including bushes and natural vegetations including shrubs (trees) of less than 30 cm girth of the proposed site to the required levels (MGLs) will be the responsibility of the contractor. The disposal of surplus soil, if any, will be disposed off by the contractor out of defence land under his own arrangements. Additional soil, if required to achieve the desired levels, will be arranged by the contractor out of defence land under his own arrangement.

DESIGN PARAMETER OF E/M WORKS:

Internal Electric supply and earthing system: Designing, supply, installation, commissioning and testing of internal electrification with controls, 5A/15 Amps sockets etc in accordance with ECBC- 2017, as per building envelope / plan being planned under relevant item of this tender duly prepared by MEP consultant approved by MES and vetted by NIT/IIT, to achieve requirements stipulated for Super ECBC Buildings as per ECBC-2017 and NBC.

Internal wiring will be done by 1100 Volt grade FRLS insulated flexible copper wires, confirming to IS: 694, in Medium duty PVC conduit concealed neatly. Medium Duty PVC conduit will be used for wiring/ extra

low voltage wiring e.g. Telephone cable, data cable, and security co-axial cable, etc wherever concealed in concrete. In all other areas, MS conduit will be used in case of surface conduit like risers, plant rooms, car park and above false ceiling. Generally, the whole wiring installation shallbe done in accordance to IS: 732. The lighting circuit/point wiring shall be carried out with 1.5 sq. mm only, while power wiring shall becarried out either with 2.5 / 4.0 Sq. mm, according to load requirement. Colour code shall be maintained for the entire wiring installation i.e. Red, Yellow and Blue for the phases and black for neutral and green for earthing.

General-purpose outlets shall be rated at 240V, 2P+E 5A/15A BS type will be provided through out. Weatherproof industrial socket outlets shall be used in all service areas and wet locations. All sockets shall be shuttered type. Sockets are also to be provided in the Common areas for cleaning and in the utility room like sub-stations, pump room etc.

Premium range Modular plate switches/sockets / step type fan regulators etc along with associated accessories shall be provided. Ceiling fans(BLDC type with remote) shall be provided in all the rooms. Fans shall be 5 star rated and complying IS : 374. Adequate capacity exhaust fans will be provided in Toilets/ kitchens etc. as per authorization.

Complete wiring scheme along with sub-main wiring & location of various DBs shall be planned to minimize circuit lengths. The factory-made sub distribution boards for distribution of light, power, small machines load etc. shall be recessed in wall with MCCBs/ MCBs/RCCBs as incoming/outgoing and shall be connected with related MDB through FRLS insulated flexible copper wires of suitable size with earth wire in concealed/surface conduit. For common areas, separate control at suitable locationsis desired for easy operation.

The tentative items involved in internal electric supply and earthing system as per departmental planning is enclosed for guidance of contractor.

LIGHTING: Designing, supply, Installation, commissioning and testing of internal lighting incorporating day lighting in accordance with ECBC-2017, as per building envelope / plan being planned under relevant item of this tender duly prepared by MEP consultant approved by MES and vetted by NIT/IIT, to achieve requirements stipulated for Super ECBC Buildings as per ECBC-2017 and NBC.
External Water Supply: Design, supply, installation and commissioning and testing for external water supply system i.e. GI Pipe lines, Pumps, Control panels, cables, Cable trays with valves and storage tanks U/G LT cables to meet the water requirement & fire fighting requirement.

External Electric supply and Standby Power:

(a) Design, Supply, installation, commissioning and testing for external electric supply system i.e. HT switchgears, Transformers (N+1), Standby power DG sets with U/G HT /LT cables/ Bus truncking , Cable trays to meet the electric requirement duly prepared by MEP Consultant approved by MES and vetted by NIT/IIT, to achieve requirements stipulated for super ECBC as per ECBC-2017 and NBC-2016. Also all technical & safety parameters as mentioned in Central Electricity Authority regulations 2010 should be complied with. Scope of work for EPC contractorwith respect to HT shall commence from 11 KV HT Panel onwards situated at 33/11 KVsubstation. 11KV power shall be tapped through 11 KV HT cables from outgoing feeders of 11 KV HT Panel for feeding 11 KV HT power supply to the proposed two No. 11/0.433 KV substations.

(b) Prepaid Digital Energy Meters shall be provided fro all 32 Md offrs accn as per the calculations to be done by the contractor. The prepaid meters, BIS 15884 marked in mter board. Prepayment touch key pad of latest technology/version shall be provided for all 32 Md Officers Accn as per load calculations to be done by the contractor. The prepaid energy meters will be integrated with the existing server. The make of the prepaid energy meter shall be the make of the existing server.

(c) The tentative items involved in External Electric supply and Standby Power as per departmental planning is enclosed for guidance of contractor

Fire detection & Fire fighting system:

(a) Design, Supply, Erection, Testing and Commissioning of firefighting system consisting of fire hydrant system complete in all respect duly checked and vetted by MEP Consultant (approved by MES) and approved by CFEES. The scheme shall be prepared as per CFEES letter No. 0225/IFA/CFEES/2020 dt 18 Mar 2020 and shall be got approved from Fire Advisor of CFEES in consultation with department. The work and all plant, equipments and materials forming part of this contract shall comply in all respect with relevant statutory regulations, by-laws and other regulations currently in force.

(b) The contractor shall finalise the design & drawings and shall prepare Single Line Diagram (SLD) for firefighting lines on latest AutoCAD software (genuine licensed version software) and submit 03(three) copies on A1 siz white paper for approval by CFEES. It shall be the responsibility of contractor to get the final plan approved from CFEES (after incorporating all corrections needed) before commencing the execution of work.

(c) For access to fire tenders, a clear motorable approach of at least 6 meter shall be kept for movement of fire tenders all around the building. The width of the main entrance to the complex shall not be less than 5.5 meters.

Lifts:

(a) Design, Supply, Erection, Testing and Commissioning of two passenger lifts for 8 and 13 passengers for the block of officers DUs duly checked and vetted by MEP Consultant approved by MES, complying with the requirements stipulated in, relevant BIS Codes and NBC.

(b) The elevators shall conform generally to the following IS standards including their latest amendments or their approved equivalent US/BS/ISO :-

IS 14665: 2000 Electric Traction Lifts

Part1 : Outline Dimensions

Part 2 : Code of practice for Installation, Operation Maintenance

Part 3 : Sec 1 Safety Rules; Passenger and Goods Lifts

Part 4 : Sec 1-9 Components

Part 5 : Inspection Manual

IS 2365: 1977 Steel wire suspension rope for lifts and hoists

IS 8216:1976 Guide for Inspection of Lift Wire Ropes

IS 4289 Specification for Flexible Cables for Lifts and Other Flexible ConnectionsPart

1: 1984 Elastomer Insulation Cables

Part 2: 2000 PVC insulated Circular Cables

National Building Code -2016 Volume 2 Part 8 Section 5A & 5B

(c) All lifts shall have necessary provisions & door opening as required for physically challenged person.

(d) Power supply to each elevator shall be connected with dual source. One elevator from each bank of elevators shall be key operated to be used as fireman"s lift as per code.

(e) Lift case opening panel shall be equipped with Braille buttons. Automatic rescue device and emergency lighting shall be provided in each elevator supported by independent rechargeable batteries.

3.1 Following clearances to be obtained

SN	Clearances Required	Status	Remarks
1	Land Acquisition	Land is transferred to the implementing agency which is under process.	-
2	Building Construction Permission	Required	Shall be provided by the State Govt.
3	Heritage Clearance	Required	Shall be provided by the State Govt.
4	Water & Sewerage Connection	Required	
5	Shifting of Services and utilities	Required	
6	Traffic Management during Operation	Required	
7	Application for PAN, sales tax and other tax registrations etc.	Required	
8	Electricity connection	Required	
9	Clearance for employing labor-Primary Employer	Required	
10	Clearance for blasting and use of Explosives	Required	
11	Employment of migrant labour	Required	
12	Storage of sludge/silt	Required	
13	Environmental Clearance	Required	
14	License for commercial activities	Required	
15	Realignment and channelization of Nallas	Required	
16	Installation of Lifts	Required	
17	Fire safety equipment	Required	
18	Firefighting system clearances	Required	
19	Drains and Sewers	Required	
20	Diesel Generator	Required	
21	Labour Camps	Required	
22	Working in Night Shifts	Required	
23	Re-routing of vehicular traffic	Required	

3.2 Digital walk through video of complete Military Infrastructure perspective view of minimum two minutes shall be provided to the NHIDCL before start of physical work.

4 Construction of Boundary Fencing and Fixing of Gates

4.1 The existing structures in the plots to be demolished and derbies to be removed. The complete area to be levelled at the level of 1 m above the High Flood Level (HFL).

4.2 Construction of boundary and fixing of two gates to be completed as per the drawings and standards. The design of the gates to be approved by the authority. Overhead gantry on both the gates shall be placed. The gates should also be designed in matching ambience of culture of Jammu. The boundary wall shall be constructed with pre cost panel with embossed sign of NHIDCL and Contractor.

4.3 The frontage of the boundary wall to be painted with paintings on theme suitably matching with ambience of the Military services. Rest of the fencing shall have exterior paint in consultation with the authority.

5 Detailed Scope of Work

5.1 Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District

This accommodation Block has an area of 532.99 sqm.

(i) The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Ground Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on ground floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm
5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	sqm
7	Entry Platform	11.79	sqm
8	Cleaning area	2.12	sqm
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	sqm
2	Washing room	2.22	sqm
3	Washroom	1.55	sqm
C	**Parking – Total 4 nos of parking with 2 on each side of the staircase**	17.76	sqm

D	**Staircases**		
1	U shaped staircase with circular foyer	5.74	sqm
2	U shaped staircase with one landing	18.34	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on first floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm
5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	sqm
7	Verandah	12.33	sqm
8	Cleaning area	2.12	sqm
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	sqm
2	Washing room	2.22	sqm
3	Washroom	1.55	sqm
C	**Verandah – Total 2 nos of verandah on each side of the staircase**	36.91	sqm
D	**Staircases – the same connecting the ground floor**		sqm
1	U shaped staircase with circular foyer	5.74	sqm
2	U shaped staircase with one landing	18.34	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of First Floor Plan at Schedule I.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace – 2 on either side of staircases**	Overall area	
B	**Coverage over Verandah - 2 on either side of U shaped staircases**	As per 1st floor	
C	**PVC Water storage tank – 2 tanks on either side of the circular foyer staircase**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(ii) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per approved design
B	**Oval/Circular wash basin with water assembly and other necessary components**	
C	**Single liver basin mixer**	
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**	
E	**Glass mirror**	

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(iii) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(iv) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.
- Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design.

5.2 Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District

This accommodation Block has an area of 392.98 sqm.

(i) The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Ground Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on ground floor on either side**		
1	Bedroom 1 Washroom	15.42 3.84	sqm
2	Bedroom 2 Washroom	15.42 4.40	sqm
3	Drawing room	13.92	sqm
4	Kitchen	7.77	sqm

5	Dining Room	12.29	sqm
6	Platform	6.37	sqm
7	Verandah	8.37	sqm
B	**Servant Quarters – 2 quarters on the back side of staircase**		
1	Servant Room	9.09	sqm
2	Kitchenette	4.50	sqm
3	Washroom	2.64	sqm
C	**Parking – Total 4 nos of parking with 2 on each side of the Block**	53.25	sqm
D	**Staircase - U shaped staircase with one landing**	8.46	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on first floor on either side**		
1	Bedroom 1 Washroom	15.42 3.84	sqm
2	Bedroom 2 Washroom	15.42 4.40	sqm
3	Drawing room	13.92	sqm
4	Kitchen	7.77	sqm
5	Dining Room	12.29	
6	Balcony 1	8.37	
7	Balcony 2	3.16	
B	**Servant Quarters – 2 quarters on the back side of staircase**		
1	Servant Room	9.09	
2	Kitchenette	4.50	
3	Washroom	2.64	
C	**Staircase - the same connecting the ground floor**	8.46	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of First Floor Plan at Schedule I.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace – 2 on either side of staircases**	Overall area	
B	**PVC Water storage tank – 2 tanks on either side of the foyer staircase and 2 behind the foyer area**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(ii) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per approved design	
B	**Oval/Circular wash basin with water assembly and other necessary components**		
C	**Single liver basin mixer**		
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**		
E	**Glass mirror**		

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(iii) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(iv) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design

5.3 Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District

This accommodation Block has an area of 532.99 sqm.

(v) The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Ground Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on ground floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm

5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	sqm
7	Entry Platform	11.79	sqm
8	Cleaning area	2.12	sqm
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	sqm
2	Washing room	2.22	sqm
3	Washroom	1.55	sqm
C	**Parking – Total 4 nos of parking with 2 on each side of the staircase**	17.76	sqm
D	**Staircases**		
1	U shaped staircase with circular foyer	5.74	sqm
2	U shaped staircase with one landing	18.34	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on first floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm
5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	sqm
7	Verandah	12.33	sqm
8	Cleaning area	2.12	sqm
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	sqm
2	Washing room	2.22	sqm
3	Washroom	1.55	sqm
C	**Verandah – Total 2 nos of verandah on each side of the staircase**	36.91	sqm
D	**Staircases – the same connecting the ground floor**		
1	U shaped staircase with circular foyer	5.74	sqm
2	U shaped staircase with one landing	18.34	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of First Floor Plan at Schedule I.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace – 2 on either side of staircases**	Overall area	
B	**Coverage over Verandah - 2 on either side of U-shaped staircases**	As per 1st floor	
C	**PVC Water storage tank – 2 tanks on either side of the circular foyer staircase**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(vi) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per approved design	
B	**Oval/Circular wash basin with water assembly and other necessary components**		
C	**Single liver basin mixer**		
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**		
E	**Glass mirror**		

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(vii) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(viii) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design

5.4 Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K

This accommodation Block has an area of 312.61 sqm.

(i) The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Ground Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on ground floor on either side**		
1	Bedroom 1 Washroom	12.32 3.84	sqm
2	Bedroom 2	11.52	sqm
3	Living room	22.00	sqm
4	Kitchen	5.52	sqm
5	Verandah	4.98	sqm
6	Powder room	3.84	sqm
			sqm
B	**Parking – Total 4 nos of car parking with 2 on each corners of the Block and 2 scooter parking on either center ramp**	14.40	sqm
D	**Staircase - U shaped staircase with one landing**	11.69	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on first floor on either side**		
1	Bedroom 1 Washroom	12.32 3.84	sqm
2	Bedroom 2	11.52	sqm
3	Living room	22.00	sqm
4	Kitchen	5.52	sqm
5	Verandah	4.98	sqm
6	Powder room	3.84	sqm
7	Terrace area	36.72	sqm
B	**Staircase - U shaped staircase with one landing**	Same as Ground floor	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of First Floor Plan at Schedule I.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace**	Overall area	
B	**PVC Water storage tank – 2 tanks on either side of the foyer staircase and 2 behind the foyer area**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(ii) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per approved design	
B	**Oval/Circular wash basin with water assembly and other necessary components**		
C	**Single liver basin mixer**		
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**		
E	**Glass mirror**		

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(iii) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(iv) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design

5.5 6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu

This accommodation Block has an area of 673.82 sqm.

The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Stilt Floor Details

SN	Component	QTY	Unit
A	**Parking – 12 Car parking on either corner of the blocks and 11 Scooter parking on either side of staircase and elevator**	As per approved design	
B	**Electric room – 4th corner beside parking**		
C	**Staircases – 02 U shaped staircase with one landing**		

D	**Elevators – 02 elevators beside staircase**		

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Stilt Plan at Schedule I

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 4 houses on ground floor on either corner**		
1	Bedroom 1 Washroom	15.57 5.11	sqm
2	Bedroom 2	13.05	sqm
3	Living room	17.56	sqm
4	Kitchen	5.47	sqm
5	Balcony	4.30	sqm
6	Powder room	3.03	sqm
7	Dry Balcony	1.81	sqm
B	**Elevator – Total 2 nos of on either side of stair case**	As per specs	
C	**Staircase – 2 U shaped staircase with one landing**	5.35	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

#The same floor plan will be executed till 6th Floor with all the requisite details tabulated above.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace with parapet across each corner of the block**	Overall area	
B	**Machine room with separate MS ladder and trap door**	As per drawing	
C	**Solar water heaters – 04 Heaters**	As per specification	
D	**Overhead water tank**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(v) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
4	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per approved design	
B	**Oval/Circular wash basin with water assembly and other necessary components**		
C	**Single liver basin mixer**		
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**		
E	**Glass mirror**		

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(i) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(ii) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design.

5.6 02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K

This accommodation Block has an area of 499.55 sqm.

The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Stilt Floor Details

SN	Component	QTY	Unit
A	**Parking – 08 Car parking on either corner of the blocks and 08 Scooter parking on either side of staircase and elevator**	As per approved design	
B	**Commercial Store – 03 Commercial store 3 corners beside parking**		
C	**Electric room – 4th corner beside parking**		
D	**Staircases – 02 U shaped staircase with one landing**		
E	**Elevators – 02 elevators beside staircase**		

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Stilt Plan at Schedule I

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 4 houses on ground floor on either corner**		

1	Bedroom 1 Washroom	10.46 2.53	sqm
2	Bedroom 2	9.0	sqm
3	Living room	11.71	sqm
4	Kitchen	4.72	sqm
5	Balcony	3.44	sqm
6	Powder room	2.36	sqm
7	Washing space	0.25	sqm
8	Verandah	3.06	sqm
B	**Elevator – Total 2 nos of on either side of stair case**	As per Specs	
C	**Staircase – 2 U shaped staircase with one landing**	5.34	sqm

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

#The same floor plan will be executed till 6th Floor with all the requisite details tabulated above.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace with parapet across each corner of the block**	Overall area	
B	**Machine room with separate MS ladder and trap door**	As per drawing	
C	**Solar water heaters – 04 Heaters**	As per specification	
D	**Overhead water tank**	As per specification	

(iii) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**	As per the approved design	
B	**Oval/Circular wash basin with water assembly and other necessary components**		
C	**Single liver basin mixer**		
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**		
E	**Glass mirror**		

*Apart from this, all the requisite washroom should be fitted with equipments as per the standards of Military infrastructure.

(iv) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(v) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design.

5.7 Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K

This accommodation Block has an area of 532.99 sqm.

(vi) The major component of the block has been tabulated below in accordance to which the work would be executed at site:

Ground Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on ground floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm
5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	
7	Entry Platform	11.79	
8	Cleaning area	2.12	
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	
2	Washing room	2.22	
3	Washroom	1.55	
C	**Parking – Total 4 nos of parking with 2 on each side of the staircase**	17.76	
D	**Staircases**		
1	U shaped staircase with circular foyer	5.74	
2	U shaped staircase with one landing	18.34	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Ground Floor Plan at Schedule I.

First Floor Details

SN	Component	QTY	Unit
A	**Residential House – 2 houses on first floor on either side**		
1	Master Bed room Washroom	16.08 4.47	sqm
2	Bedroom 1 Washroom	17.05 4.14	sqm
3	Bedroom 2 Washroom	13.47 4.95	sqm
4	Drawing room	20.01	sqm
5	Kitchen	11.83	sqm
6	Dining Lounge	18.49	
7	Verandah	12.33	
8	Cleaning area	2.12	
B	**Servant Quarters – 2 quarters on either side of staircases**		
1	Servant Room	14.89	
2	Washing room	2.22	
3	Washroom	1.55	
C	**Verandah – Total 2 nos of verandah on each side of the staircase**	36.91	
D	**Staircases – the same connecting the ground floor**		
1	U shaped staircase with circular foyer	5.74	
2	U shaped staircase with one landing	18.34	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of First Floor Plan at Schedule I.

Roof Top Details

SN	Component	QTY	Unit
A	**Open Terrace – 2 on either side of staircases**	Overall area	
B	**Coverage over Verandah - 2 on either side of U shaped staircases**	As per 1st floor	
C	**PVC Water storage tank – 2 tanks on either side of the circular foyer staircase**	As per specification	

*This is just a detailed representation of plan. Contractor shall take the other details in accordance with the drawing of Terrace Plan at Schedule I

(vii) Plumbing Components

The Contractor has to install the following tabulated plumbing components:

SN	Component	QTY	Unit
A	**Water closer (European Type) with bolts, nuts, hanging arrangement etc**		

B	**Oval/Circular wash basin with water assembly and other necessary components**	As per the approved design
C	**Single liver basin mixer**	
D	**Stainless Steel A ISI 304 (18/8) kitchen sink**	
E	**Glass mirror**	

*Apart from this, all the requisite washroom should be fitted with equipment as per the standards of Military infrastructure.

(viii) Drainage System

- Proper manhole should be constructed by the Contractor in accordance with the standard design.
- Water storage Tank should be set up by the Contractor as detailed above.
- Setting up of Domestic water relift pump by the Contractor.
- Proper connection of PVC, bends and other connection should be put up in accordance with the approved standard design.

(ix) Electric Part

- Proper installation of fans and exhaust should be done by the Contractor in accordance with the standard design.
- FRLS PVC Wiring of all the electrical component as per the approved design.
- Installation of Generator set shoulder be done by the Contractor.
- Fire extinguisher installation should be done by the Contractor.

Proper connection of lighting and other electrical components shall be done by the Contractor in accordance with the approved standard design

5.8 Ancillary Work in Akhnoor village, Chak Singh Jammu District & Uri Lines and Rajouri Lines. The details of specification and quantities are enclosed as Annexure VIII.

(x) The following Ancillary works are to be constructed at Uri Lines and Rajouri Lines as per the attached drawings

S.NO	Description	Nos.	Length/Area
1	Building No.P-20 (Toilet Block) (as per the dimensions provided in the drawing) The finishes of the toilet would be same as the Toilet of OR building as specified in the finishes. The fitting will be in accordance with the items specified in the drawing. All external and internal electrification, plumbing and sanitary filling would be included as per the specification.	1	9.30 SQM.HT.3.65M
2	Septic Tank Near P-86, P-09 The Specification has been mentioned in Schedule B as the drawing is attached for reference	2	CAP.100 users
3	Drainage Near T-95 &T-97 Block as per specification (Trapezoidal open drain with PCC lining)	1	85.0mtr. w=0.75m, ht=0.90m

4	Building No T-54, T-55 As per the Specified drawing attached. The main entry gate has to be given. The Specification of Shed roof will be on steel truss as Pre painted Galvalume aluminium zinc coating GI based 0.50 mm thick of a colour having tensile strength of 550 Mpa as in roof covering/cladding to wall fixed with self tapping.	2	50.0 SQM.,HT =5M
5	Building No. T99C, T-99D (Toilet Block) (as per the dimensions provided in the drawing) The finishes of the toilet would be same as the Toilet of OR building as specified in the finishes. The fitting will be in accordance with the items specified in the drawing. All external and internal electrification, plumbing and sanitary filling would be included as per the specification	2	15.0 SQM,, HT=2.5M
6	Building No.t-14, t-17 (as per the dimensions provided in the drawing) The finishes will be in accordance with the finishes of OR Residencial block with electrification included as per specification. The Specification of Shed roof will be on steel truss as Pre painted Galvalume aluminium zinc coating GI based 0.50 mm thick of a colour having tensile strength of 550 Mpa as in roof covering/cladding to wall fixed with self tapping	2	284.0 SQM. , Ht.3.65M
7	TAPPS Bio Toilet (Four Seater with Two Bio digester) As per manufacturer's design and specification	1	3.0 SQM., HT. 2.44M
8	Septic Tank (The Specification has been mentioned in Schedule B as the drawing is attached for reference)	2	CAP.100 user
9	Providing and laying Optical Fiber (OFC) along with the all accessories connectors, switches etc.	1	2280.00M
10	PLB-HDPE (Permently Lubricated High Density Poly Ethylene) pipe 40mm, dia pipe for laying optical Fiber Cable	1	2280.00 m
11	Cable RCC Route Marker and Straight Joint maker	1	65.00 M
12	Providing and laying JFC (10 Pair 5 mm) along with the all accessories connectors, switches etc.	1	800.00 M
13	Providing and laying JFC (20 Pair 10 min) along with the all accessories connectors, switches etc.	1	1200.00 M
14	Boundary Wall near new APS Ht=4 M above finish road level with fencing.	1	135.00 M
15	Road along the newly constructed wall Width 3.75 M, GSB 150mm, WMM=150mm, DBM-50mm & BC=40mm	1	375.00 M

(xi) The following Ancillary works are to be constructed at village Chak Singha & ranjan Jammu District as per the attached drawing

S. No	NAME OF THE WORK	TOTAL AREA
1	LT Overhead Feeder including Pole, Cross Arms, Insulators, Stay etc.	300 RM
2	LT Undergound Cable of size 10 SqmmX 4 Core including Poles Street Lights and Junction Boxes etc with Earthing.	1.1 KM
3	HT Underground Cable of size 95 Sqmm x 3 Core including End Joints, PCC Covers, Sand etc including Cable Protection pipe under Road.	700 RM
4	Two Pole Structure complete with Earthing GOD ETC	EACH-6
5	CI/DI Pipe line of size 150 mm Dia.	500 RM
6	GI Pipe lines of of size 50/40/25/20 mm including Gate valves.	600 RM
7	Shifting Transformer including Connected Accessories, LT Panel, Cable, Fencing	1- EACH Set of Job
8	CI/DI Pipe line of size 100 mm Dia.	400 RM
9	HT 11 KV Feeder including Pole, Cross Arms, insulators, stay, Earthing etc.	2.15 KM
10	Armoured jelly Filled Cable 20 Pair.	06.00 KM
11	Armoured jelly Filled Cable 50 Pair.	08.00 KM
12	Armoured jelly Filled Cable 100 Pair.	01.00 KM
13	Armoured Optical Fibre Cable 12 Core Single Mode.	08.00 KM
14	Boundary wall Road, 4m High RCC wall with 7' view Cutters above finished road level.	525.00 M
15	Road along the newly constructed wall Width 5M, GSB 150mm, WMM=150mm, DBM-50mm & BC=40mm	300.00 M
16	Sentry Post with Guard Room (As per the attached drawing)	02 NOS.
17	Regimental Buildings the drawing is attached for reference. The finishes will be in accordance with the finishes of OR Residencial block with electrification, plumbing and sanitary fittings included as per specification as per Annex. The Specification of Shed roof will be on steel truss as Pre painted Galvalume aluminium zinc coating GI based	03 NOS.

	0.50 mm thick of a colour having tensile strength of 550 Mpa as in roof covering/cladding to wall fixed with self tapping .	
18	Vocational Training Buildings (Sno. 18,19 & 20 has to be combined as per the drawing enclosed) the drawing is attached for reference. The finishes will be in accordance with the finishes of OR Residencial block with electrification, plumbing and sanitary fittings included as per specification as per Annex	365.07 SQM
19	Vocational Training Buildings (open sheds)	121.92 5QM
20	Vocational Training Buildings (Basket Ball Court)	01 NO.
21	Boundary Wall (Reconstruction site)	510.00 M
22	Jafri Compound Wall 1.5M High with RCC Columns	175.00 M
23	Steel Gate with 3.5m Wide with RCC Columns	02 NOS.
24	Integrated Perimeter Security System	200.00 M
25	OR'S Institute (s/s) (As per the drawing attached) the drawing is attached for reference. The finishes will be in accordance with the finishes of OR Residencial block with electrification, plumbing and sanitary fittings included as per specification.	116.58 SQM
26	02 Pole Structure	02 NO.
27	Security Light Pole	48 Nos.
28	Security Light	48 NOS.

(xii) The following Ancillary works are to be constructed at village Ambaran as per the attached drawing.

S. No	NAME OF THE WORK	TOTAL AREA
1	Boundary Wall (Reconstruction with Integrated Perimeter Security System)	L=1000 M
2	Sentry Post with Guard Room As per the attached drawing	01 NO.
3	Steel Gate	06 NOS.
4	Tower Post	02 NOS.
5	Fencing	400 M
6	Security Post	05XAnte ANE
7	Officer Mess Area (As per the attached drawing) the drawing is attached for reference. The finishes will be in accordance with the finishes of Major Residencial block with electrification, plumbing and sanitary fittings included as per specification as per Annex.	01 NO.

	The Specification of Shed roof will be on steel truss as Pre painted Galvalume aluminium zinc coating GI based 0.50 mm thick of a colour having tensile strength of 550 Mpa as in roof covering/cladding to wall fixed with self tapping.	
8	Inter connectivity service road (03 km distance with a min width of 3.5m to 4m) Specification and design criteria specified in Schedule B	03 KM width 3.5M-4.5M
9	12 Core optical fibre	05 km
10	Jelly Filled Cable 20 Pair Armoured	05 km

5.9 The work includes complete work as per drawing and specifications which are illustratedbelow but not limited to

(xiii) Foundation work upto plinth level
(xiv) Column/Shear Wall/ Slab/beams
(xv) Completion of Partition walls
(xvi) Completion of Flooring
(xvii) Completion of Door, windows including wood work, painting, etc
(xviii) Internal Finishing and painting.
(xix) Surface finishing with synthetic mortar
(xx) Painting work
(xxi) External Finishing.
(xxii) False ceiling work
(xxiii) Internal Electric Installation.
(xxiv) Internal Plumbing Installation.

5.10 The Contractor, while designing the Military infrastructure Facility shall consider and comply with the following planning & design parameters.

5.10.1 The most important design consideration for a Military Infrastructure is the safety requirements, which can be met by segregating the traffic movements across the area and convert the infrastructure facility into an 'close construction concept. Pedestrian circulation inside the Military Infrastructure complex shall be designed in such a manner that no pedestrian can come on to the Military Infrastructure area/s. For efficient working of the Military Infrastructure and to reduce the noise & air pollution the movement of vehicular traffic should be totally unobstructed.

5.10.2 The entire Project complex should be differently disabled friendly. Ramps with proper slope as per NBC codes shall be provided at user entry and exit of Military Infrastructure, connectivity to parking area and passenger concourse area, interconnectivity between the passenger concourse areas and at any such places adjacent to footsteps following upward and downward gradient concourse area. Handrails fixed to walls along the staircase and ramps shall be provided for ease and convenience of pedestrians.

5.11 Brief Specification to follow for above mentioned buildings

- **Foundation :** RCC Raft / Pile foundation as per structural requirement based on CodalProvisions.
- **Plinth Height :** Plinth height shall be 45 cm from top of surrounding road level.
- **ATT Treatment:** ATT treatment shall be provided in all buildings as per requirements of BIS codes.

Pre-construction anti-termite chemical treatment shall be carried out to surface which include bottom and sides of excavation in foundations of walls, columns, the back filled earth in immediate contact with the foundation structure, plinth filling, filled earth under floors, junction of walls and floors, soil under plinth protection,

Soil along external perimeter of the buildings and soil surroundings the conduits/pipes of the buildings mentioned in Schedule `A" notes all as specified in clause 3.26.1 to 3.26.11 of MES Schedule Part-I.

Anti termite treatment shall be got done through an approved specialized agency which is a member of Indian Pest Control Association holding valid license as per Clause 13 of Insecticides Act 1968. Persons employed to do the Antitermite treatment shall be qualified as per Rule 10 of the rules framed under the Insecticides Rule 1971. The work shall be carried out through any of the agency as mentioned in list of makes attached hereinafter.

Anti termite treatment shall be carried out with emulsion as mentioned in Appx-`A" of makes attached hereinafter shall be purchased directly from manufacturer or his authorized agent. Purchase vouchers shall be produced to the GE for verification.

Cholorophyrus 20% EC Chemicals brought to site in sealed containers bearing ISI certification marks shall only be permitted to be used. Chemicals shall be stored carefully at site. Seals of containers should be broken only in the presence of Engineer-in-Charge (EIC). Empty containers shall be kept at site till the completion of work under safe custody. If on a particular day the contents of one full container could not be used in the work, the container should be got sealed at the end of the day in the presence of the Engineer-in-Charge and opened when required in the presence of the AE.

The AE should work out on his own, the total requirement of chemical required for the work as per specifications and ensures that the full quantity is brought to site and used in the work. Engineer-in-Charge should ensure that paid vouchers are produced by the agency executing the work for the full quantity of the chemical required and brought to site and a record of such vouchers duly defaced by Engineer-in-Charge with his dated signature should also be kept on record. For this purpose entries should be made in the MB as "NOT TO BE ABSTRACTED" indicating the brand name, quantity brought etc, and signed by Engineer-in-Charge as well as the representative of the Agency
executing the work.

- **Super Structure :** RCC framed Structure
- **Masonary :** Bricks shall be Sub "class B" kiln burnt, locally available, best quality. Bricks shall have minimum compressive strength of **100** Kg/Sqcm. Water absorption of bricks shall not exceed 20% when tested in accordance with IS-3495. Sampling and testing of bricks shall be carried out as per IS-5454 and IS-3495. The size of bricks shall be 230mm x 115 mm x 75mm. The tolerance in the dimensions shall be ± 8 percent.
  - **Water will not be supplied by the MES**. The contractor shall make his own arrangementsfor water required for work and his workmen at his own cost.
  - The contractor shall be permitted to collect the water from any nearby Nallah by way of digging/boring tube well or hand pump under his own arrangements at his own cost at the site of work. If this water on testing

is found suitable and conforming to the requirement of IS-456, the contractor may use the same in the work.

- In respect of the water arranged by the contractor from his own resources and the resources stated in para (b) above, it will be ensured by him that the water is free from injurious quantities of acid, alcohol, silt, oil, injurious salt, organic matters or other impurities all as specified in IS-456 and is clean, potable and suitable for mixing with concrete and mortar, for washing aggregate, soaking of bricks/brick tiles and for curing concrete and plaster.
- In all above cases water shall be treated under contractor 's own arrangements from Govt approved test laboratories and the test report shall be kept in AE's office for record.
- Sub-soil water obtained by boring tube wells, hand pumps or from nearby Nallah etc, if not found suitable and conforming to IS-456 can be used in the formation of road work and water bound macadam for road and the like, if the water is so approved by the Engineer-in-charge.
- In the event of contractor using sub soil water as above, no recovery will be made for the rent of land/royalty for the sub soil water etc.
- The contractor shall at his own cost provide and fix pipes and install pumping set(s) etc. as required for drawing the water from tube wells/hand pumps.
- The contractor shall at his own cost provide and fix pipes and install pumping set (s) etc. as required for drawing the water from tube well. On completion of the work, the contractor shall remove the pump and fittings installed, fill up the hole and make good the site as directedby the Engineer-in-charge at his own expenses and bore will be the property of the department and no extra payment will be made to the Contractor.

Contractor shall make his own arrangements to procure cement as specified here- in-after. The cost of cement, its transportation, storage, testing charges, its accounting and preservation etc. till consumed in work shall be borne by the contractor.

Type of Cement.

Type of cement to be used in this contract shall be Ordinary Portland Cement **(OPC)** Grade 43 conforming to IS-8112-1989 unless otherwise specifically specified. Different type of cement, if so required, as per contract provisions, shall also be arranged by contractor at no extra cost to Govt. But however, Portland Pozzolana Cement **(PPC)** (as per IS-1489-1991) can be used in lieu of Ordinary Portland Cement without any price adjustment subject to fulfilling certain criteria enumerated in Schedule D.

Requirements for using Portland Pozzolana Cement.

(a) PPC meets the strength criteria of 43 Grade OPC as laid down in IS-8112-1989.

(b) The minimum period before stripping form work given in clause 11.3.1 of IS- 456-2000 is to be suitably modified and as approved for the period. The contractor shall not claim extra on this account.

(c) Mixing of **OPC & PPC** shall not be allowed in a work. However with the strict control of the ground executives, different buildings can have different type of cement.

(d) Following requirements shall be ensured at the time of procurement and certificate to this effect shall be obtained from manufacturer for each batch.

(i) The quantity of Fly Ash is strictly as per IS-1489 (Part-I)-1991.

(ii) Fly ash is underground with clinker not mixed with clinker.

(iii) Dry fly ash is transported in closed containers and stored in silos only. Only pneumatic pumping should be used.

(iv) The fly ash is received from thermal power plants using high temperature combustion above 1000^0 C should be used.

(v) The fly ash contents in PPC shall not exceed **35%** to ensure consistency.

(e) In cold climatic regions where temperature goes below 15^0 C and important structures like overhead reservoirs, underground sumps and buildings with spans 10 m or more, only **OPC** shall be used.

However, for other structures during working seasons in cold climatic regions, where **OPC** is not available use of **PPC** may be permitted provided it shall be ensured that while using **PPC**, atmospheric temperature should be more than 15^0 C.

Aggregates

Aggregates for concrete work shall conform to specifications all as specified in clauses 4.4.1 to 4.4.7.3 of MES Schedule Part-I.

Fine aggregate (sand)

Grading for fine aggregate shall be within the limits of grading zone I to III as given in clause 4.4.7.2 of MES Schedule Part-I. However for all concrete and masonry work, fine sand within limits of grading I & II shall be provided and for all other balance work including plastering/screeding etc. where it shall be provided within limits of grading –III.

Coarse aggregate

Unless specified otherwise in these particular specifications, coarse aggregate for all concrete work in all situations shall be graded crushed stone aggregate of approved quality. Contractor may, however, use graded shingle aggregate of approved quality in lean concrete under foundation, sub base of floor without any price adjustment. Two types of aggregate shall not be mixed.

Grading of coarse aggregate

Graded aggregate of nominal sizes given hereunder, shall be used, unless specified otherwise in the specifications hereinafter:-

(a) Reinforced cement concrete.

(i) For elements of depth/thickness more than and incl 100mm : 20mm.

(ii) For elements of depth/thickness less than 100mm : 12.5mm.

Note: However, in no case the nominal size of aggregate shall be greater than one fourth the minimum size of the member and further it should conform to the requirement given in Clause 5.3 of IS-456-2000.

(b) Plain Cement Concrete

(i) Under 30 mm thickness : 12.5 mm

(ii) 30 to 80mm thickness : 20 mm

(iii) Exceeding 80mm thickness : 40 mm

(iv) Lean concrete and concrete sub base of floors. : 40 mm

Mix of concrete

Unless otherwise specified in drgs and elsewhere in these particular specifications, the mix of cement concrete in various situations shall be as under. However the grade of concrete shall not be less than what is given below:-

Sl No	Situation	Type of Concrete
(a)	Lean concrete under foundation of walls, plinth toe beam and in gaps between plinth columns footing.	PCC (1:5:10)(by Volume)
(b)	Lean concrete under column footing.	PCC(1:4:8)(by Volume)
(c)	PCC in plinth protection and channel/drain, PCC cills, PCC block for holder bats and holdfasts or lugs for doors, windows and ventilators and plugging for scaffolding holes.	PCC(1:3:6)(by Volume)

(d)	PCC in bed blocks/plates, Kerbs, benching splash stones and coping and PCC in any other situation not covered above.	PCC(1:2:4) (by Volume)
(e)	All RCC works for buildings/structures.	M-25 (Design mix) for building work and M-30 (Design mix) for water retaining structures as per IS-456 of 2000

Acceptance criteria for concrete

The criteria for acceptance of the concrete shall be as given in clause 16(Section- II) of IS-456/2000(Code of practice for plain and reinforced concrete). The minimum frequency for the work tests shall be as specified therein or samples taken from concrete poured in operations as specified in clause here-in-after which ever more. Frequency of sampling is laid down in para 15 (Section-II) of IS-456/2000.

Tests

The following tests shall be carried out during the execution of work. These tests shall be in addition to those specified in clause 3.9 hereinbefore. Tests shall be carried out in accordance with IS-516 and IS-1199. The contractor shall provide all facilities and equipment for casting and curing of test cubes and conveyance of test cubes and other material for testing purpose to MES Laboratory, the cost for which shall also be borne by the contractor. However, testing charges to be levied from contractor for tests carried out in MES Laboratory as per special condition No 34 here-in-before. All equipments required for site tests as per BIS norms will be procured by the contractor. The cost of the same is deemed to be included in the lumpsum quoted by the contractor.

(i) Workability test

Workability test shall be as per clause 7 of IS-456/2000.

(ii) Sampling and strength of designed concrete mix

(a) General samples from fresh concrete shall be taken as per IS-1199 and cubes shall be made, cured and tested at 28 days in accordance with IS-516.

(b) In order to get a relatively quicker idea of the quality of concrete, optional tests on beams for modulus of rupture at 72 ± 2h or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength test. For this purpose the values should be arrived at based on actual testing. In all cases, the 28 days compressive strength specified in table 2 shall alone be the criteria for acceptance or rejection of the concrete.

(iii) Frequency of Sampling

(a) Sampling Procedure

A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable change of being tested that is, the sampling should be spread over the entire period of concreting and cover all mixing units.

(b) Frequency

The minimum frequency of sampling of concrete of each grade shall be in accordance with the following:-

Quantity of concrete in work, in cum	Numbers of samples
1-5	1
6-15	2
16-30	3
31-50	4
51 and above	4 plus one additional sample for each additional 50cum or part thereof.

Note: - At least one sample shall be taken from each shift. Where concrete is procured at continuous production unit, such as ready mixed concrete plant, frequency of sampling may be agreed upon mutually by suppliers and

purchasers

(c) Test Specimen

Three test specimens shall be made for each sample for testing at 28 days. Additional samples may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the form work, or to determine the duration of curing, or to check the testing errors. Additional samples may also be required for testing samples cured by accelerated methods as described in IS-9103. The specimen shall be tested as described in IS-516.

(d) Test Results of sample

(i) The test results of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ± 15 percent of the average, if more, the test results of the sample are invalid.

(ii) For the purpose of subsequent identification of the work test cubes, the concrete of which these pertains shall be cross referred and records of this maintained and signed by the Engineer-in-charge and contractor or his authorized representative.

(iv) **Slump Test**.

(a) The frequency of the test shall be decided by the AE. The slump for the vibrated concrete may be 1 inch to 3 inches maximum. The AE, however, reserves the right to vary the limit, which will be ascertained at the time of deciding the mix design for each grade. Any batch from which a slump test is being made shall not be transferred to the places of lying until the slump in excess of that required shall not be consumed and removed from the site.

(b) Compression Test

A group of nine test cubes (15 cm x 15 cm x 15 cm) shall be taken out at the following stages of work in all building catered in Schedule `A" Part-I. Column footing and raft beams, columns, walls, beams, band, slab etc.

Note: The frequency may be increased as considered necessary by the AE.

(c) Three cubes shall be tested at 7 days and three at 28 days for compressive strength and the remaining three cubes shall be kept as reserved exclusively for subsequent testing if so desired by GE and preserved for one year from completion of work under the contract. The contractor shall not object testing of other cubes for a purpose as a matter of right.

(d) For the purpose of subsequent identification, test cubes shall be cross-referred and record of this maintained and signed by the Engineer-in-Charge and contractor or his authorised representative. Test report will be signed jointly by the Engineer- in-Charge and the contractor.

(e) Acceptance/Rejection of concrete

Any concrete not acceptable after taking into consideration the criteria stated in table 11 of IS: 456, shall be rejected. The contractor shall replace such concrete at his own expenses.

(f) When defective or rejected work cannot be replaced due to any reason whatsoever, (decision of Accepting Officer in this respect shall be final and binding),the cost of removal and replacement of the rejected concrete including the joints shall be recovered from the contractor whether it is subsequently replaced by the Govt or not.

(g) Bulking of sand - Test shall be carried out as per IS: 383.

(h) Impurities of sand - Test shall be carried out as per IS: 383.

(j) Sieve analysis of aggregate - Test shall be carried out as per IS: 383.

RCC Beam shall be casted monolithically with slab

Placing and compaction of concrete

(i) Concrete shall be transported without delay and incorporated in works at the position of laying within 20 minutes from the time of discharge from the mixer.

(ii) Mixed concrete shall be deposited in final position and solidly packed around reinforcement carefully poured and consolidated by means of portable vibrators or mechanically operated and of the kind as suitable for particular situation as directed by GE. Care shall be exercised that no voids or honeycomb pockets are formed. The concrete shall not be laid in position for more than 1 metre in height in one consecutive operation.

Water cement ratio

The water cement ratio for the concrete shall be as per IS-456. To achieve this water cement ratio, the moisture content in respect of coarse aggregate and fine aggregate shall be tested and kept on record. The frequency of testing of moisture contents in respect of coarse aggregate and fine aggregate shall be decided by Engineer-in-Charge depending upon site conditions. The amount of water required shall be adjusted depending upon the results of tests for the moisture contents carried out. For determination of moisture content in aggregate, IS-2386 (Part-III) may be referred to.

Curing

The concrete shall be protected from premature drying for at least 8 days after pouring and shall be cured as directed by the Engineer-in-Charge for a period of not less than 14 days.

Concrete other than controlled concrete

Ordinary concrete using graded crushed stone aggregate shall be provided all as specified here-in-before.

Plain cement concrete

(i) Unless otherwise indicated, all plain cement concrete shall be mixed in mechanical mixer with hopper of approved type. The course and fine aggregates for mixing of cement concrete shall be put in the hooper through measuring boxes. Under no circumstances, measuring with other than proper measuring boxes shall be allowed. However, in case of small quantity i.e, the quantity of concrete required being less than one batch of mix the contractor may after obtaining written permission of the Engineer-in-Charge be allowed hand mixing. Where hand mixing is permitted, it shall be carried out on watertight platform and care should be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency. All plain concrete shall be consolidated / compacted by tamping and Roding.

Nominal mix

Nominal mix where indicated shall be provided as per IS-456-2000

Form work

Formwork shall comply with requirement of para 4.11.6.1 to 4.11.6.5 and 7.15.1 to 7.15.12 of MES Schedule (Part I).

All formwork for columns, beams, slabs, chajjas etc. shall be provided of steel with steel props adjustable with lateral stability and no wooden ballies/planks etc. will be allowed for the same as directed by Engr-in-Charge. In case of any deviation involving formwork, the pricing shall be done at the rates of timber formwork for fair finished surface of concrete as specified in clause 7.15.2 of MES SSR (Part-I).

Exposed surface of concrete

Exposed RCC/ PCC surfaces, which are ultimately required to be finished by application of white/colour wash, distemper, cement base paint or oil paint etc. shall be plastered with cement and sand mortar (1:3), 5mm thick and finished even and smooth after removal of form work.

Exposed surfaces of lintels, beams, columns, etc., which are continuous with plastered surfaces of walls, shall be plastered in the same manner as specified for the walls.

Precast concrete articles

Cement concrete lintels with or without integrally cast chajjas upto 1.5 metre clear span, shelves, bed blocks/plates ,cover slabs, fins and the like may either be precast or cast in situ at the contractor‟s option unless otherwise specified elsewhere. If, precast, these shall be set in cement mortar (1:3). In case of deviation involving these items, pricing shall be done on the basis of cast-in-situ work.

RCC Chajjas

RCC Chajjas (whether cast integral with the lintel or precast and embedded in the wall) shall be provided with a

coved fillet of radius 50mm in PCC (1:2:4) preferably casted while the concrete is still green

The top surface of chajjas and the coved fillet shall be finished with 10mm thick cement plaster in cement mortar (1:3) with a mixture of approved water proofing compound as per manufacturer‟s instructions just after the initial setting of cement in lintel has taken place.

Drip Course

Drip course to projections of RCC/PCC beyond external faces of the walls where shown on drawings, and where RCC Chajjas are not provided with down ward facia, shall be formed in the concrete while casting, as per details shown on drawings.

Window / Ventilator cill

Irrespective of what is shown on drawing, 20mm thick kota stone on 20mm thick screed bed of CM(1:4), flush on interior side of wall opening shall be provided under all windows/vents extending 100mm in walls on internal side. On external side of wall, 50mm thick PCC 1 : 2 :4 type B0 shall be provided.

Bearing of RCC Structural Members

Bearing of all RCC roof/floor slabs should rest on two layer of bitumen laminated water proofing building paper type-I, weighing not less than 60 gms/Sqm each layer, laid over 20mm thick bearing plaster in CM 1:4 finished even and smooth treated with one coat of white wash over PCC band/masonry wall.

All beams/bressumers resting on masonry shall be provided with PCC bed blocks of cement concrete mix 1:2:4 type B-1. The size of bed block shall be as indicated on drawings. In case size is not indicated, it shall be 200mm deep, length equal to the width of beam plus twice the depth of block and width equal to the thickness of wall.

The bearing of lintels shall comprise of a full brick with vertical joints in brick work staggered.
Note : Provisions given in this clause are applicable only to load bearing wall and not for frame structures.

Junction of RCC Roof slabs and parapet walls, Moulds/Facia/Pipe etc (As applicable)

PCC padding in the form of a coved fillet of radius 75mm shall be provided in PCC (1:2:4) all alongwith junction of RCC roof slabs and vertical projections as specified above.

Plinth Protection

Plinth protection in all situations as shown on drawings shall be provided with 50mm thick PCC (1:3:6) type C-1 using 20mm graded crushed stone aggregate over 75mm thick consolidated bed of hard core blinded with coarse sand over well consolidated earthen surface. Unless otherwise indicated on the drawing, the width of the plinth protection shall be 100cm. PCC shall be laid in alternate bays (not exceeding 2 Sqm) and finished fair on top without using extra cement. 6mm wide joints shall be provided throughout the thickness of plinth protection in concrete bays and in between walling and plinth protection. All joints in bays of concrete as well as between walling and the concrete in plinth protection shall be filled with mastic filling comprising of one part of heated bitumen 85/25 grade and 3 parts of sand (all by weight). The plinth protection shall be laid to slope of 1:12 from outer edge of wall.

PCC Benching

PCC benching/stopper shall be provided as shown on drawings and the radius of the round portion shall be 75mm.

Concrete padding

Where the required height of walls, opening is not obtained with adequate size of PCC blocks/stone/bricks, the same shall be obtained by providing concrete padding of PCC (1:3:6) type C-1.

➢ STONE MASONRY

Stone masonry works where indicated shall be provided as under:-

Materials
Stone: Stone shall be harder stone such as granite, trap or basalt of best quality locally available. Stone shall be hard, sound, durable and free from defects like cavities, sand holes or any other defect that may adversely affect its strength and appearance. It shall be of uniform colour and texture.
Stone boulders (in their original rounded shape) shall not be used in the stone masonry work.

Sand: Refer Clause 5.4 of the MES Schedule Part-I.

Type of stone Masonry.
Random rubble masonry brought upto courses for situations other than retaining walls shall be provided as specified in clause 6.10.2 of the MES Schedule and in accordance with Fig 8 of the MES Schedule. The stone masonry work shall be built in cement mortar 1:6 unless otherwise specified, elsewhere in these specifications or in Schedule „A". In case contractor does the superior quality masonry as per local practice, then the masonry specified, nothing extra shall be admissible on this account to the contractor.
Dry random rubble masonry uncoursed or RR masonry uncoursed in cement mortar for retaining walls shall be provided as specified in clause 6.10.1 and 6.17 of the MES Schedule Part I.
Bond stones
Refer clause 6.10.1.5 of MES Schedule Part-I. If the through bond stones of adequate size/length are not available, PCC bond stones in lieu shall be provided cast- in-situ or Pre-cast cement concrete of mix 1:3:6 type C-1 of section 15cmx 15 cm without any price adjustment**.**

➢ Timber

Timber for all joinery and wood work shall conform to specification given in clause 7.3 of the MES Schedule Part-I and shall be within the permissible limits of defects defined in clauses 7.4 and 7.5 of the MES Schedule Part-I.

Timber shall be well seasoned (weather air or kiln dried), at the discretion of the contractor (except factory made door shutters which shall be kiln seasoned only) but without any price adjustments. The moisture content of timber shall not exceed the limit laid down in clause 7.7 of MES Schedule Part-I for Zone-II

Preservation of Timber

Preservative Antitermite treatment shall be carried out to all woodwork and joinery fabricated by the contractor at site. Factory made wood based boards are not to be treated with any chemical.

Chemical used for Antitermite treatment to wood work and joinery shall be copper NAPTHNATE or any other chemical specified in IS-401 & applied in any one of the manner specified in the ibid IS.

Species of timber

The species of timber and prefabricated wood products (ie plywood, wood particle board etc), shall be as specified below:-

(i)	Panelled/glazed/wire gauzed shutter for doors (styles, rails, glazing bars, beading/ moulding fillets).	:	Factory made shutter using 2nd Class hard wood suitable for joinery (SAL/ HOLLOCK).

(ii)	Edging of cup boards, ward robes/cabinet shutters, pelmet boxes etc.	:	First Class hard wood.
iii)	Panel inserts of door shutters, pelmets, shutters of cup board/ward robes where shown	:	Particle board commercial veneered on both sides of the thickness as shown on drawing.
iv)	Sliding/folding wooden doors/hatch window	:	1st Class soft wood (Deodar).
(v)	Any other wood work not indicated in drawings or specification not given.	:	Ist class soft wood (Deodar).

In the event of deviation of panelled joinery with veneered particle board inserts, the pricing shall be done at the rates given in SSR Part-II for factory made panelled shutters.

Panelled shutters shall be provided with beading all round the panel inserts on the front side of door. The size of beading shall be 20mm in width and tapered thickness from 10mm to 5mm**.**

Commercial Veneered Particle Board

Particle boards shall be three layered flat pressed teak wood veneered particle board bonded with phenol formaldehyde synthetic resin adhesive and shall conform to exterior grade of IS-3897 specifications for veneered particle board. Edges of particle board shutters/shelves shall be provided with 6mm thick edging of wood as specified above. It shall any of the make as mentioned in list of makes hereinafter.
All ply wood where indicated on drawings shall be BWR grade conforming to IS- 303. Decorative plywood where indicated in drawings shall conform to IS-4728. These shall be any of the make as mentioned in list of makes.

Prelaminated particle Board

It shall be of exterior grade conforming to relevant IS and of any of the make as mentioned in list of makes attached hereinafter.

Factory Made Shutters

All panelled/glazed/wire gauzed shutters of doors shall be 35 mm thick factory made, manufactured in accordance with IS-1003 made of well selected and seasoned chemically pressure treated 2nd Class hard wood suitable for joinery. Styles, rails and glazing bars shall be as specified in clause 6.3(i) here-in-before. Panel inserts shall be of particle board 12mm thick commercial veneered on both faces, conforming to specifications mentioned in clause 6.4 above. The shutters shall be procured from any of the factory as mentioned in list of makes of makes attached hereinafter.
A tolerance of $\pm$ 3mm on width and height shall be allowed provided the shutter Snugly fits into the frame.

FLUSH DOOR SHUTTERS

Flush shutters wherever indicated to be provided, shall be solid core type with block board core or particle board core with commercial plywood facing on both sides or one side commercial facing and the other decorative or both sides decorative facing as described in the item description. The doors shall conform to IS-2202 (Part-I) 1983 and as specified in MES Schedule clause 8.21.1 to 8.21.6.

Cup boards/wardrobe shutters, cabinets etc. where indicated on drawings or in item description shall be exterior grade melamine faced, flat pressed, three layered, pre-laminated particle board, bonded with exterior grade synthetic resin BWR grade laminated on both sides or on one side all as described in item description conforming to IS-3087-1985 and IS-12823-1990.

HDF Door

Wherever the drawing indicates PVC Doors the same shall be provided with HDF doors in addition to HDF doors indicated on Drawing for other location. HDF doors shall be of quality of High Density Fiber (HDF) panel board doors includes High Quality Timber Frame with machine filled Poly Urethane Foam (PUF) core of minimum 45Kg/ Cum Density and 3.20mm thick HDF facing layer, all as shown in drawings.

- **BUILDERS HARDWARE**

Items and Quantities: Hardware fittings shall be provided according to the scales indicated in the Schedule of iron mongery on the relevant drawings. In all buildings iron mongery shall be used of aluminium anodized except butt hinges which shall be of mild steel medium weight.

In case the size of particular fittings is not given in the drawing, it shall be of size as decided by the AE.
All articles of builder"s hardware shall bear ISI marking. In case ISI marked articles are not manufactured, these shall conform to the relevant ISI specifications and the specifications given in the MES Schedule for the relevant items.

Finish of articles shall be as specified in clause 9.2.4 of MES Schedule part-I.
Screws used for fixing the articles of builders hardware shall be as specified in clause 9.2.6 of MES Schedule Part-I. All the iron mongery wherever required to be welded, shall be welded with gas welding only.

Articles

Butt Hinges: Butt hinges shall be cold rolled, mild steel, medium weight all as specified in clause 9.7.2 of MES Schedule Part-I.

Continuous (Piano Hinges)
Continuous (Piano) hinges shall be mild steel chromium plated all as specified in clause 9.7.6 of MES Schedule Part-I.

Locking Bolts Steel
Locking Bolts shall be mild steel, electro galvanized plate and bright bolt not less than 10mm dia, 100mm size all as specified in clause 9.6 of MES Schedule Part-I.

Helical Door Springs
All wire gauged shutter shall be provided with helical door springs made of mild steel all as specified in clause 9.7.8 of MES Schedule Part-I irrespective whatever is shown on drawings. The size of helical door spring shall be 150mm

Towel Rails
Towel rails shall be tubular of aluminum alloy anodised of „D" shape with flanged ends for fixing. It shall be of minimum dia 20mm and 60cm long in case length is not mentioned in drawings.

Wire Cloth
Wire cloth to be used for wire gauged shutters shall be of galvanised mild steel with average width of aperture 1.18mm and nominal dia of wire 0.56mm all as specified in clause 9.25 and 9.32 of MES Schedule Part-I.

Tie Hanger
Tie hanger shall be 20mm x 6mm flat of aluminum. The length of the tie hanger if not shown on the drawings shall be 400mm.

Door handles, tower, bolts, hasps and staples and sliding door bolts shall be of aluminum anodized all as shown on drawings in all building. Where mortise locks or knobs are shown in the drawings, handles shall not be provided. Tower bolts shall be barrel tower bolts having shoot dia of 12mm for more than 150mm and above.

Knobs
Shutters and drawers of small size built in cabinets/meter and switch boxes and built in furniture shall be provided with aluminum anodised knobs of 40mm dia.

Flush Bolts
Where double shutters have been provided for built in furniture, one of the shutters shall be provided with flush bolts of aluminium anodized.

Pegs
Pegs where shown on drawings shall be of aluminum anodised, cast integral with base plate.

Curtain, rod and pelmet boxes
Curtain rods where shown on drawings shall be fancy type, PVC coated, 25mm dia drapery rods with fancy valves at both ends including MS brackets and shall be approved by GE. Pelmet boxes where indicated or shown in drawings shall be provided as per details and dimensions shown in drawings of block board 19mm thick interior grade.

Hydraulic door closer
Hydraulic door closer were indicated in drawings shall be of cast iron body Designation No.2 Universal type, conforming to IS 3564 - 1995 as per clause 9.16 of MES Schedule Part-I.

Mortice Lock/Rim Latch
Where shown on drawings these shall be of brass chromium plated

- **Steel and Iron Works**

General
Items of steel and iron brought to site by the contractor for incorporation in the work shall be free from defects all as specified in clause 10.4.3 and 10.17.6 of SSR Part-I and shall be conforming to IS specifications as given below

(a) Reinforcement steel : High strength deformed steel bars produced by Thermo Mechanical Treatment Process (TMT steel bars of grades Fe- 500D)meeting all other requirements of IS : 1786 shall be used as indicated on drawings**.**

(b) Structural Steel:-

(i) Standard Quality – Conforming to IS: 2062 of 2011 (Grade E-250 Quality „BR")

(ii) Ordinary Quality – Conforming to IS: 1977 (Fe 290 Gde E-165)

Black/Galvanised Steel Sheets: (Plain & Corrugated) conforming to IS: 277. Galvanised steel sheets, wherever indicated, shall have 275 grade of zinc coating**.**

Fabric Reinforcement for Concrete: Conforming to IS: 1566

Source of steel can be checked from Schedule D with approved Govt Vendors.

Quality of steel shall be ascertained by following tests:-

(i) Thermo mechanically treated bars

Tensile test, bend test and rebind test shall be carried out as per clause 8 of IS- 1786-2008. Test specimen shall be taken as per clause 10 of said IS. Minimum tensile strength, yield stress and elongation for different grades shall be as under:-

Ser No	Grade	Yield Stress	Elongation Not less than	Tensile Strength

1.	TMT-500(D)	500 N/Sqmm	18 %	565 N/Sqmm.
2.	TMT-550(D)	550 N/Sqmm	18 %	600 N/Sqmm.

(ii) **Mild Steel Bars**. Tensile test and bend test shall be carried out as per clause 9 and delivery inspection as per clause 10 of IS-432 (Part-I) 1982. Minimum yield stress shall be 240 N/Sqmm.

(iii) **Structural Steel**. Tensile test and bend test shall be carried out as per clause 10 and 11 of IS-2062-2011. Minimum yield stress shall be 250 N/Sqmm.

(iv) **Chemical Test.** Chemical test shall be carried out to ascertain chemical composition which shall conform to the norms laid down in relevant ISI codes.

Note: If the test fails and steel has been incorporated in the work, The further execution of the work with that steel will be stopped and matter shall be referred to AE. The decision of the AE regarding acceptance of work done with the steel which has failed in test, with price adjustment as decided by him or redoing the work with steel of proper specifications or any other decision shall be final and binding on the contractor. In case Accepting Officer decide to remove the substandard steel the work executed using substandard steel shall also be demolished and site cleared by the contractor without any extra cost to the Govt.

Weight Conversion

Conversion factor for various sections/sizes of steel shall be as per conversion tables given in SSR. Where conversion table is not available in SSR, IS conversion table shall be followed.

Mixing of different types and grades of bars shall not be done in the same structural member as main reinforcement to satisfy clause 25.1 of IS-456 of 2000.

TMT bars shall not be treated as corrosion resistant steel bars.

Steel Reinforcement

All steel for Reinforcement shall be TMT (Thermo – Mechanically Treatment) process steel and shall be provided as shown on drawings and in the absence thereof in accordance with the provisions of IS-456.

Reinforcement shall be fabricated and place in position all as shown on drawings and specified in clause 10.17 to 10.22 of MES Schedule (Part-I) without application of heat**.**

Welding

Welding wherever shown on drawings shall be by metal arc process in accordance with IS-1816 and IS-822

MS Grills

MS grills as shown on drgs shall be provided to all windows/vents**.**

Hold Fasts/ Lugs

Flat iron hold fasts/lugs shall be provided by welding as and where shown on drawing except those to be provided to wooden chowkhats which shall be fixed with bolts/nuts as per details shown on drawings. Holes in wooden chowkhats shall be plugged with hard wood plugs**.**

Fan Hook with MS Boxes

Wherever fan hooks/fan points have been shown mild steel boxes with fan hooks as per details shown on drawings shall be provided. Exposed faces shall be treated with two coat of synthetic enamel paint**.**

Box type Steel Windows/ Ventilators

General : Irrespective of whatever is shown on drgs ,steel windows/ventilators shall be box type conforming to IS-1038 and shall be ISI marked manufactured by any ISI approved manufacturer whose list can be seen on website

www.bis.org.in pertaining to IS-1038. Along with the paid voucher, contractor will submit attested copy of valid license, certificate of manufacturer to authenticate that ISI marked windows are supplied by ISI approved manufacturer. Rolled steel sections used shall also be ISI marked. Makes given in Annexure „E" of makes attached hereinafter for steel windows/Ventilators, shall be applicable only if they fulfill the criteria mentioned here-in-before.

Fixed and openable frames shall be fabricated of sections specified in drgs, corners welded to form a solid fused welded joint. The process of welding adopted may be flash butt welding which gives a continuous and solid joint all along the place of meeting of the member. Welds shall be properly ground and left with no protrusions of welding material at the joint.
Handles shall be of Z section welded with openable frame**.**
Box steel section used in outer frame, shutter frame and central frame shall be ERW section of 16 gauge.
Fixing lugs to fixed frames shall be as per provision of IS-1038 except that top lugs shall not be provided.
All openable shutters of side hung windows shall be provided with non friction hinges.
Two mild steel tower bolts of size as shown on drawings shall be provided to each leaf of window (one at top and one at bottom). Where size of bolt is not shown, the same shall be 75mm.Each tower bolt shall be welded on 3mm thick steel sheet piece of suitable size which shall in turn be welded to Z section of steel window to provide suitable arrangement of using tower bolt.

Pressed steel frames for doors

Pressed steel frames shall be all as per details shown on drawings and shall be made out of 1.25mm thick MS Sheet for main doors and 2mm thick for kitchen doors. Irrespective of what is shown on drawings, the frames shall conform to IS- 4351. The void of the steel frames shall be filled with PCC 1:3:6 type C0 (using 12.5mm graded stone aggregate). Hold fasts for the frames shall be provided as per details shown on the aforesaid drawings. P ressed steel frames shall be painted with two coats of synthetic enamel paint over a coat of zinc chrome primer.

Shock absorber shall not be provided to pressed steel door frames and in lieu 50mm butt hinges, cold rolled, mild steel shall be welded to frame to receive wooden cleats.

Angle Iron frame for door
Wherever shown on drawings, angle iron door frames shall be provided to door openings as per detail shown on drawings. The size of angle iron shall be as indicated on the drawing. The joints shall be welded properly to form solid fused welded joints. Welds shall be properly grounded and left with no protrusion of weld material at the joint.

Pressed steel windows/ventilators. Pressed steel windows/vents shall be all as per details shown on drgs and shall be made out of 1.25mm thick MS sheet, and shall confirm to IS-4351. The void of the steel frames shall be filled with PCC 1:3:6 type C-O. Hold fasts shall be provided all as shown on drgs. The window shutter shall be made of hot rolled steel section all as shown on drgs and shall confirm to IS-1038 of 1983 and 7452 of 1990. All openable shutter shall be provided with nose frictional hinges. Iron mongry all as shown on drgs shall be provided to windows/ventilators.

Solid PVC joinery
Solid PVC joinery wherever indicated on drawings shall be provided as per sub section 8B on pages 133 to 153 of MES Schedule Part-II (Rates) and as directed. Pressed steel door frame as specified hereinbefore shall be provided to all PVC doors. Irrespective of whatsoever is shown on drawings, no painting shall be carried out over PVC doors. However pressed steel door frames shall be painted with two coats of synthetic enamel paint over a coat of red oxide zinc chrome primer. The PVC joinery shall be any of the make as mentioned in Appx`E" of makes attached hereinafter.

Aluminium Doors/Windows
Aluminium doors/windows shall be provided all as shown on drawings as described in clause 10.37 of MES Schedule Part-I (2009) (Specifications).

- **Glazing**

All glazing shall be with sheet glass of ordinary quality and shall conform to IS- 2835. Glass shall be free from all defects viz bubbles etc. and shall be of uniform thickness.

Glazing to windows/door etc. as shown on the relevant drgs shall be with 3mm thick glass upto 0.5 square meter and 4mm thick beyond 0.5 square meter in each pane unless otherwise shown on drawings. Glass used shall be plain sheet glass except in bath/WC/Toilets/Lav as applicable where it shall be pin headed.

Glazing to steel frames, where shown on drawings, shall be fixed with special spring glazing clips and as shown in drawing and glazing to wooden joinery shall be fixed with wooden beading with putty all as specified in clause 16.5 to 16.10.2 of MES Schedule. If fixing detail is not shown in drawing it shall be fixed with putty as per the direction of AE

Sanitary and Toilet Fittings.

General

All sanitary appliances shall be of vitreous china (white or coloured as specified) first quality and shall conform to IS-2556 for General requirement and the specific requirements be as mentioned in clause 18.32 to 18. 40 of MES Schedule Part-I. These shall be of an approved make as per Appx`A"of makes attached hereinafter.

All waste pipe and fittings upto floor/nahani trap shall be galvanised steel tubing medium grade all as specified in clause 18.4 of MES Schedule Part-I.

Flush pipe and socket of flushing rim of WC shall be jointed with white cement and red lead (white cement and red lead in equal proportion by weight) and linseed oil to form paste.

CI „P" or „S" trap shall be jointed to WC pan with cement joints as specified in clause 18.86.1 of MES Schedule Part-I. Low level flushing cistern, dual action, water saver, PVC flushing cistern with valve less syphonic action fitting compete. The sizes, given here-in-after are approximate sizes. The sizes or sanitary fittings to be provided shall be the nearest size as per manufacturer" catalogue.

Water Closet (Squatt Pattern)

Water Closet (Squatt Pattern) Orissa type wherever provided shall conform to IS- 2556 Part-III and shall be of approved make of size 580x440mm provided with cast iron „P" or „S" trap and the following fittings/items irrespective of whatever is shown on drawing:-

- A pair of cast iron brackets.
- 32mm dia PVC flush pipe of required length including PVC coupling and bend.
- 15mm dia polythene overflow pipe upto 75mm from floor level with polythene antimosquito rose.
- Low level, dual action water saver PVC flushing cistern of total capacity 10 litres and one time discharge capacity of 5 liters with valve less symphonic fittings, complete.
- The pan shall be set in cement mortar (1:2) at least 15cms around and finished just below the rim to receive the specified thickness of floor finish.

Wash Hand Basin oval type with granite top

Wash hand basin(Vitreous China), glazed, oval shaped, counter type, fixed on RCC slab after laying black granite (as shown on drawing) as approved by GE over 10 mm thick screed in cement mortar 1:3. The edges shall be bull nosed as directed by Engineer-in-Engineer. If more than 1 wash hand basin are shown at same location, the RCC shelf with granite stone be continuous.

All wash hand basin shall have following accessories :-

(i) Waste coupling 32 mm dia full threaded.
(ii) 32mm dia CP waste coupling.
(iii) CP pillar cock, cast copper alloy with capstan head with long screwed and fly nuts suitable for

15mm bore pipe.

32mm dia galvanized steel medium grade waste pipe fitted with brass chromium plated waste coupling outlet complete. Length of waste pipe shall be as indicated on drawings/as directed by Engineer-in-Charge. Where bottle trap in lieu of waste pipe is shown on drgs, CP brass bottle traps suitable for 32mm waste coupling shall be provided.

Water Closet (Pedestal pattern)

Water closet (Pedestal pattern) shall be fixed with cast iron „P" trap and shall consist of following:-

- Water closet with wash down pattern of height 40cm, vitreous china ware and„P" trap all as per IS-2556 part-II.
- Plastic seat and cover with mat under side, solid moulding closed front pattern, with cover conforming to IS-2548, seat and cover shall be white colour with chromium plated hinge and nuts.
- Low level, dual action water saver PVC flushing cistern of total capacity 10 liters and one time discharge capacity of 5 liters with valve less syphonic fittings, complete.
- A pair of standard brackets/clamps as supplied by manufacturer.
- 15mm dia polythene overflow pipe 75mm length with polythene antimosquito rose.
- 32mm dia flush pipe of chromium plated brass tube bent to required shape including chromium plated brass coupling.
- The closet shall be screwed with brass screws to sheesham wood plugs embedded in floor.
- CP fancy type health faucet with 8mm dia 1m long flexible tube fixed with 15mm dia pipe.

Water Closet (Anglo Indian type)

Water closet (Anglo Indian type) shall be fixed with cast iron „P" trap and shall consist of following:-

- Water closet of vitreous china ware with „P" trap height as per IS-2556 part-II all as specified therein.
- Plastic seat and cover with mat under side, solid moulding closed front pattern, with cover conforming to IS-2548, seat and cover shall be white coloFur with chromium plated hinge and nuts.
- Low level, dual action water saver PVC flushing cistern of total capacity 10 liters and one time discharge capacity of 5 liters with valve less syphonic fittings, complete.
- A pair of standard brackets/clamps as supplied by manufacturer.
- 15mm dia polythene overflows pipe 75 mm lengths with polythene ant mosquito rose.
- 32mm dia flush pipe of chromium plated brass tube bent to required shape including chromium plated brass coupling.
- The closet shall be screwed with brass screws to sheesham wood plugs embedded in floor.
- CP jet with connection pipe.

Urinals: Urinal shall be half stall type, white, vitreous china, conforming to IS with Grating and union including the following fittings:-

- 5 Liters discharge capacity, PVC flushing cistern..
- 20mm bore medium grade galvanized iron flush pipe from cistern to pan.
- Chromium plated brass coupling to connect urinal pan with bottle trap.
- The pan shall be fixed with brass screws on sheesham wooden plugs embedded in the wall in CM (1:2).
- Urinal partition of marble / granite shall be provided as per details shown on Drawings.

Mirror

Looking mirror of thickness not less than 5mm shall be provided where shown on drawings. It shall be well polished, defect free waveness and mirror shall be fixed on 12mm commercial plywood BWR grade mitered at corners and provided with aluminium angle heavy quality of suitable size frame. Mirror shall be hung by key sets on screws fixed to plug embedded in walls unless otherwise shown on drawings. Size of mirror where not shown on drawings shall be 60x45 cm. The mirror shall be any of the make mentioned in Appx`A" of makes attached herewith.

Wash Hand Basin with granite top

Vitreous china designer wash hand basin, flat back, excluding taps, Waste, chain and plug and procelain stopper, Waste, chain and plug and porcelain, Waste pipe, CP Waste coupling etc. Cat Part No CNS-WHT-705, Make :

jaquar, fixed on RCC slab after laying black granite (as shown on drawing) as approved by GE over 10 mm thick screed in cement mortar 1:3. The edges shall be bull nosed as directed by Engineer-in-Engineer. If more than 1 wash hand basin are shown at same location, the RCC shelf with granite stone be continuous.

Water Closet (Pedestal pattern)

Water closet (Pedestal pattern) shall be fixed with cast iron „P" trap and shall consist of following:-
(i) Vitreous china Wash down water closet pan (pedestal pattern) composite type (one piece) with flushing cistern 10 ltr capacity dual flushing, coloured, including fixing bolt, plastic water closet seat soft type, CP jet including all necessary fittings. Cat Part No LYS-WHT-388511S, Make : jaquar and „P" trap all as per IS-2556 part- II.

Urinals: Vitreous china Half stall, flat back, complete including water spreader , waste pipe of suitable size and length providing and fixing plugs, bedding urinal against wall in cement mortar 1:2, securing urinal to plugs with and including 60 mm long brass screws, pointing around urinal back in cement; fixing flush pipe, grating and union for discharge pipe. Cat Part No URS-WHT-13261, Make jaquar with following accessories
(i) Chromium plated brass coupling to connect urinal pan with bottle trap.
(ii) Urinal partition of marble / granite shall be provided as per details shown on drawings.

➢ PLUMBING WORK

General

Plumbing work shall be carried out all as specified in clauses 18.13 to 18.27 and 18.40,18.62 to 18.67 of MES Schedule Part-I.

Soil/Waste/Vent pipe/Fittings/Accessories

These shall be of cast iron (sand cast) conforming to IS-1729 with or without ears and with spigot and socket ends. All the pipes and fittings shall bear ISI certification mark.

Jointing

CI Pipes pipes and fitting laid under floor/hidden portion shall be jointed as specified in clause 18.40 and 18.67 of MES Schedule Part-I and all other joints shall be in cement mortar as specified in MES Schedule Part-I.

Fixing of Pipes to Walls

CI Pipes and fittings shall be fixed to wall with mild steel clamps as specified in clause 18.67 to 18.67.6 of MES Schedule Part-I.

Nahani/Floor traps

Nahani/floor traps shall be provided in situations as shown on drawings. These shall conform to IS-3989. Floor traps/ Nahani Traps shall be provided with C.I. grating.
Notes :- Where nahani/floor traps of 22.5cm depth cannot be accommodated in sunken floor, a 300mmx300mm portion of the RCC slab shall be sunk to the extent it accommodate the nahani trap without any additional cost.

Shorter lengths

Except for WC connectors, the contractor may use pipe pieces without sockets in shorter lengths (less than one pipe length), where approved by the GE and connect these to pipe fittings with double socket/collars including additional joints as specified above without extra cost to the Government.

Gully Trap

- Gully traps shall be salt glazed stoneware complying with the requirements of IS-651. These shall be surrounded in PCC (1:3:6) type C-1 15cm thick in all the four sides and 10cm thick at bottom. Jointing to drain pipe shall be done in cement mortar (1:1).
- Cast iron perforated grating shall be 150mmx150mm bituminous coated and fixed as directed by Engineer-in-Charge. PCC (1:2:4) type B-1 kerb and RCC cover slabs shall be provided all as directed by Engineer-in-Charge.

Trenches for Pipe Lines

Excavation for trenches shall be done as per the width given in clause 3.2.3 of MES Schedule Part-II and depth as required at site. The trenches shall be back filled after testing of pipes with approved excavated earth in layers not exceeding 250mm and surplus spoil disposed off to distance not exceeding 100 meters.

Testing On completion of work, all soil, waste and vent pipes including fittings shall be tested as specified in clauses 18.79 and 18.93 of SSR Pt-I to the entire satisfaction of Engineer-in-Charge. Joints found leaking or defective shall be made good by the Contractor without any extra cost to Govt. Record of testing shall be maintained for each building separately duly signed by Engineer-in-Charge and Contractor. The Contractor's Lump sum quoted against this Schedule shall deemed to include this aspect.

INTERNAL WATER SUPPLY

Water tubing, Bib taps, Stop Valves and Shower Rose

Mild steel galvanized tubes (pipes) and fittings shall be all as specified in clause 18.4 of MES Schedule Part-I. Bib taps and stop valves shall be all as specified in clause 18.14 and 18.15 of MES Schedule Part-I.

Laying and Fixing Pipes

- The pipes for supply of water to all fittings in the buildings shall be run on the walls except otherwise as specified in these tender documents or shown on drawings, connected to various fittings and shall be brought in the room at point/position approved by the Engineer-in-Charge at site.
- Where pipes are laid underground, the trenches shall be excavated as directed by the Engineer-in-Charge. The pipes running along face of the walls shall be clamped in the walls as specified in SSR.

PVC Pipe Connection

Ready made PVC connection pipes of standard make, length and style as mentioned in relevant item of schedule-`A" suitable for 15mm nominal bore shall be provided.

➢ INTERNAL ELECTRIFICATION

General Requirements. Refer clause 19.2.1 to 19.2.8 of MES Schedule Part-I.

Type of Wiring

The type of wiring (concealed conduit) shall be as given in drawings and all as described in Schedule „**B**". Point wiring for light/power/fan/bell or buzzer point(s) includes all works mentioned in preambles to the rates in MES Schedule Part-II for point wiring unless otherwise indicated in these tender documents.

Internal Electrical Work

- Cable for internal wiring for light, power, and sub main cables shall be with copper conductor and shall be of the type and size as indicated in schedule „A", Copper conductor cable fire retardant low smoke conforming to IS-694 shall be used.
- **Flexible Cords, Twisted Copper Conductor**
  Flexible cords, three core, each with tinned annealed stranded copper conductor elastomer insulated and textile braided twisted together, size nominal cross sectional area 1.5 Sqmm shall be as per IS-9968 Part-I.

- **Wooden Battens block and boards and round block**
  These shall be in accordance with clause 19.28(19.28.1,19.28.2 and 19.28.3) of MES Schedule Part-I. Wood shall be first class hard wood (Sheesham) in lieu of teak wood.
- **Plug/Gutties, Screws and Fastenings**
  These shall be in accordance with clause 19.30 and 19.31 of MES Schedule Part-I.
- **Ceiling rose, shades and bulk head fittings**
  These shall be in accordance with clause 19.32, 19.33 and 19.34 of MES Schedule Part-I and as specified and as shown on drawings.

- **Sunk type boxes**
  These shall be in accordance with clause 19.38 of MES Schedule Part-I.
- **Switch socket outlets**
  These shall be in accordance with clause 19.40 of MES Schedule Part-I.
- **Lamp Holders**
  These shall be as per clause 19.41 of MES Schedule Part-I.
- **Miniature Circuit Breakers**
  These shall conform to IS-8828 (Specification for MCB and isolator for voltage not exceeding 1000 volts). All MCB"s/MCCB"s shall be housed in suitable size sheet metal enclosure of MS sheet supplied by the same manufacturer of MCBs/MCCB"s.

Earthing and Testing
Earthing shall be carried out as described in clause 19.137 to 19.139 and as shown in Electrical Plate No. 3 of MES Schedule Part-I.

Sitting of Electrical Equipment
The sitting of cable conduit run controls, distribution boards, fittings and accessories etc. shall be as laid down in IS-4648" Guide for electrical layout in residential buildings" or as directed by the Engineer-in-Charge. The location of fittings etc. shall be marked in advance on walls etc and approved by the AE.

System of Wiring
Wiring shall be carried out with FRLS cable. All conductors as far as possible shall run near walls and ceiling so as to be easily accessible and capable of being thoroughly inspected. Power wiring shall be kept separate and distinct from light wiring. In all type of wiring due consideration shall be given for neatness and good appearance and safety. Diagonal runs will not be permitted.

Control at point of entry of supply
These shall be linked with main switch gear (isolator) with the MCB on each live conductor of the supply mains at the point of entry. The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of the linked switch gear. No fuses shall be inserted in the earth neutral.

Type of switch boards
Hinged type metal boards for mounting the MCB and electrical meters shall be as per clause 19.105.1 of MES Schedule Part-I. Meter Box shall be made of 16 gauge MS sheet with provision of locking arrangement and glass window.

Joints and looping back
These shall be as per clause No. 19.109 of MES Schedule Part-I.

Passing through walls and floors
Refer clause 19.111 of MES Schedule Part-I for passing the conductors through walls and floors. The rates for PVC/steel conduit concealed wiring against internal electrification shall be deemed to include the provisions mentioned in clause 19.111 of MES Schedule Part-I.

Record drawings
On completion of the wiring to the building the contractor shall submit three copies of the line plans of the building (Scale 1:100) indicating actual position of all controls and fittings and actual runs of all main and sub-circuit and such other information which the Engineer-in-Charge may require. All circuits shall be clearly indicated and numbered in the wiring diagram and all points shall be given the same number as the circuit to which they are electrically connected phase and neutral wires shall be shown in red and black colours respectively.

Conduit wiring
The system of conduit wiring shall be as per clause 19.125 of MES schedule Part-I. Grade of conduit shall be medium.

Material and sample board

All materials unless otherwise specified shall possess ISI mark or conform to relevant IS specifications or to BSS if ISS is not available. Approval of GE referred to in clause 19.2.1 and 19.2.2 of MES Schedule shall be in writing. Approved samples shall be labelled as such and signed both by the contractor and the Engineer-in-Charge. They shall remain in the custody of Engineer-in-Charge, till final completion of work. The contractor is deemed to have included in rates, cost of making holes/chases where required through masonry or concrete work for taking in cables/conduits and conductors etc and making good the same to match with existing work.

End termination

All cable termination for internal electrification for various switches. Light fittings, MCBs, MCCBs junction boxes, connectors etc shall be provided with suitable crimpled legs/studs/sleeves as required to avoid any possibility of loose connections and sparking.

Electrical tests

On completion of wiring, the whole installation will be tested in accordance with IS- 732, clause 8(a) (b) & (c) and test certificate as per Appendix „B" of the above IS rendered duly signed by the contractor and Engineer-in-Charge. If the test results are not acceptable, all repairs and replacement and extra work of removal and relaying or refixing shall be carried out by the contractor at his own expense and installation retested, until test result indicate compliance with the pre scribed requirement. The contractor shall supply all necessary apparatus, lab and instruments or equipments required for testing. The quoted amount/rate for respective item/part of Sch „A" shall be deemed to include for the above provision.

➢ SEWAGE DISPOSAL

Excavation and earth work

Irrespective of the width of the trenches for the pipes excavated, the width for the purpose of payment shall be the authorized width as defined in preamble a(ii) of sub section „C" on Srl Page No. 330 of SSR (Part-II). Other requirement specified here-in-before and in the MES Schedule as applicable shall be complied with.

SGSW Pipe and Fittings

- SGSW (Salt glazed Stoneware) pipes including fittings and accessories shall conform to the specifications laid down in clause 18.28 of MES Schedule Part-I and shall be of Grade „A" conforming to IS-651.
- Laying and jointing of SGSW pipes shall be done all as specified in clause 18.69 and 18.70 MES Schedule Part-I.
- PCC in concrete bedding and haunching shall be of the type and mix given in relevant part of Schedule „A". The width and thickness of concrete shall be all as mentioned in preamble a (i) & (ii) of Sub Section „C" on Srl Page No. 330 of SSR Part II.
- In Schedule „A" item of SGSW pipes bedding and haunching have been catered for. However reference shall be made to IS-4127 (Clause 4.1,4.2 and 4.3) and if the site conditions regarding sub soil water level and other related factors so require, adjustment for providing bedding only or completely encasing the pipe shall be made through a deviation order.
- Filling of soil in trenches and ramming of earth shall be carried out in layers not exceeding 25cm thick and surface left slightly proud of the adjacent ground

Testing

Drains and pipe shall be tested as per clause, 18.79 of MES Schedule Part-I.

Manhole

Manholes shall be built as per description given in respective items of Schedule „B" and as shown on drawings or as directed by AE.

RCC Manholes Cover and Frames

Frames shall be of mild steel angle iron welded to shape embedded in masonry and hunched as shown on drawings. Precast RCC rectangular cover slab shall be of M- 25 (Design mix). Handle and frame shall be painted with a coat

of bituminous paint.

Septic Tanks

Septic Tanks of capacity as mentioned in relevant items of Sch „B" shall be built to the following specifications and as shown on drawings :-

(i)	Foundation and floor	:	PCC (1:2:4) type B-2 over hard core. Floor shall be finished with 20mm thick water proof cement plaster in cement mortar (1:3), (the cement mixed with an integral water proofing compound as per manufacturer"s instructions) to an even and smooth surfaces using extra cement.
(ii)	Brick work	:	All brick work shall be in cement mortar (1:4).
(iii)	Finishes	:	20mm thick water proofing cement plaster internally in cement mortar (1:3) finished even and smooth using extra cement mixed with approved integral water proofing compound according to the manufacturer"s instructions. External surfaces shall be flush pointed in the same mortar as the work proceeds.
(iv)	All RCC and PCC	:	RCC M-25 (Design mix)/PCC (1:2:4)
(v)	Steps	:	20mm dia mild steel steps 30cm apart vertically staggered in situations shown on drawings and painted with 2 coats of bituminous paint.
(vi)	Excavation and earth work.	:	In any type of soil and surplus spoil shall be disposed to a distance not exceeding 50 meters.
(vii)	All other etails	:	As shown on drawings.

- **External Electrification.**

Scope of work

The extent of work is as per items given in schedule „A". All references to clause in the succeeding paragraphs pertain to MES Schedule Part-I.

General Requirement

Materials, execution, testing and record of installation shall conform to relevant IS specifications and as given in clause 19.2.1 to 19.2.6 and as also in accordance with Indian Electricity Rules 1956**.**

Making Good

The contractor is deemed to have included in his lumpsum, cost of cutting holes/making chases when required through roads/bricks or concrete work for taking in cables conduit and conductors etc and making good the same to match with the existing work**.**

Materials.

- Insulator and insulator fittings shall be as specified in clause 19.6.1 to 19.6.4. Stay wire and stay wire assemblies shall conform to specification given in clause 19.7 to 19.8.
- Steel cross arms shall conform to specifications given in clause 19.9.
- Conductors shall conform specifications given in clause 19.10.
- Bearer wires shall conform to specifications given in clause 19.11.
- Lightning arrestors shall conform to specifications given in clause 19.12 and 19.13.

Excavation

- Excavation in trenches for cable sand laying of cables in trenches
- shall be carried out all as specified in clause 19.74 to 19.76 of SSR Part-I.
- Measurement of excavation shall be as per authorised width as given in section 3, clause 3.2.3 para (a), (b) and (c) on pages 17 & 18 of MES Schedule (Part-II).

Sand cushioning
Sand cushioning to UG cable shall be carried out as specified in Sch „A" and all as described in clause 19.75 of MES Schedule.

Cable protection
Brick cover as specified in relevant item of Sch „A" shall be used in cable protection, all as specified in relevant clauses of SSR Part-I.

Protection of existing work
- All pipes, water mains, cables etc., met within the course of excavation shall be carefully protected and supported without extra cost to the Government .
- The rates quoted by the contractor for various items of relevant parts of Schedule„A" shall be deemed to include for all the contingencies referred above. No claim whatsoever will be entertained by the department on this account.

➢ EXTERNAL WATER SUPPLY

Materials
Mild steel galvanised tubes (Pipes) and fittings
These shall conform to the clause 18.4.1 to 18.4.5 and shall bear ISI certification mark.

Rubber gasket for jointing
It shall be as specified in clause 18.11 of MES Schedule Part-I.

Masonry valve pits
This shall be of size as given in relevant item of Schedule „B". Pit shall be underground with foundation in PCC (1:3:6) type-C2 brick work in CM (1:6), internally finished with 15mm thick cement plaster in CM 1:4 and externally flushed pointed as work proceeds. Flooring shall be 40mm thick PCC (1:2:4) type B-1 laid over 75mm thick hardcore. Cover shall be of 6mm thick MS black sheet fixed to angle iron frame made out of 25x25x6mm by friction hinges welded to frame and sheet. Angle iron frame will be grouted on masonry chamber with MS hold fasts. Locking device will be provided to lock MS sheet cover to angle iron frame. One handle made out of MS round bar 8mm dia D type 15cm long shall also be welded on MS sheet cover. The steel surfaces exposed to view shall be painted with two coats of synthetic enamel paint over one coat of red oxide zinc chrome primer.

Back fillings of trenches
It shall be all as specified in clause 18.56 of MES Schedule Part-I.

Making connection of GI distribution with GI main
It shall be as per clause 18.59 of MES Schedule Part-I.

Cutting of GI Pipe line fixing meter and stop valves
It shall be as specified in clause 18.63 to 18.63.2 of MES Schedule Part-I.

Testing of pipe line
Testing of pipe shall be carried out as specified in clause 18.54 of MES Schedule Part-I.

➢ MISC TEMS OF WORK

The work shall be carried out as specified in respective items of Sch „B‟ and as specified in relevant Sch of SSR 2009 Part-I.

Miniature Circuit Breakers

These shall conform to IS-8828 (Specification for MCB and isolator for voltage not exceeding 1000 volts). All MCB‟s/MCCB‟s shall be housed in suitable size sheet metal enclosure of MS sheet supplied by the same manufacturer of MCBs/MCCB‟s.

LED Fittings: LED light fittings shall be as specified in relevant item of Sch `B‟.

FAN/EXHAUST FANS: These shall be as specified in relevant item of Sch `B‟ and as directed.

Underground cables

These shall be laid in trenches and shall conform to clauses 19.75, 19.76, 19.78, 19.80 to 19.82 and as given in Schedule „B‟.

Cable laying and record: The following essential data shall be furnished by the contractor as cable record of all the buried cable installation:-

(a) Size, type and make of cable.
(b) Location of cable in relation to bench marks or any other permanent structure.
(c) Cross-section showing where cables are laid in pipes or trenches giving their sizes, type and depth.
(d) Position and type of all joints.
(e) Position and depth of all pipes, ducts to which it met and obstructions to the cable run.
(f) Record of accurate lengths from joints to joint and phase sequence between joints to joints to each cable run.
(g) The contractor shall provide LT cable metal tags indicating sizes, each run Joints, length of cable between sub lead centers, so that at any spot each cable can be identified easily.
(h) While laying LT cable under the roads, paths etc, exact depth at which the cables are to be laid shall be as per SSR and as directed by the Engineer-in- Charge.
(j) Cable shall not be bent to small radius while laying in trenches/ducts. The Minimum safe bending radius shall be taken as 12 D, where `D‟ indicates dia of cable.
(k) Before laying the cable, the trenches shall be provided with a layer of sand to the thickness as directed by Engineer-in-Charge, for the purpose of cushioning. Cable ends with exposed ends shall be provided with cable sockets. Sand cushioning for protection of underground cable in trenches shall be done as described in clause 19.75 of MES Schedule.
(l) All jointing of cables in joint boxes, etc. shall be done strictly as per Manufacturer‟s instructions. The joints shall conform the relevant IS. Each jointing will be inspected and passed by Engineer-in-Charge. Random checks shall be exercised by AE also and the findings recorded. The PVC cable shall be terminated through a gland, made of suitable sizes. Before making joints in cables near the proposed building sufficient loops shall be provided for further maintenance.

Testing of cable & equipments

LT/HT cable (where the quantity of particular size is more than 500m), HT panel/DG set, transformers, Compact package type substations, RMU and the like shall be inspected & tested in presence of Accepting officer Rep and Engr-in- charge in factory premises prior to dispatch of these items . The contractor shall inform well in advance to the department for inspection at factory premises**.**

Testing of underground cables

During and after laying of cables testing shall be done as specified in clause 19.93 to 19.96 of SSR Part-I. The testing shall be carried out by the contractor in presence of Engineer- in-Charge; recorded and signed by both. For cable laying, jointing and testing, the relevant clause in pages 19.19 to 19.23 of SSR Part-I (1991) shall also be kept in view. The rates quoted by the contractor for relevant items of Schedule „A‟ shall be deemed to include for the testing

Cables boxes

These shall be straight through TC or end boxes for HT and LT cables as specified in the Schedule „B". Jointing of cables shall be as specified in relevant IS.

LT/HT Poles

These shall be as specified in relevant clauses of MES SSR 2009 Part-I. Erection of poles shall conform to clause 19.50 to 19.52**.**

LT SWITCH BOARD PANEL

LT Panel shall be of CRCA sheet construction (minimum 2 mm thick) fixed on masonry platform of suitable size 60cm above GL and 30 cm below GL. The design of LT panel shall ensure that weights of components are adequately supported without any distortion/deformation. Ample space for housing the cable and connections for the purpose of installation and maintenance of cable shall be provided at the back/front with two doors along with locking arrangements**.**

The bus bar shall be of high conductivity aluminum alloy grade EGIE and of adequate cross section to ensure that the temperature rise is within the permissible limits. The bus bar shall be insulated with PVC sleeves, supported at uniform intervals with non-hygroscopic insulated supports to withstand short circuit faults and enclosed in a separate chamber. High tensile bolts and spring washer shall be provided at all bus bar joints. Connections from main bus bar to functional circuit shall be provided with appropriate size aluminum strips and so arranged as to withstand without any damage or deformation the thermal and dynamic stresses due to short circuit. Neutral bus bar shall be half the size of phase bus bar. LT panel should be factory made. The drawings of LT panel will be got approved from AE before manufacturing /assembly.

Testing.
Pre-commissioning test of all electric equipments/machinery installed under this contract shall be carried out by Electric Inspector in presence of Contractor before issuance of satisfactory completion certificate of the work by the GE. The record of such tests will be maintained by the AE duly signed by all concerned and a copy thereof shall be forwarded to Accepting Officer for record purpose. The equipments required for all the tests to be carried out. The quoted amount/rate of respective parts/items of Sch „B" shall be deemed to include for the above provision**.**

DIESEL ENGINE (DG SET)
The diesel engine shall be water cooled diesel engine driven generating set enclosed in acoustic cover of capacities shown in relevant items of Schedule „A", 415 volt, 3 phase, 4 wire, 50 Hz at 1500 RPM conforming to the requirement of Euro-II conforming to ISO-900: 1994 and consisting of the following standard accessories and controls:-

(i) Engine speed governor (Electronic/ mechanical).
(ii) Air filter dry/oil both type as per manufacturer"s standard specification.
(iii) Turbo charger after cooler.
(iv) Tor signal vibrator damper.
(v) Electric motor starter.
(vi) Gear Pump for forced lubrication.
(vii) Fuel injection pump.
(viii) Lub oil filter and lub oil cooler.
(ix) Instrument panel comprising of temperature gauge, tacho-cum-hour counter meter and fuses, battery charging Ammeter.
(x) One set of indicating lamps for load on, main load on, set fails to start, low oilpressure, high temperature alarm/ high temperature trip and alternator over load.
(xi) One audio alarm hooter.
(xii) One KWH meter 3 phase unbalanced load.

(xiii) One KW meter of suitable capacity.
(xiv) One set of bus bar.
(xv) One power factor meter.
(xvi) Corrosion resister.
(xvii) Set of tools as per Manufacturer‟s catalogue.
(xviii) Spares as Manufacturer catalogue.

LUBRICATION OIL SYSTEM

Force feed lubricating system of adequate capacity comprising of gear type lubricating oil pump, oil sump, oil cooler, oil filter, lubricating oil pump. It shall be placed at readily accessible place. It shall be provided with regulator valve and pressure relief valve to protect the system from excessive pressure and to maintain constant oil pressure in complete system.

ELECTRIC STARTING SYSTEM

Electric starting system shall comprise of BOSCH‟s/LUCAS/Mico starter complete with copper leads of adequate size connected to the system start/ stop button, starter gear ring and battery charging generator with regulator to charge the batteries.

EXHAUST SYSTEM

Exhaust system shall include provision of a suitable size silencer and complete pipe system of suitable size to carry the exhaust gases out of the generator room without creating undue back pressure. System shall be cladded with asbestos rope.

ENGINE PROTECTION DEVICES

The tenderer shall clearly indicate the alarms and safety device incorporated in his offer. However, system must have following protection devices with Engine (Audio/ visual) indicator with sheet down:-

(a) Low lubricating oil pressure.
(b) Over speeding of engine.
(c) High water temperature in radiator/ high cylinder temperature.

FUEL TANK

Fuel tank offered by tenderer shall be of capacity not less than 12 hours running at full load with level indicator, stop cock, drain plug alongwith suitable filing arrangement consisting of semi rotary hand operated pump with suitable connections. The rate quoted by tenderers in Schedule „B‟ against Gen Set shall be deemed to include the same.

TESTING AT FACTORY

Testing of DG Set/ Alternator and panel at factory shall be done during manufacturing process. Contractor will intimate Accepting Officer through concerned GE at least one month in advance to nominate representative of Accepting Officer for testing at factory.

TESTING AT SITE

The DG set after installation will be tested for 12 hours continuous run on resistive load or water load in the presence of rep of AE as follows:-

INITIAL RUN

(i) at 25% load for one hour.

(ii) at 50% load for one hour.
(iii) at 75% load for one hour.
(iv) at 100% load for one hour.
(v) at 110% load for one hour.
(vi) at 100% load for rest hour

All necessary arrangement of load and fuel and other equipments required for testing will be arranged by contractor. No extra payment will be made for the testing.

In case of failure, contractor will repair or replace defective part or complete set at his own cost. GE"s decision shall be final on this aspect.

Spare parts and tool kit as per manufacturer's recommendations shall be provided by the contractor without any extra cost to the department.

Acoustic Enclosure: Acoustic enclosure should be made as per CPCB guidelines and it should satisfy all CPCB conditions. Certificate for Noise test from NAL to be obtained by contractor. Engine should be conforming to latest IS code.

- **Doors:**

Door frame shall be of second-class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing shall be carried out in all out side facing doors including all fittings.	Officers DUs, Servant Quarters, Fire Control Room, Electrical Room and Pump House.
PVC door frames & Shutters for Toilets.	Officers DUs, Servant Quarters and PumpHouse
2-Hrs fire rated door with fire rated hardware and fire rated glass vision panel	Fire exit staircase and electrical Panel Room

- **Windows**:

Aluminum windows with mosquito proofing (with wire gauze openable shutters) with provision to accommodate Air conditioners in all bedrooms and coolers in living rooms & dining halls including all fittings.	Officers DUs and Servant Quarters.

- **Internal & External Finishes**

(a) Plinth Protection:

50mm thick PCC 1:3:6 type C1 using 20mm thick graded crushed stone aggregate laid over 75mm thick hard core using stone aggregate over rammed earth having 100 cm width.	All buildings

(b) Floor:

PCC floor	Stilt (Garage, Passage, Services, Fire controlroom, Electrical room & Ramp)
Coloured vitrified tiles of as specified in finishes	Entrance foyer, Living room, Dining Room, Bed rooms (3 Nos) Balcony/open terrace (Balcony level) of Officers DUs
Anti skid Ceramic tiles (square/rectangular)600 x 600 mm	Kitchen & Toilets of Officers DUs, Servant quarters (Living room, bathroom, WC & Balcony) and toilet of pump house bldg.
Polished Kota stone/Udaipur green slab 18-20mm thick.	Lobby & Staircase of Officers DUs and pumphouse building (except toilet)
Coloured vitrified tiles of size 600mm x 600mm	All other places

(c) Plaster on Walls & Ceiling:

(i) 10mm thick internal plaster in CM 1:6 on brick masonry surfaces finished even and smooth without using extra cement in the building housing Officers DUs, servant quarters etc. and pump house building.

(ii) 15mm thick external plaster in CM 1:4 mixed with WPC as per manufacturer's instructions in secured layer finished fair and even without using extra cement in the building housing Officers DUs & servant quarters and pump house building.

(iii) 5mm thick plaster in CM 1:4 on ceiling in Officers DUs, servant quarters and pump house building.

(d) Walls / Ceiling Surfaces finishes:

Two coats of OBD over one coat of primer over a coat of minimum 1mm thick white putty finish on walls and ceilings.	Officers DUs
Three coats of white wash on walls andceilings.	Servant quarters, Stilt floor and pump house bldg.
Vitrified coloured tiles	Entrance foyer, Living Room, Dining Room,Bed rooms & Balcony of Officer DUs
7-8mm Glazed ceramic tiles skirting 100mm high over 10mm thick backing of CM 1:3	Living room & Balcony of servant quartersfrom 1st floor to subsequent floors.
Polished Kota stone/Udaipur green slab skirting 100 mm high	Lobby & staircase of Officers DUs and pump house bldg.
Two coats of synthetic enamel paint over acoat of red oxide for all steel surfaces	All places
Two coats of synthetic enamel paint over acoat of primer for all wooden surfaces	All places
Glazed ceramic tiles dado	Kitchen/ toilets of Officers DUs , pump house toilet

(e) Staircase:

Kota Stone single piece riser and treads with double bull nosing	Block of Officers DUs and Servant quarters

Stainless steel railing SS304 grade, designer / ornamental type using roughened glass notless than 6mm thick.	Block of Officers DUs
MS railing	Servant quarters

(f) CP Fittings:

Ornamix prime series of Jaquar or equivalentseries in other makes specified in the bid document.	All Officers Dus
CP fittings & fixtures of make Elite/Zim/Prima/Essco/Janiko/Prayag/Gem/Soma/ Anchor/Sieco	Servant quarters, Services, Fire control room, electrical room and pump housebldg.

(g) External Facade Finishes:

Two coats of weather proof exterior emulsion paint over a coat of primer	Complete block of 32 DUs including servant quarters, stilt floor, Garage, Passage, Services, Fire control room, electrical room and pump house bldg.

(h) Builders Hardware:

Aluminium anodized fittings	Complete block of 32 DUs including stilt floor, Garage, Passage, Services, Fire control room, electrical room and pump house bldg.
Al powder coated	All other places

(i) Sanitary Fittings:

EWC wall hung with seat, concealed cistern, health faucet with vitreous chinaware WHB. All other fitments & fixtures as per authorisation.	Toilets of Officer Dus
EWC & WHB of vitreous chinaware. All other fitments & fixtures as per authorisation.	Toilets of servant quarters pump house bldg.

(j) Internal Water Supply: Concealed GI pipe of medium grade of appropriate size.

(k) Drainage System: Cast Iron pipes & fittings confirming to IS : 3989 and for soil & waste pipes and UPVC pipes type A for Rain water pipes.

(l) Water Proofing Treatment:

APP Membrane with cement tile	Balcony/open terrace (Balcony level) on all floors & roof terrace of block of 32 DUs & all other accessible roofs/terraces

APP Membrane with aluminium paint	Machine/Lift room (Non accessible), RCC water tank & roof terrace of pump house buildings & all other non-accessible roofs/terraces.

The Errors / Tolerances in vertical and horizontal profile of the structures/building elements / Services will not exceed following limits:-

Parts of Building / Structure	Maximum Tolerance Permitted
(a) Measurements i.e., Length, Width, height and diagonals in layout of buildings and other RCC structures.	(a) Plus or Minus 5 mm for dimensions exceeding 10 m. (b) Plus or Minus 2 mm for dimensions upto 10 m.
(b) Level of Plinth, Floors and slabs	Plus or Minus 1mm in 20 m length
(c) Verticality / plumb of Columns	Max 1mm in any axis in one storey height
(d) Verticality / plumb of brick walls	Max 3 mm in storey height
(e) Verticality in RCC Reservoirs frame work	Max 5 mm in entire height
(f) Sub grade level of Floors of the buildings	Plus or Minus 5 mm.
(g) Road Formation / Earthen Formation top	Plus or Minus 10 mm in 10 m length.
(h) Finished Road Surface of Bituminous Roads and hard standings	Plus minus 3 mm in 10 m length longitudinally as well as acrossthe carriage way.
(j) Finished Road Surface of Concrete Roads and hard standings.	Plus minus 2 mm on 10 m length longitudinally as well as across the carriage way.

SCHEDULE OF FINISHES AND SPECIFICATIONS OF BUILDING

1. **Major and Captain Accomodations at Uri Line & Rajouri Line (**Same to be used for Officer's Mess at Ancillary work)

Srl. No.	BUILDING	SPACE NAME	FLOOR	SKIRTING/ DADO	PLASTER OF WALLS		CEILING		INTERNAL FINISH	EXT FINISH	DOOR FRAME	DOOR SHUTTER	WINDOWS	Remarks
					INTERNAL	EXTERNAL	PLASTER	FINISH						
1	Constructionof 1. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District 2. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District 3. Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K 4. Two Storied	a) Lobby & Staircase from 1st floor to subsequent floors	18-20 mm Mirror Polished Kota Stone/Udaipur Green slab 600x600mm as specified	18-20 mm thick Polished Kota Stone/Udaipur Green slab skirting 100 mm thick as specified	10MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:4	Two coats of OBD over one coat of primer over a coat of min 1mm white putty finish	Two coats of OBD over onecoat of primer over a coat of min 1mm white putty finish	Two coats of weather coat over a coat of primer.	Door frame shall be of second class hard Wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing be carried outin all outside facingdoors inclall fittings & Two coatsof Synthetic Enamel Paint over a coat of primer and PVC door frames to toilets.	Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings and Two coatsof Synthetic Enamel Paint over a coat of primer.	Aluminum window with mosquito proofing by provisioning ofwire gauze openable shutters t owindows, with provisionto accommodate Air conditioners inall bedroomsand coolers in living rooms And dining rooms incl all fittings.	
		b) Entrance Foyer, Living Room, Dining Room,Bed Rooms (3 Nos) & Balcony/Open Terrace (Balcony Level) 1st floor to subsequent floors	10-12 mm thick vitrified colours tiles (HD full polished) of size 600x600mm as specified	10-12 mm thick vitrified coloured tiles Skirting 100mm high as specified.	10MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:4	Two coats of OBD over one coat of primer over acoat of min 1mm white putty finish	Two coats of OBD over onecoat of primer over a coat of min 1mm white putty finish	Two coats of weather coat over a coat of primer.				
		c) Kitchen &Toilet from 1st floor to subsequent floors	7-8 mm thick antiskid ceramic Tiles (Square/ Rectangular) area of tiles exc 0.11 Sqm but not exc 0.18 Sqm as specified.	Skirting as per Floor tiles/ dado of glazed tiles 300x 450 mm	10MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:4	Two coats of OBD over one coat of primer over acoat of min 1mm white putty finish	Two coats of OBD over onecoat of primer over a coat of min 1mm white putty finish	Two coats of weather coat over a coat of primer.		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting & Two coats of Synthetic		

	(02 Storeyed) family accomodation Block (04 houses) for Army Officers of Captain Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K										Enamel Paint over a coat of primer and PVC door Shutter for toilets.		
		d) Servant Quarters, Bath Room, WC & Balcony	7-8 mm thick ceramic tiles (Square/Rectangul ar) area of tiles exc 0.11 Sqm but not exc 0.18 Sqm as specified	7-8 mm thick ceramic tile skirting 100mm over 10mm thick screed bed in CM1:3	10MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:4	Three coats of white wash	Three coats ofwhite wash	Two coats of weather coat over a coat of primer.		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings & Two coats of Synthetic Enamel Paint over a coat of primer and PVC door Shutter for toilets.		

2. 06 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu & 02 no. of 06 storey OR accommodation.

Srl. No.	BUILDING	SPACE NAME	FLOOR	SKIRTING/ DADO	PLASTER OF WALLS		CEILING		INTERNAL FINISH	EXT FINISH	DOOR FRAME	DOOR SHUTTER	WINDOWS	Remarks
					INTERNAL	EXTERNAL	PLASTER	FINISH						
1	Construction of 1. 06 storey Family Accomodation Block of 24 No's for JCO's at district Jammu 2. 02 no. of 06 storey OR accommodation	a) Lobby & Staircase from 1st floor to subsequent floors	Lobby - Living room – Matt Gazed Ceramic floor tiles 400x400 mm rectified IS:15622:2006/ ISO-13006 (GR B-III)on subbase Staircase - Sub base 100 mm thick PCC 1:4:8 type D2 over rammed earth ground floor. & 100 mm thick PCC 1:2:4 type B2 Extended Stilt floor – 1000 mm wide on all side 100 mm thick pcc 1:2:4 type B2 over 100 mm PCC 1:4:8 Type as per drawing	Same as flooring 100 mm thick as specified	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .	Door frame shall be of second class hard Wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing be carried outin all outside facingdoors inclall fittings & Two coatsof Synthetic Enamel Paint over a coat of primer and PVC door frames to toilets.	Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings and Two coatsof Synthetic Enamel Paint over a coat of primer.	Aluminum window with mosquito proofing by provisioning ofwire gauze openable shutters t owindows, with provisionto accommodat e Air conditioners inall bedroomsand coolers in living rooms And dining rooms incl all fittings.	

		b) Entrance Foyer, Living Room, Dining Room,Bed Rooms (3 Nos) & Balcony/Open Terrace (Balcony Level) 1st floor to subsequent floors	Sub base 100 mm thick PCC 1:4:8 type D2 over rammed earth ground floor. Living room and Bed room 1&2 – Matt Gazed Ceramic floor tiles 400x400 mm rectified IS:15622:2006/ISO-13006 (GR B-III)on subbase	Same as flooring 100 mm thick as specified.	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .				
		c) Kitchen &Toilet from 1st floor to subsequent floors	Matt Gazed Ceramic floor tiles 300x300 mm Non skid IS:15622:2006/ISO-13006 (GR B-III)on subbase Toilet 2 – Rough Sand Paper Finish ceramic floor tiles 300x300 mm on subbase	Same as flooring 100 mm thick as specified Dado at toilet 1 and 2 – Coloured glazed ceramic printed tiles 300x200 mm laid over screen upto 2100 mm height Dado at Kitchen – Coloured glazed ceramic printed tiles 300x200 mm laid over screen upto 1500 mm height Kitchen counter – 19 mm Baroda Green marbles laid over screen with 100 mm ceramic tiles	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting & Two coats of Synthetic Enamel Paint over a coat of primer and PVC door Shutter for toilets.		

				apron									
		d) Servant Quarters, Bath Room, WC & Balcony	7-8 mm thick ceramic tiles (Square/Rectangul ar) area of tiles exc 0.11 Sqm but not exc 0.18 Sqm as specified	Same as flooring 100 mm thick as specified	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings & Two coats of Synthetic Enamel Paint over a coat of primer and PVC door Shutter for toilets.		

		Lift lobby, Machine room and electric room & store & Plinth protection	Lift lobby – Kota stone 20-25mm thick flooring on subbase Machine room – 50 mm cc flooring type B1 1:2:4 electric room & store, parking - Sub base 100 mm thick PCC 1:4:8 type D2 over rammed earth ground floor. & 100 mm thick PCC 1:2:4 type B2 Plinth Protection – 1500 mm wide on all sides PCC 1:3:6 Type C2 75 mm thick over 75 mm hard core as shown in drawing	Same as flooring 100 mm thick as specified Dado at Lift main – 20 mm granite in lift front wall door jambs/sills over cement mortar under ceiling height	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .				

3. Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu (Same finishes to be used for **OR institute and Vocational Training centre** for Ancillary Work)

Srl. No.	BUILDING	SPACE NAME	FLOOR	SKIRTING/ DADO	PLASTER OF WALLS		CEILING		INTERNAL FINISH	EXT FINISH	DOOR FRAME	DOOR SHUTTER	WINDOWS	Remarks
					INTERNAL	EXTERNAL	PLASTER	FINISH						
1	Construction of Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu	a) Lobby & Staircase from 1st floor to subsequent floors	Lobby - Living room – Matt Gazed Ceramic floor tiles 400x400 mm rectified IS:15622:2006/ ISO-13006 (GR B-III)on subbase Staircase - Sub base 75 mm thick PCC 1:4:8 type D2 over rammed earth ground floor.	Same as flooring 100 mm thick as specified	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .	Door frame shall be of second class hard Wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing be carried outin all outside facingdoors inclall fittings & Two coatsof Synthetic Enamel over acoat of primer and PVC door frames to toilets.	Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings and Two coatsof Synthetic Enamel Paint over a coat of primer.	Aluminum window with mosquito proofing by provisioning ofwire gauze openable shutters t owindows, with provisionto accommodate Air conditioners inall bedroomsand coolers in living rooms And dining rooms incl all fittings.	
		b) Entrance Foyer, Living Room, Dining Room,Bed Rooms (3 Nos) & Balcony/Open Terrace (Balcony Level) 1st floor to subsequent floors	Sub base 75 mm thick PCC 1:4:8 type D2 over rammed earth ground floor. Living room and Bed room 1&2 – Matt Gazed Ceramic floor tiles 400x400 mm rectified	Same as flooring 100 mm thick as specified.	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .				

			IS:15622:2006/ISO-13006 (GR B-III)on subbase										
		c) Kitchen &Toilet from 1st floor to subsequent floors	Matt Gazed Ceramic floor tiles 300x300 mm Non skid IS:15622:2006/ISO-13006 (GR B-III)on subbase Toilet 2 – Rough Sand Paper Finish ceramic floor tiles 300x300 mm on subbase	Same as flooring 100 mm thick as specified Dado at toilet 1 and 2 – Coloured glazed ceramic printed tiles 300x200 mm laid over screen upto 2100 mm height Dado at Kitchen – Coloured glazed ceramic printed tiles 300x200 mm laid over screen upto 1500 mm height Kitchen counter – 19 mm Baroda Green marbles laid over screen with 100 mm ceramic tiles apron	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting & Two coats of Synthetic Enamel Paint over a coat of primer and PVC door Shutter for toilets.		

		d) Servant Quarters, Bath Room, WC & Balcony	7-8 mm thick ceramic tiles (Square/Rectangular) area of tiles exc 0.11 Sqm but not exc 0.18 Sqm as specified	Same as flooring 100 mm thick as specified	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .		Door Shutter shall be of second class hard wood with factory made panelled door shutters with alumimum anodized fitting. Mosquito proofing to be carried out in allout side facing doors inclall fittings & Two coats of Synthetic Enamel Paint over a coat of primer and PVC door Shutter for toilets.		
		Entrance, Steps, verandah, Staircase area G floor, Terrace, Plinth protection	Entrance and steps – Kota stone 20-25mm thick flooring on subbase Parking - Sub base 100 mm thick PCC 1:4:8 type D2 over rammed earth ground floor. & 100 mm thick PCC 1:2:4 type B2 Plinth Protection – 1500 mm wide on all sides PCC 1:3:6	Same as flooring 100 mm thick as specified Dado at Lift main – 20 mm granite in lift front wall door jambs/sills over cement mortar under ceiling height	12 MM TH Plaster in CM 1:6 on Brick/PCC block Masonry finishedas specified	15mm TH Plaster in CM 1:4 mixed with WPC as specified	5 MM thick Plaster in CM 1:3	Three coats of white wash	2 coats of dry distemper over /coat of primer	Wash grits plaster in 2 layers .				

			Type C2 75 mm thick over 75 mm hard core as shown in drawing											

For all works Schedule of finishes Roofing is tabulated below

SR No	BUILDING	SPACE NAME	FLOOR	SKIRTING/ DADO	PLASTER OF WALLS		CEILING		INTERNAL FINISH	EXT FINISH	DOOR FRAME	DOOR SHUTTER	WINDOWS	Remarks
					INTERNAL	EXTERNAL	PLASTER	FINISH						
1	**ROOF**	a) Terrace (Md Accn for Offr) (Accessible)	All Accessible roof/Terrace shall be provide APP Membrane with cement tile as specified in Particular Specifications.											
		b) Machine/Lift Room (Non Accessible)	All non accessible roof shall be provided APP Membrane with aluminum paint as specified in Particular Specifications											
		c) RCC Water Tank (Non Accessible)	All non accessible roof shall be provided APP Membrane with aluminum paint as specified in Particular Specifications											
		d) Terrace (Pump House) (Non Accessible)	All non accessible roof shall be provided APP Membrane with aluminum paint as specified in Particular Specifications											

6 Parking and Internal service Roads

(i) The parking and internal roads should be designed and constructed along with the drainage system as per IRC:44-2017. The internal service roads carriageway/rigid pavement have an area of 4,770 sqm and Carriage way/rigid pavement of parking & drop offarea of 1,750 sqm. The design of the parking, drop off area and internal roads to be approved by the authority.

(ii) The Contractor shall construct the parking area along with the approaches/roads to various components in the Military Infrastructure with an embankment of 60 cm and flexible pavement of 20 MSA and 8% CBR value with the width of 3.75 m single laned.

(iii) The areas shall be marked and designated with thermoplastic paint along with the provision of appropriate informatory signage as per the directions of the Authority.

(iv) The Intermediate Public Transport (IPT) modes like the auto rickshaws and taxis are the expected modal change for the users apart from private modes. The private modes of transport are two-wheelers, cars and cycles. There should be provision for arrival, departure and parking of these categories of private and public transport.

(v) Designated parking area shall be allotted for the public and private vehicles along with the drop in and drop off facility.

7 Electrical and Mechanical Works

7.1 Scope of work covers the following:

(i) All Electrical Works including IEI, aviation light, lightning arrestor, DG Sets etc.

(ii) Design, Supply, installation, testing and commissioning of power supply to the building which includes Dry type transformer, HT/LT Panels, bus trunking/cables to all LT Panels, Feeder Panels as per specifications given in Schedule D.

(iii) Supply, transportation, foundation, installation, testing and commissioning of Silent type DG Sets. All minor civil works including Foundation, electrical and other works associated with the testing, installation and commissioning of the sets shall be carried out by the tenderer as per specification. The tender should quote for complete job to be executed under the works contract. Diesel engines directly coupled with alternators mounted on a rigid fabricated base frame with resilient anti vibration mountings.

(iv) Cabling, P&F rising main, meter, panel etc. and connection to the main receiving station.

(v) Providing, Installation, Testing and Commissioning & putting into operation of lifts and escalators with all control equipment's & accessories for the required nos. of landings/openings and speed of lifts/escalators in accordance with NBC 2016 as amended up to the date. All electrical works including interconnections from TP& N Switch (including TP&N Switch) and loop earthing from the earth bar provided in the machine room. Provision of adequate lighting in the machine rooms, lift shafts and all

landings. Provision of proper ventilation in machine rooms, lift wells and water proof lift pits including lighting. Provision of hoisting beam or hook above the lift well and trap door. Architrave work at lift entrance. Temporary barricades with caution boards at each landing to prevent accident during execution of work. Electric supply to individual lift shall be given from the dedicated lift panel.

(vi) UPS 3 nos. x 200 (minimum) KVA (2 Working +1 Standby) in parallel redundant mode with 30 min. battery back-up for following (Electrical room, Commercial Shops Elevators etc.). The complete system with all switches, cabling, safety devices, batteries, earthing including the UPS system of capacity so calculated shall be in the scope of work.

(vii) All testing of Electrical control rooms, displays and system etc. complete as per the direction of Authority's Engineer/Authority.

(viii) To monitor & supervise the entire area for security purpose, as well as record and inform officials on unwanted, untoward incidents. It is also essential to have recorded images to be stored at least for min 30 days of all critical area's to facilitate investigations of a reported incidents.

(ix) The hardware required for the system including Servers VMS & Recording, Workstations, Monitors, CAT-6 Patch Cable to connect the camera to nearest POE enabled LAN point, Cables, connectors, conduits, power supplies etc. will be in vendor's scope. Details of specification of IP back bone is given in the subhead of Local area network. Backbone upto core switch and rack in CCTV control room is taken in the scope of LAN subhead. The complete LAN networking, for the CCTV should be separate and exclusive for CCTV system only and not mixed with other LAN system. The proposal and design to ensure it.

(x) Planning, designing, supplying, installation, testing & commissioning of LAN networking with 10G backbone with Wi-fi modem on all floors covering complete floor area. The requirement of LAN outlets as indicated in the Internal EI subhead shall be taken into account for the designing of the complete system. The system shallhave redundancy at the level of core switch as well for the backbone.

(xi) The wiring shall be in the scope of the work of the firm and shall be IP based LAN networking, as described in the Internal EI subhead. LAN networking shall be covered in the LAN subhead. The complete system has to be supplied, installed, tested and commissioned in complete manner to have a fully functional system, as required.

(xii) Building Management system shall be provided to monitor & Control all parameters of all Utilities. Building Automation System shall not only help in conserving energy

by making it possible to plan and execute various energy conservation control schemes but also help in reducing scarce trained man power requirement for operating and maintaining the building services without compromising on quality of services. It shall also act as a Management Information System (MIS) by keeping the management informed about the critical operation of various equipment and make available data required for analyzing the working of, and possibilities of conserving the energy. The system shall be based on Micro Processor Control System, using the various Energy Management Programmers' to save the energy with the latest techniques of controlling the environment.

(xiii) Supplying, installation, testing & commissioning of Automatic Intelligent Addressable Fire alarm system. It shall be as per CPWD specifications, NBC 2016 and Local bylaws and as per approval of Local Fire Service. The work shall also include planning, designing, preparing drawings and getting the drawings approved from the Engineer-in-Charge and its subsequent execution. Scope work also includes integration of Automatic Intelligent Addressable Fire alarm system provided among various buildings, among other equipment like AHUs, Ventilation system etc., as per NBC 2016, requirements to the main control room, located at the one of the maingate.

(xiv) Approvals / NOCs / clearances from local bodies and other statuary agencies etc.

7.2 The Military Infrastructure shall be adequately lit as per the minimum approximate illumination standards prescribed. During night time common areas and facilities should be sufficiently illuminated to ensure visibility and safety to users. High mast lighting shall be provided to lit up the Military Infrastructure area.

7.3 The Contractor shall provide signage with customer focussed approach following the below mentioned guidelines:

7.3.1 Adequate number of traffic signs (informatory, cautionary and warning) and signage shall be provided in the Military Infrastructure for convenience to crew and users.

7.3.2 Insofar as possible, architectural elements, landscaping, and other design features shall identify entrances, exits, etc.

7.3.3 Signs shall be located for maximum visibility at or before all decision points within facilities.

7.3.4 Signs shall be placed at frequent enough intervals so that the infrequent or new usercan readily find his or her way without assistance.

7.3.5 All signage should comply with relevant standards and codes and include items relating to regulatory enforcement (e.g. no smoking, no parking here, etc.).

7.4 Specification of Elevator

Sr. No.	Description of item	Unit	Qty
1	Supply, Installation, testing and commissioning of 8 passengers lift, PM Gearless (Located above shaft) speed 1.0 mps, lift with single speed motor 415 volts, 3 phase, AC, 50 Hz, suply confirming to IS-14665, suitable to serve G+8 upper floorswith AC Variable Voltage & Variable Frequency drive (VVVF drive) complete with all standards accessories, simplex automatic and manual dual controlled operationwith/without attendant, centre opening doors with door drive (electric motor driven mechanism) sliding stainless steel doors, automatic rescue device (ARD) system, 3D infra-red sensor in full height of door & built in announcing system without hand set (04 Nos, one each in car, Machine room & near Ground Floor landing door) complete all as specified and directed as under :-	No.	1

	ELEVATORS :-		
	[i] Type and capacity of lift 08 passengers – 544 Kgs.		
	[ii] Speed 1.0 m/sec with single speed motor.		
	[iii] Type of drive – AC Variable Voltage and Variable Frequency.		
	[iv] Machine Room – Located above the hoist way.		
	[v] Travel – 22.40 Metres (Approx)		
	[vi] Serving – Ground to 6th floor (Floor designation will be 0, 1.....).		
	[vii] Nos of Stop – 9.		
	[viii] Hoist way dimension 1900mm(w) x 1800mm (D).		
	[ix] Power Supply – 415 Volts, 3 phase, AC, 50 Hz.		
	[x] Auxiliary – AC, single phase, 220 volts, 50 Hz.		
	[xi] Car size (inside) – 1300mm (L) x 1100mm (W) x 2200mm (H).		
	[xii] Pit depth – 1600mm.		
	[xiii] Head room – 4200 mm.		
	[xiv] Car Enclosures — Car ceiling & panel — SS hairline finish, panelling of standard thickness with adequate LED lighting on ceiling covered with translucent acrylic cover fitted with powder coated aluminium frame and concealed fan (CT002) with powder coated aluminium grill.		

7.5 EXTERNAL ELELCTRIC SUPPLY& STANDBY POWER SUPPLY (DG SET)

Ser No	Description of item	Unit	Qty
1	Incoming HT Cable from Existing Tapping point to Transformer along with four pole Structure, GOD, Lightning Aresstor, and connected accessories including platform of transformer, Earthing of machinery and size of cable not less than 95 Sqmm 3 core.	Each	As Required
2	Transformer 11:0.433 KV 3 phase copper wound, outdoor type complete in all respect with standard accessories and fitments capacity not less than 315 KVA	Each	As Required
3	Stand by DG Set with AMF panel complete with acoustic enclosure all asper CPCB guidlines capacity including foundation not less than 62.5 KVA (100 % load of Lifts, water supply pump and Fire Fighting System)	Each	As Required
4	LT Panels with essential supply and non-essential supply and bus couplers	Each	As Required
5	LT Cables from Transformer / DG Set to main LT Panels		
6.	LT cables from Main LT panels to other panels / Feeder Pillar Boxes to equipments and Buildings		
7.	Earthing of Machinery/Equipment set of using 32x6 Cu strip electrodealong with Copper /Chemical Bore earthing	Each	As required
8.	Perimeter Lighting of proposed building with LT pole and LED Lighting of suitable wattage.		

The electric requirement of 315 KVA worked out for the proposed Building will be met through 11KV supply from existing source

8 Plumbing and Firefighting

8.1 The Contractor shall provide adequate number of Water Storage and Supply Structures in the form of Over Head Water Storage and Under Ground Water Storage Tanks. Water storage capacity of adequate capacity shall be designed and built as per relevant NBC standards. Apart from meeting the user requirements, water storage shall be maintained for meeting the contingency requirements in case of fire or similar incidents.

8.2 All pumps, valves, piping, cabling, protection and safety devices, electrical control panelswith BMS compatibility, earthing etc. as required for the building for all the water based services to collect the water in the underground/ on ground/ overhead tanks and to pump themto the required tanks, as required to ensure the availability of the water for different type of utilities. This will include the water being received from local body, borewell, STP treated water etc. besides others if any as applicable.

8.3 Water treatment plant (RO) for the treatment of the water from the borewell to make it potable.

8.4 Pumping arrangement along with piping for the irrigation purpose for the complex.

8.5 The Contractor shall also provide pump chamber along with the requisite mechanical, electrical equipment and other accessories installed in a proper enclosure as per relevant standards in a suitable area.

8.6 Supply and installation of Construction of the fire detection and firefighting systems etc.

8.7 Complete internal and external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings

8.8 Completion of sewerage system/ grid

8.9 Completion of Drainage system

8.10 Provide rain water harvesting system including recharge well &tube wells with properly designed network as per the Applicable Laws.

8.11 Supply and installation of STP with suitable technology of 66 kld, in discussions withAuthority to treat waste water generated in the Military Infrastructure.

8.12 EXTERNAL WATER SUPPLY SYSTEM

Srl. No.	Description of item	Unit	Qty
1	GI pipe line water main from tapping point to underground sump to Pump house to clear water tank cum fire fighting storage tank at proposed location including sluice valves, air release valves with complete accessories etc.	Job	1
2.	Pump House building of suitable size for housing water supply pumps.	Each	01 No.
3.	Clear water cum fire fighting storage tank of capacity not less than 50000 Ltrs	Each	01 No.
4.	Supply, installation, testing and commissioning of water supply system consisting of pumps, Microprocessor based control panel, inter connectingpipes, valves, cabling, switchgear etc as required.	JOB	As required.
5.	Distribution network of water supply GI pipe, sluice valves & gate valve complete in all respect	Job	As required.

8.13 EXTERNAL SEWAGE SYSTEM

Srl. No.	Description of item	Unit	Qty
1	Sewage disposal network from each building to connect existing sewage network finally connected to existing sewage network leading to STP plantwith RCC NP-2 pipes of suitable diameter laid on 150mm thick PCC bed with excavation in any type of soil, including manholes /drop manhole of standard size made of brick masonry / RCC / Precast RCC with SFRC ventilating cover and frame at appropriate depth / slope to achieve self cleansing velocity including all items and activities to execute and make sewer line functional.	Job	1

8.15 AREA DRAINAGE AND RAIN WATER HARVESTING SYSTEM

Srl. No.	Description of item	Unit	Qty
1	The area drainage system as per metrological data. The storm water will be routed to RWH pit / existing storm water drains through storm water drains. The Area Drainage System/ Network as per site plan along with roads / buildings.	Job	One

Restricted Area

All work lies in **RESTRICTED AREA.** The restriction for entry to work site conditions of working in restricted area shall be as under:-

(a) The contractor / his agents / representatives / workmen etc. and his material carts, trucks or other means of transport etc. will be allowed to enter through and leave from such gate or gates and at such times as the authorities in charge of restricted area may at their sole discretion permit to be used. Contractor's authorized representative is required to be present at the places of entry and exit for the purpose of identify his carts, trucks etc. to the personnel in-charge of the restricted area.

(b) Identity of workmen: Every workman shall be in possession of an identity card. The identity cards shall be issued after a thorough investigation of the antecedents of the laborers by the contractor and attested by officer in charge of the units concerned in accordance with the standing rules and regulations of the unit. Contractor shall be responsible for conduct of his

workmen, agent or representatives.

(c) Identity cards or passes: The contractor, his agents and representatives are required individually to be in possession of an identity card or pass which will be examined by the security staff at the time of entry into or exit from the restricted area at any time or number of times inside restricted area.

(d) Search:

Thorough search of all persons and transport shall be carried out at each gate and for as many times gate is used for entry or exit and may also be carried out any number of times at the site within the restricted area.

(e) Working hours: The units controlling restricted area usually work during six days in a week and remain closed on the seventh day. The working hours available to the contractor's labour staff gets reduced because of the time of entry and exit during working hours. The exact working hours, working days and non- working days observed for these restricted area (s) where works are to be carried out shall be deemed to have been ascertained by contractor before submitting his tender. The trenderer's attention is invited to the fact that numbers of working hours for a unit are prescribed in regulations and that they cannot be increased by the GE or authorities controlling the restricted area.. However following working hours shall be available to the contractor's labour inside the unit area:-

(i) Working hours 0830 hours to 1630 hours

(ii) Half day 830 hours to 1400 hours

(f) Fire Precautions

(i) The contractor, his agents, representatives, workmen etc. shall strictly observe theorders pertaining to fire precaution prevailing within the restricted area.

(ii) Motor transport vehicles, if allowed by the authorities to enter the restricted area must be fitted with the serviceable fire extinguisher and spark arrestor.

(g) Female searcher If the contractor desires to employ female labour on works to carry out inside the area of factory, depot, park etc. and a female searcher is not borne on the authorized strength of the factory, depot, park etc. at the time of submission of tender, he shall be deemed to have allowed in his tender for pay and allowances etc. for a female searcher (class IV servant) calculated for the period female labourer(s) employed by him inside the area. If more than one contractor employ female labourer(s) during any month and female searcher(s) has/have to be employed in addition to the authorised strength of the factory, depot, park etc. the salary and allowances paid to the additional female searcher(s) shall be distributed on equitable basis between the contractors employing female labour taking into consideration the values and period of completion of their contracts. The AE's decision in respect of the amount recoverable on this account from any contractor shall befinal and binding.

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9 Green Area Development

9.1 No area/pocket in the Military Infrastructure is to be left barren. An area of about 1,237 sqm is expected to be green. Adequate landscaping shall be done in the Project Site. This area has to be suitably provided for improving the aesthetics of the Military Infrastructure. The pockets shall be properly illuminated and railings of suitable type shall be provided to boundary the area. Landscaped area shall be provided as a buffer between the passenger concourse area and the commercial development component.

9.2 Trees that are to be removed for development of this Military Infrastructure may be replanted, as per Applicable Laws in the planned landscaped areas, where feasible.

9.3 Scope includes plantation grass, plants, trees, shrubs, hedges and compound wall upto height of 1.2 m above FGL with gates.

10 Rooftop Solar Water heater

10.1 Planning, designing, supply, installation, testing and commissioning of solar water heater (one for each house) of 200 litres on the terrace and canopy consisting of following equipment's/components.

(i) Tank volume – 200 LPD.

(ii) Inner Tank Material – Stainless Steel

(iii) Inner Tank Thickness – 0.5 mm

(iv) Outer Tank Material – Power coated

(v) No. of Tubes - 20

(vi) Can handle upto 350 ppm of water hardness

10.2 The solar water heater should follow the relevant MNRE guidelines.

10.3 The solar water heater will be installed after creating MS structure at least 2 meter above the terracelevel to have maximum installation.

11 List of Specialized Works (Civil)

The following work are the specialized works for which contractor has to associatespecialized agencies to execute the work based on eligibility:

- Water Proofing.
- Structural Glazing.
- Aluminium work
- Sanitary Installation & Water Supply.
- Termite Treatment work.
- Wooden Flooring.
- Stone Cladding Work.
- Texture Paint.
- UPVC-Windows.

- Fire Checked Doors
- False Ceiling
- Façade Cleaning
- Expansion Joint

Other services as per MES works manual declared specialized.

The contractor shall engage specialized agencies or experience firm to execute the work as per requirement of the Authority's Engineer.

12 Site Office

Scope of work includes construction/providing of site office (pre-fabricated structure or equivalent) with modern outlook for use by Engineer-in-charge and his staff consisting of 3 rooms (total area not less than 100 Sqm with 2 toilet and one conference Room with toilet having area not less than 40 Sqm for NHIDCL officers & staff. The location and plan shall begot approved from Authority's Engineer. Specification for the site office shall be suitable and matching for running an office which shall be got approved from Authority's Engineer. The Contractor shall provide a typical plan of site office & conference room (having light fixtures,wiring &, AC etc.) with specification within 15 days of award of work and shall construct after approval of Authority's Engineer. All running cost & charges shall be borne by the Authority.

13 Quantity of work execution

The minimum quantity of work to be executed for Plumbing work, Drainage System and Electrical work is tabulated below:

SN	Facilities	Quantities Details
1	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District	Attached as Annexure I
2	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District	Attached as Annexure II
3	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District	Attached as Annexure III
4	Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K	Attached as Annexure IV
5	6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu	Attached as Annexure V
6	02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K	Attached as Annexure VI

7	Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K	Attached as Annexure VII
8	Ancillary Work in Akhnoor village, Chak Singh Jammu District	Attached as Annexure VIII

14 Change of Scope

All the scope not above in this Schedule shall be dealt on prorate basis of Schedule H and Article13 of DCA if covered in Schedule H. Contractor while designing the Military Infrastructure should follow the above area provisions only. In the interest of work 5% deviation in consultation with authority is permissible and the cost shall be deemed to be included in Schedule 'H'.

SCHEDULE-C: Project Facilities

Nil

SCHEDULE-D: Specifications and Standards

1 Construction

The Contractor shall comply with the Specifications and Standards set forth in Annexures of this Schedule-D for construction of the Military Infrastructure.

SN	Items	Annexures
1.	General Guidelines for Design-Civil Works	Annexure-I
2.	Particular Specification and condition for E&M Works	Annexure-II
3.	List of Applicable Codes	Annexure-III
4.	Specifications for Solar Works	Annexure-IV
5.	Landscaping and Horticulture works	Annexure-V
6.	Architectural Finishing Schedule	Annexure-VI
7.	Signage	Annexure-VII
8.	Parking Management and Passenger Information Display System	Annexure-VIII

2 Design Standards

The Military Infrastructure Project including Project Facilities shall conform to design requirements set outin the following documents/ codes:

(i) National Building code 2016 India enclosed with the bid.
(ii) IRC Manual for Rigid pavement
(iii) Code for Practice of Road Signs IRC 67:2001.
(iv) MES standard Schedule of Rates (Part-I) (2009) Specifications and (Part-II) (2020) Rates including amendments.
(v) General Conditions of Contracts (IAFW-2249) (1989 Print).
(vi) **IS-1200 (latest)** and other relevant BIS standard

Annexure -I

(Schedule-D)

General Guidelines for Design - Civil Works

1 General

1.1 The work in general shall be carried out in accordance with the MES standard Schedule of Rates (Part-I) (2009) Specifications and (Part-II) (2020) Rates including amendments hereinafter referred as MES Specifications.

1.2 For internal roads, Manual of Standards and Specifications for Two Laning of Highways (IRC : SP : 73 – 2007) published by the Indian Roads Congress and MORTH Specifications for Road and Bridge Works shall be used.

1.3 The other codes and standards applicable for the Project are as follows:

(i) J&K Building Bye laws 2011 including all the amendments thereafter
(ii) Indian Road Congress (IRC) Codes and Standards
(iii) Bureau of Indian Standards (BIS)
(iv) National Building Codes 2016 and revisions. (NBC);
(v) latest BIS codes, super ECBC norms as per ECBC-2017
(vi) Local fire regulations
(vii) MNRE guidelines for rooftop solar water heater
(viii) Energy Conservation Building Code 2017 and
(ix) Approved zoning plan of the site.

1.4 Where the specification for a work is not given, Good Industry Practice shall be adopted to the satisfaction of the Authority's Engineer.

1.5 The Contractor shall use indigenous products, wherever feasible and shall provide a list of imported products to the Authority with sufficient details.

1.6 Statutory fees required to be deposited by the contractor for processing the case, shall be reimbursed by the department.

1.7 Approvals / NOCs / clearances from local bodies and other statutory authorities shall be responsibility of Contractor for design, execution and operation of the project or part thereof. All statutory fees / charges required for obtaining approvals / NOCs / clearances shall be paid by the Contractor.

1.8 All equipment shall be delivered with

(i) Manufacturer‘s test certificate,
(ii) Manufacturer‘s technical catalogues, and installation / instruction (O&M) manuals.

2 Sound Engineering Practice as per Directions of the Authority‘s Engineer

2.1 Before commencement of any item of work, the contractor shall correlate all the relevant architectural and structural drawings, and specifications etc. and satisfy himself that the information available is complete and unambiguous. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work based on any erroneous and or incomplete information and no claim whatsoever shall be entertained on this account.

2.2 Contractor shall provide permanent bench marks, flag tops and other reference points for the proper execution of work and these shall be preserved till the end of the work. All such reference points shall be in relation to the levels and locations, given in the Architectural and plumbing drawings. On completion of work, the Contractor(s) shall submit six prints of ―as built drawings to the Authority‘s Engineer (Hard & soft copy both).

2.3 The Contractor should engage approved, licensed plumbers for the work and get the materials (fixtures/fittings) tested as per Applicable Laws at its own cost.

2.4 The contractor shall give performance test of the entire installation(s) as per the specifications in the presence of the Authority‘s Engineer or his authorized representative before the work is finally accepted and nothing extra what-so-ever shall be payable to the contractor for the test.

2.5 The contractor shall conduct his work, so as to minimize the interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Authority‘s Engineer.

2.6 Sample of building materials, fittings and other articles required for execution of work shall be got approved from the Authority‘s Engineer before use in the work. The quality of samples brought by the contractor shall be judged by standards laid down in the relevant CPWD/ BIS specifications. All materials and articles brought by the Contractor to the site for use shall conform to the samples approved by the Authority‘s Engineer which shall be preserved till the completion of the work.

2.7 BIS marked materials except otherwise specified shall be subjected to quality test at the discretion of the besides testing of other materials as per the specifications described for the item/material.

2.8 The contractor shall procure the required materials in advance so that there is sufficient time to testing of the materials and clearance of the same before use in the work. The contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimensions as may be necessary for execution of work.

2.9 Regarding testing of civil & electrical materials, the testing of materials shall be conducted in Govt. Laboratory/ Govt. colleges/ IITs/NITs or from the laboratory approved by Authority's Engineer. The charges of testing of materials in approved laboratory shall be borne by the contractor.

3 Approved Make for Civil Works:

3.1 Specification / brands names of materials to be used as per the scope of work are listed here. The Contractor should also consider the availability of spares parts/components for maintenance purposes while proposing any brand/manufacturer. The materials of any other brand/manufacturer may be proposed for use by the contractor in case the brands specified below are not available in the market and/or contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Authority's Engineer. The list of approved make for Civil Works is given below:

Structural and Civil

SN	Material	Preferred Makes/ Brands/ Manufacturer
1	Ordinary Portland Cement/ Portland Pozzolana Cement	ACC/ULTRATECH/ AMBUJA/NUVOCO / JKCEMENT
2	White Cement	BIRLACEMENT/J. KWHITE TRAVANCORE
3	Reinforcement Steel	SAIL/ TATA STEEL LTD./ RINL/JINDAL STEEL& POWER LTD / JSW / OR AS APPROVED BY THE AUTHORITY'S ENGINEER FROM TIME TO TIME AS PRIMARY PRODUCER
4	Parallel Threaded Couplers	DEXTRA / G-TECH
5	Re-barring Chemical	HILTI / 3M INDIA
6	Structural Steel	TATA/ JSW STEEL LTD/ SAIL/ JINDAL STEEL & POWER LTD./ RINL
7	Plasticizer, Super Plasticizer Admixtures, Other construction chemicals	M.C. BAUCHEMIE / FOSROC /SIKA BASF
8	AAC Block	AEROCON/BILTECH/JKLaxmi/ MAGICRETE
9	AAC Block Adhesive	ULTRATECH / FERROUS CRETE / BAL ENDURA / AEROCON / J K Laxmi
10	Polymer modified grout cementitious	BAL ENDURA/ WEBBER/ MYK LATICRETE
11	List of RMC producers	ULTRATECH/ NUVOCO / ACC / READY MIX INDIA PVT. LTD OR as Approved by the Authority's Engineer from time to time
12	Curing Compound	FOSROC / SIKA / PIDILITE / STP / CICO / BASF
13	Expansion Joint- modular	HERCULES / Z-Tech / SANFIELD
WATERPOOFING		
1	Waterproofing Self Adhesive (HDPE)Membrane	GRACE / FOSROC / MYK SCHOMBURG

SN	Material	Preferred Makes/ Brands/ Manufacturer
2	Single Component Liquid PU Elastomeric Membrane (spray applied) for Deck Waterproofing	BASF/SIKA/FOSROC/MYK SCHOMBURG/GRACE
3	Waterproofing Compound (Crystalline) and Swellable Bar	XYPEX / KRYTON / PENETRON / BASF / SIKA / FOSROC / MYK SCHOMBURG / GRACE
4	Polymeric Cementitious Coating	BASF / FOSROC / GRACE / STP / PIDILITE
5	Elastomeric Acrylic UV resistant liquid applied coating	BASF/ FOSROC / SIKA / GRACE
DOOR, WINDOWS & WOODWORK		
1	Laminated Particle Board / Particle board / Laminates / Plywood	MERINO / GREENLAM / CENTURY / DECOLAM/ NOVAPAN / ARCHIDPLY / KITLAM
2	Veneered Particle Board	MERINO/DURO/GREENLAM/ KITPLY
3	SS Mesh	GKD / WMW
4	Flush door shutters	GREENPLY/ ARCHIDPLY / DURO / MERINO / KUTTY / JAYNA / CENTURY / KITPLY
5	Glass wool Insulation	UP TWIGA / POLY GLASS / LLOYDS/ OWENSCORNING
6	Rock Wool Insulation	LLOYDS / ROXUL ROCKWOOL
7	Polycarbonate Sheet	GE LEXAN / DANPALON/ GALLINA
8	Decking Steel sheet	TATA STEEL / LLOYDS / JSW
9	Natural wood veneer	SONEAR / GREEN PLY / TRUWOOD / ARCHID
10	Anti-static high-pressure laminate	FORMICA/BAKELITEHYLAM/ DECOLAM MERINO /KITMICA
11	Fire Sealant	HILTI / 3M INDIA / FISCHER
12	Extruded Polystyrene Board	STP / SUPREME / OWNESCORNING, SHALIMAR
13	Wooden / Metal / Glaze-fire rated Door Shutters & Acoustic	NAVAIR / KUTTY / GODREJ/ SUKRI / SHAKTIMET
14	UPVC Doors & Windows	ALUPLAST/ENCRAFT/REHAU/ FENESTA / LG-HAUSYS
15	Fire rated glass (2 hours fire rating)	GLAVERBEL/SAINTGOBAIN/ PILKINGTON/PYROGUARD/SCHOTT
FINISHING		
1	Melamine Polish	ASIAN PAINTS/ PIDILITE INDUSTRIES/ DULUX/ BERGER/
2	Polyester Powder Coating Shades	NEROLAC / BERGER / AKZONOBEL
3	Wall Putty	BIRLA WHITE / JK WHITE / FERROUSCRETE / BERGER / SAINT GOBAIN
4	Oil Bound Washable Distemper	ASIAN PAINTS / BERGER / NEROLAC / ICI / AKZONOBEL DULUX
5	Acrylic Distemper	BERGER / ASIAN / DULUX / NEROLAC
6	Cement Primer	BP WHITE (BERGER) / DECOPRIME WT (ASIAN) / NEROLAC / AKZONOBEL (DULUX)

SN	Material	Preferred Makes/ Brands/ Manufacturer
7	Steel / Wood Primer	AKZONOBEL (DULUX) / NEROLAC / BERGER / ASIAN PAINT / JENSON & NICHOLSON
8	Adhesives	ANCHOR/DUNLOP/PIDILITE- FEVICOL
9	Premium Acrylic Emulsion paints	DULUX AKZONOBEL / NEROLAC / ASIAN PAINTS / BERGER
10	Textured Exterior Finish	ASIAN (ULTIMA) / BERGER (WEATHER COAT ALL GUARD) / DULUX AKZONOBEL (ULTRA CLEAN) / NEROLAC (EXCEL TOTAL)
11	Synthetic Enamel Paint	ASIAN/BERGER/NEROLAC/ AKZONOBEL(DULUX)
12	Epoxy Paint	AKZONOBEL (DULUX) / NEROLAC / ASIAN PAINTS / FOSROC / BERGER
13	Fire Paint	ASIANPAINT/BERGERPAINTS/ SHALIMAR / JOTUN / AKZONOBEL
14	Gypsum Plaster	FERROUSCRETE/ ULTRATECH / INDIA GYPSUM / ELITE (90) OF GYPROC
15	Cement based Ready Mix Plaster	FERROUSCRETE / ULTRATECH / SAINT GOBAIN
16	Pre-Cast GRC Jali	UNISTONE / KERAKROME GRC
17	Polysulphide sealant	FOSROC / SIKA / TUFFSEAL / PIDILITE / WACKER/ DOW CORNING / GE/ STP
18	Silicone / Weather Sealant	WACKER / DOW CORNING / GE
STEEL & ALUMINIUM WORKS		
1	Stainless Steel	SALEM STEEL / JINDAL ALLOYS / SAIL
2	Welding Electrodes	ADVANI-OERLIKON / MODI
3	Dash / Anchoring Fasteners	HILTI / FISHER / BOSCH / AXEL
4	AnodisedAluminiumHardware (HeavyDuty)	HARDIMA/ALUALPHA/PULSE OF LGF SYSMAC / HINDALCO /EVERITE
5	Aluminium Structural Members – Windows, Glazing and Partitions	JINDAL/HINDALCO/NALCO/ INDALCO
6	Stainless Steel Railing, Accessories etc (Grade SS 316)	OZONE / GEZE / KICH / DORMA / JINDAL STAINLESS STEEL
7	G. I Steel door frame	SYNERGYTHRISLINGTON/ SHAKTIMET /NAVAIR
CEILINGS		
1	False ceiling Grid system	GYPROC/GRIDLINE/RK/ GRIDSYSTEM
2	False Ceiling – Gypsum	SAINT GOBAIN GYPROC / AMF / BORAL / LAFARGE / INDIA GYPSUM / HUNTER DOUGLAS
3	Metallic False Ceiling	ARMSTRONG / DURLUM / HUNTER DOUGLAS / SAINT GOBAIN
4	Acoustical Tile False ceiling	ARMSTRONG/SAINTGOBAIN/ ECOPHON/ DEXUNE/ANUTONE

SN	Material	Preferred Makes/ Brands/ Manufacturer
5	Calcium silicate ceiling tiles/ Board	GYPROC / AEROLITE / BORAL / HILUX / ARMSTRONG(MYLAR) / EVEREST/ NCL
6	Aluminium Composite Panel	ALUCOBOND / ALPOLIC / ALUDECOR / REYNOBOND
7	Acrylic Solid Surfaces	HANEX / L.G-HIMAC / DUPONT
FLOORINGS/ WALL TILES		
1	Glass Mosaic Tiles	BISAZZA, MRIDUL, OPIO, PALLADIO, ITALIA GLASS
2	Floor & Wall Tiles: Ceramic / Vitrified tiles / Antiskid / Matt / Glazed	KAJARIA / H&R JOHNSON / SOMANY/ ASIAN(AGL) / ORIENTBELL / VARMORA
3	PVC Flooring	ARMSTRONG / TARKETT / LG HAUSYS
4	Laminated flooring	ACTION / TESA / PERGO
5	Engineered stone - Marble / Quartz	ASIAN/JOHNSON/KALINGA/QUTONE
6	Chequered Tiles, Paver Block & Kerb Stone (of Non-Recycled C&D Waste)	OVILITE / UNISTONE / HINDUSTAN / KK / ULTRA / DALAL TILES/ NITCO
7	Tile / Stone Adhesive / Tile Grout	PIDILITE/FERROUSCRETE/BALLENDURA / MYKLATICRETE
8	Floor hardener	PIDITOP 333 BY PIDILITE / FOSROC / SIKA / IRONITE / FERROK / HARDONITE
9	Epoxy Flooring	FOSROC / SIKA / CICO / LATICRETE / BASF
10	Heat Resistant Tiles	THERMATEK/ NATIONAL/ THERMAX
11	Floor Trap	JAYNA / CHILLI / NIRALI
GLAZINGS		
1	Glazing Structural / Suspended / Skylight/ clear/ float/ frosted/ mirror	SAINTGOBAIN/PILKINGTON/ GLAVERBELL
2	Clear / Float / Frosted Glass /Mirror	AIS / GLAVERBELL / MODIGUARD / PILKINGTON / SAINT GOBAIN/ ATUL
3	Glass Spider Fittings	DORMA / HAFELE / OZONE
4	Toughened Glass / Hermetically sealed performance glass	SAINT GOBAIN / GUARDIAN GLASS / PILKINGTON / MODIGUARD
HARDWARE		
1	Nuts / Bolts & Screws	GKW / HILTI / ATUL
2	Clampsystemfordrystone cladding	HILTI / FISCHER / BOSCH / AXEL
3	Hinges & Brassware	EARL BIHARI / KICH / INDO-BRASS / ASSA-ABLOY/ HAFELE/ GEZE/DORMA
4	MDF Board	NUWOOD/ DURATUFF
5	Vitreous Chinaware	HINDWARE/JOHNSON/CERA/ PARRYWARE

SN	Material	Preferred Makes/ Brands/ Manufacturer
6	All type of hardware and fitting for all type of glazing / doors/ windows etc. including mortise latch & lock, tower bolt, ball bearing butt hinges, friction stay hinges, sliding door bolts, lever handle, magic eye door closer etc.	DORMA / KICH / HAFELE / GEZE / GODREJ / ASSA-ABLOY / HARDWYN / IPSA / DORSET / INGERSOLL RAND / OZONE / HETTICH / EVERITE / LGF SYSMAC
7	Toilet Cubicles	MERINO / GREENLAM / DORMA
8	Hardware for Fire Check Door/ panic bar/ panic trim/ door closer/ hinges/ mortise lock	INGERSOLL RAND / DORMA / GEZE / HAFELE / ASSA-ABLOY / KICH
9	EPDM Gasket	HANU / ANAND / OSAKA
Plumbing & Sanitary		
1	GI Pipes	JINDAL(HISAR)/TATA/SURYA PRAKASH
2	GI Fittings	UNIK / ZOLOTO / SURYA
3	SS Pipes & fittings	JINDAL / VIEGA / J-PRESS
4	HDPE Pipes	RELIANCE / JAIN IRRIGATION / KISAN/ ORIPLAST / SUPREME
5	DI Pipes	ELECTROSTEEL (VEDANTA) / JINDAL / TATA DUCTURA
6	DI Fittings	ELECTROSTEEL(VEDANTA)/ KALINGA / TATADUCTURA
7	CI Double flanged sluice valve	KIRLOSKAR / SONDHI / KEJRIWAL
8	Float Valve	LEADER / ZOLOTO / KSB
9	Centrifugally Cast (Spun) Iron Pipes &Fittings	JAYSWAL NECO / RIF / SKF
10	Centrifugally Cast (Spun) Iron (Class LA)Pipes	JAYSWAL NECO / ELECTRO STEEL / TATA
11	CI Manhole covers, Frames & GI Gratings	JAYASAWAL NECO / RIF / SKF
12	SFRC Manhole Covers & Gratings	KK / OCR / PARGATI / T-CON
13	Stoneware Pipes and Gully Traps	PERFECT / PARRY / BURN / ANAND / RK / HIND
14	RCC Manhole covers & Frames	KK MANHOLE / GRATING CO. (P) LTD
15	Gun Metal Valves, Globes	ZOLOTO / CASTLE / KARTAR
16	Sanitary CP Fittings & Accessories	ORIENTALSERIES‖ofMARCorequivalent series of: JAQUAR / PARRYWARE / GROHE / KOHLER / CERA / JOHNSON
17	Water Meter	PRIMA / ZOLOTO / LEADER / CAPSTAN
18	Brass Stop & Bib Cock	ZOLOTO / SANT / L&K / LEADER / ASTRAL
19	UPVC/ CPVC Pipe & Fittings	AKG / ASTRAL/ SUPREME / FINOLEX /

SN	Material	Preferred Makes/ Brands/ Manufacturer
20	Non-Return Valve (Check valve) and other kind of Valves	ZOLOTO / SANT / LEADER
21	Brass Ferrules	DHAWAN SANITARY UDYOG / KALSI / ANNAPURNA
22	Insulation for hot water pipes	KAIFLEX / ARMAFLEX / CAREFLEX / LLOYD
23	Insulation for external / exposed hot water pipes	KAIFLEX / ARMAFLEX / CAREFLEX
24	Pipe protection for external water supply pipes	PYPKOTE/ARMAFLEX/ MAKPOLYKOTE
25	Stainless Steel Sink	NEELKANTH / NIRALI / CERA / JAYNA
26	RCC Pipes	LAKSHMI / SOOD & SOOD / JAIN &CO./ PRAGATI CONCRETE
27	Dash/ Stud/ Anchor Fasteners	HILTI / CANON / BOSCH / FISCHER
Electrical works		
1	FRLS PVC insulated copper wire /Telephone cable / copper conductorcontrol cable	L&T / Havells / Polycab/ Finolex /RR
2	HT/LT XLPE aluminum cable	Havells/ Polycab/ KEI/ RR
3	Co-axial TV cable	L&T/ Havells / Polycab/ Finolex
4	Steel Conduit	RM CON/ AKG / BEC ISI Marked
5	Conduit fittings	ISI marked
6	PVC Conduit	AKG / Polycab / Prince / Norpak (ISIMarked)
7	L. T. Panel / Meter Board	AdlecMundka/ Control and Switchgears Pvt. Ltd/ Tricolite / SPC Electrotech Ltd/ Ambit Switchgear Pvt Ltd/ Neptune India/Milestone
8	MCB/MCB DB and sheet steel Metalenclosed industrial socket, plug top and Isolators	Legrand/ Siemens/ L&T/ ABB / Schneider
9	Modular type switch/Socket, Telephonesocket, cable TV Antena socket, Electronic fan regulator and GIBoxes	Legrand (Myrius/ Havells (Piccadilly)/ Honeywell (citric) / North West(nova)
10	LED fitting	Philips/ Crompton/ Wipro/ GE/ Zumpobel /Trilux
11	Tube / Vane Axial Flow Fan	Kruger/ Nicotra/ Greenheck/ Airflow/Humidin/ Flaktwood
12	Ceiling Fan / Exhaust fan (BEE-5 Star)	Crompton Greaves/ Usha/ GEC/ Orient
13	Octagonal steel pole	Bajaj/ Valmont/ Utkarsh
14	Conical / Decorative Poles / Bollards	Bajaj/ Philips / Wipro /Valmont/ Utkarsh
15	Air Circuit Breaker	L&T-U Power/ Siemens-3WL/ ABB-Emax/Schneider-Master pact-NW
16	MCCB	L&T- Dsine/ Schneider- Compact NSX/ABB- Tmax/ Legrand- DPX3/ Siemens

SN	Material	Preferred Makes/ Brands/ Manufacturer
17	Digital Voltmeter/ Ammeter/ Multi-function meter	Schenider- conzerv/ Ducati/ Secure/AE
18	Capacitor	Epcos / L&T/ Schneider/ Siemens /Crompton Greaves.
19	APFC Relay	Epcos/ L&T/ Siemens/ Schneider/ Enercon
20	Power Contactor – AC 3 rating / capacitor duty contactor/ starter / Thyrister module /Harmonic reactors.	Siemens/ L&T/ ABB/ Schneider
21	11 KV HT(VCB) panel OEM	Siemens/ Schneider/ ABB/ CromptonGreaves
22	Distribution Transformer (dry type castresin type)	Crompton Greaves/ ABB/ Schneider/Siemens/ Bharat-Bijlee
23	Distribution transformer (oil type) is-1180, part2	Crompton Greaves/ ABB/ Schneider/Siemens/ Bharat-Bijlee
24	Package Type Substation	ABB/ Schneider/ Crompton Greaves
25	Solar street light fitting	Philips/ Bajaj/ Wipro/ Crompton Greaves
26	Rising mains / duct	Legrand/ Schneider/ C&S/ GE
27	Fire Extinguishers	Safex/ Minimex / Superex / Ceasfire
28	Diesel operated Power Generating Engine	Cummins India/ Caterpillar- Perkins
29	AMF Panel	OEM/ OEA of DG Set
30	Alternator	Stamford/ Leroy Somer/ Caterpillar
31	HDPE / DWC pipe	AKG/ Duraline / Rex
32	GI / M. S. Pipe	Jindal (Hissar) / TATA / BST
33	Standard M.S. Fittings & GI fittings	Jainsons Industries / INDUS
34	Ball Valve / Sluice Valve / Check Valve /Pot /Y Strainer / Butterfly Valve	Audco / Kirloskar/ Zoloto/ Advance
35	Pressure Switch	System Sensor / Indfoss / Denfoss
36	LIFTS	M/s OTIS M/s Kone M/s Mitsubishi M/s Schindler M/s Johnson Lifts Pvt. Ltd. Chennai The contractor has to give at least three options out of the make mentioned above for lift and the department will be free to select any one of them.
37	BMS Operator Work Station	HP/ Dell / Lenovo /Acer
38	BMS Controller and Power Supply /Software	Siemens / Honeywell EBI / Sauter / TAC(Schneider) / ALC
39	BMS Controller Housing	Enclotek / Rittal
40	Temperature Sensor & Humidity Sensor /Enthalpy Sensor / Lux Sensor / COSensor	Siemens / Invensys / Honeywell / Sontay /Greystone / Sauter / Kele / TAC

SN	Material	Preferred Makes/ Brands/ Manufacturer
41	Pressure Transmitters / Air Velocity Meter	Siemens/ Invensys/ Kele/ Honeywell /Sontay/ Greystone/ Sauter/ TAC
42	Flow Meter	Forbes Marshal/ Kele/ Sontay/ Greystone/Siemens/ TAC/ Honeywell/ Schenitech
43	Differential Pressure Switch	Siemens / Invensys / Honeywell / Sontay /Greystone / Kele / Sauter
44	Ph Sensor / Conductivity / TDS	Forbes Marshal / Endres Hauser / Kele /Sontay / Greystone
45	Flow Switch / Level Switch / LevelIndicator	Siemens / Elektronik / Invensys / Honeywell/ Sontay / Greystone / TAC
46	Current Transducer / Voltage Transducer /Power Factor Transducer / Frequency Transducer	ABB / Southem Transducer / Veris / SETO / Sontay / Greystone
47	Personal Computer	Dell / IBM / HP / Compaq
48	Laser jet Printer	HP / Canon
49	Fire / Sprinkler Main Pump / JockeyPump	Mather & Platt India Limited / Grundfos /Kirloskar / KSB
50	Diesel Engine	Cummins / Kirloskar / Catepillar
51	Motor	ABB/ Siemens/ Kirloskar / CromptonGreaves
52	Anti-Vibration Mounting	Kanwal Industrial Corporation/ Resistoflex /Ewren
53	Starter	L&T/ Siemens / Crompton/ GE / ABB /BCH
54	Current Transformer (Cast Resin)	AE/ L&T/ Kappa
55	Anti-Vibration Pad	Cori/ Dunlop / Diamond Pipe Support/ EasyflexFlexionics / Resistoflex / Emerald
56	Factory fabricated duct	Waves/ Zeco /Ductofab/ GP Spira
57	Perforated with powder coating M.S. /Hot dipped G.I. cable trays	Vinous/ Indiana/ steelway / Slotco / Pilco
58	Addressable Multicriteria Smoke Detectors With base / Addressable Duct Type Smoke Detectors With base/ Fault Isolator with base/ Addressable Heat Detectors with base/ Addressable Manual Call points / Addressable Control Module/ Addressable Monitor Module / Sounder/ Hooter cum Strobe/ Fire Alarm Control Panel/ PA System Panel/ Telephone Jack / Hand Set/ Software/ Speaker	Notifier / Siemens / Bosch / Edward.
59	Conventional Fire Detection and Alarm SystemDetector PanelsManual Call Points Hooters	Daksh/Agni/ System Sensor/ Ravel

SN	Material	Preferred Makes/ Brands/ Manufacturer
60	Fire Survival Cable	Fusion Polymer/ Havells/ Bonton/ Rallison/Batra Henlay
61	Thermo plastic (Textilereinforced) Hose Reel ISI Mark	Mitra/ Kesra / Padmini
62	Stainless Steel Brach Pipe	Safex/ Padmini / GETech / New Age
63	Fireman Axe/ Installation Control Valve	Safex/ Padmini / GeTech
64	2-way/4-way FBC	Safex/ NewAge (Mumbai) / GeTech
65	Sprinkler Heads	Tyco/ HD/ omax UL listed
66	Pipe Protection Pypcoat (AW4) Wrapping	IWL/Taxa/ Mac- poly coat
67	Rubber Bellow	Kanwal Industrial Corporation / Resistroflex/ AIP Valves
68	Window Sprinkler	Tyco / HD
69	Deluge Valve	Safex/ Tyco / HD
70	Air release valve	Superex/ GeTech / NewAge / Safex
71	Welding Rods	Ador/ Esab / Essar/ Advani
72	Fastner	Hilti/ Fisher
73	Hose Box(External) (GI Powder Coated)	SPC Electrotech Ltd/ AdlecMundka/Ambit Switchgear Pvt Ltd/ Milestone/ Tricolite
74	Flexible Drop (UL Approved)	Safex / HD / Kofulso (Easy flex)
75	Galvanized Sheet Steel	Tata/ Jindal/ Sail
76	IP Based CCTV system CCTV CamerasBullet, Dome, PTZ Camera Network Video Recorder	Honeywell/ Panasonic /Sony
77	LED TV	Sony/ Panasonic/ Samsung
78	Data Networking System Information Outlet (I/O)Patch Panel, Patch Cords SFP	Legrand/ Molex/ Amp
79	Cat-6 /6A Cable	Legrand/ D-link / Ploycab
80	Managed Switch for Data Network,CCTV system	Cisco/ Hewlett Packard
81	Data Racks	i Ball/ D-link/ President/ Legrand
82	EPABX	Panasonic/ Alcatel/ Sansung
83	Telephone Handsets	Beetel/ Binatone/ Panasonic
84	MDF and Telephone Tag Blocks	Krone
85	Boom Barriers	Kaba/ Magnetic/ SEAA/ Makim/ FAAC
86	Solar PV Modules	Vikram/ Tata Solar/ Waaree/ Enkay Solar
87	Inverter (for solar power system)	Kaco/ Delta/ Schneider / SMA
88	Cables for solar power (XLPO/XLPE)	Lapp/ Havells/ Universal/ Polycab
89	String Combiner Box	Hensel/ Schneider
90	0.2 Class ABT Compliant Net Meter	Secure/ L&T/ Schneider

SN	Material	Preferred Makes/ Brands/ Manufacturer
91	Weather Monitoring Station	SMA/ ABB
HVAC		
1	Chilled Water Machine	Daikin / Carrier/ York /Dunham Bush
2	Pumps (primary, Secondary & Condenser)	Armstrong / Grundfos / ITT/Willo
3	Cooling Tower	Nihon Spindle/ Baltimore / Evapco/PAHARPUR
4	Air Handling Unit (AHU)	VTS / System Air / Flaktwood/ZECO
5	Cooling Coil	VTS / System Air / Flaktwood/ZECO
6	Hydronic cassette unit	Carrier/ Bhutoria / Midea
7	UVGI system	Ruks / Trimed / Rydair
8	EC Fan &Plug Fan for AHU	System Air / VTS / Kruger/NIKOTRA
9	Air filter	Mechmaark / Pyramid / Thermodyne
10	Electrostatic Filter	Cleair / Kleanwaves / ZecoPureair/HONEYWELL
11	Variable Frequency Drive (VFD)	Danfoss / Siemens / LG/ABB
12	Exhaust Fan Section	Kruger / System Air / Greenheck
13	Ventilation Fan (Centrifugal / Axial)	Kruger / System Air / Greenheck
14	Inline Fan	Sphere / Kruger / Pineair
15	Propeller Fan	Marathon / Khaitan / GEC
16	MS Pipe	TATA / SAIL / Jindal (Hissar)
17	GI Pipe	TATA / SAIL / Jindal (Hissar)
18	PUF Pipe Support	Malanpur / Lloyd / Best Puf
19	Pressurized Expansion Tank & Air Separator	Grundfos / ITT /Anergy/EMRAID
20	Butterfly Valve	Advance / Audco/ Honeywell
21	Balancing Valve	Advance / Audco/ Honeywell/ Castle
22	Check Valve	Advance / Audco/ Honeywell
23	Y – Strainer	Rapidcool / Emerald /Castle/
24	Pot Strainer	Sant / Rapidcool / Emerald/
25	PIBC Control Valve with Actuator, Motor & Thermostat	Danfoss / Siemens / Oventrop/ Honey well
26	Motorized Butterfly Valve	Advance / Danfoss / Zoloto
27	Ball valve with & without strainer	Audco / Castle / Betaflo/ Honeywell
28	Thermometer / Pressure Gauge	Emerald / H-Guru / Anergy
29	Test Point	Anergy / Rapidcool / Emerald
30	Flow Switch	Siemens / Anergy / Honeywell
31	Flexible Pipe Connection	Resitoflex / Dunlop / Easyflex
32	Auto Air Vent with Stop Valve	Anergy / Rapidcool / Emerald
33	Factory Fabricated Duct	ZecoAircon / Ductofab / Rolastar
34	Flexible Duct	Sphere / ATCO / U.P.Twiga
35	G.I. Sheet	Jindal / TATA / Nippon / SAIL
36	Demand Ventilation Equipment	Conaire / Greenheck / Cynor
37	CO Sensor / CO_2 Sensor	Gas Alarm / Honeywell / Seimens / MSR

SN	Material	Preferred Makes/ Brands/ Manufacturer
38	Modulating Motor / Valve	Danfoss / Honeywell / Siemens / Oventrop
39	Fire Damper	System Air / Ruskin / Trox
40	Volume Control Damper, Fresh / Exhaust air louver	Pineair / System Air / Conaire/ Caryaire
41	Grilles/ Diffusers	Pineair / Conaire / Servex / Caryaire
42	Actuator for Fire Damper	Siemens / Honeywell / Danfoss
43	Nitrile rubber insulation	Armacell / Aflex / Supreme
44	Acoustic Insulation for Duct	UP Twiga/Owens conning
45	Fastener	Hilti /Wurth / Fisher
46	Electrical Panel	Tricolite / / Adlec/ KEPL/ System Power Control/ SPC Electrotech/
47	Motor for AHU Fan	Siemens / ABB / Crompton
48	Motor for Ventilation Fan	Siemens / ABB / Crompton
49	Starter	Siemens / Schneider
50	Single Phase Preventer	Minilec / EAP, Bangalore
51	Current Transformer (Cast Resin)	AE / L&T / Kappa
52	Switch / Fuse Unit / HRC Fuse	L&T / Siemens / ABB
53	MCCB	ABB(T-Max) / Siemens (Sentron-VL) / Merlin Gerin (Compact) / L&T (DNX Series) / Legrand (DPX)
54	MCB	Legrand (Lexic) / L&T (Hager) / Siemens (Betagard) / Schneider (Multi9) / ABB (S 270)
55	ACB (with microprocessor release)	Schneider-MVS / Siemens-3WL / L&T-U-power Omega / ABB-Emax
56	Ammeter / Voltmeter (Digital Type)	AE / L&T / Crompton Greaves/Siemens/Conserve
57	LED Indicating Lamp / Push Button	Siemens / GE power / ABB / L&T / Schneider Electric
58	Selector Switch	AE / L&T / Kaycee
59	Relay / Timer / Contactor/Starter/ Push Button	Siemens / L&T / Schneider Electric / ABB / BIL
60	Power Cable /CONTROL CABLE	Worldcab / Skytone / Polycab/ RR Kabel/ RHINO
61	Termination Kit	Raychem / Densons / Xicon / ABB
62	Perforated Cable Tray	B.E.C. / Apex / Indiana/ Steelway / OBO
63	Cable Gland	Commet / Gripwel / Dowell / Raychem
64	Solder less Lug	Dowell / Schneider Electric / Jainsons, Mumbai
65	Hot Water Generator	Rapidcool/ Emrald / KEPL
SOLAR EQUIPMENT		
1	SPV Modules	Schneider/ Moser Baer/ Tata/ BPSolar CEL/ BEL/ Reliance/ GE Solar/ Sanyo PCI/ PANASONIC
2	Power Control Unit(PCU)String PCU	EMERSON/ MITSHUBISHI/ SCHNEIDER/ DELTA
MEDIUM VOLTAGE EQUIPMENT		
1	Power Distribution Panel	As mentioned in the sub-station sub head

SN	Material	Preferred Makes/ Brands/ Manufacturer
2	Moulded Case Circuit Breaker (MCCB) 3&4 Pole With rotary operating mechanism	Schneider Electric (Compact NX) ABB (T-Max)/ Larsen & Toubro (D-Sine) Siemens (Sentron-VL)/ GE Power Controls (Record Plus)
3	Miniature Circuit Breaker (MCB)	Schneider Electric (MG)-Multi-9 ABB GE Power Controls/ Hager (L& T) Legrand Siemen
4	Residual Circuit Breaker (RCCB/ RCBO's)	Schneider Electric (MG)-Multi-9 ABB/ GE Power Controls Hager (L& T) Legrand/ Seimens
5	Lamps LED type,Push Button	Vaishno Electricals/ Larsen & Toubro (Esbee)/ Siemens/ Schneider Electri(MG)
6	Power/ Aux. Contractor 3 /4 Pole	Schneider Electric(Telemechanique)/ ABB/ GE Power Controls/ Larsen & Toubro/ Siemens
7	Lamps LED type,Push Button	Schneider Electric(MG)/ Vaishno Electricals/ Larsen & Toubro (ESBEE)/ Siemens
8	Electronic Digital Meters (A/V/PF/HZ/KW/KWII) Conzerv (Networkable) L &T	Schneider Electric Secure
9	XLPE insulated PVC sheathed copper conductor Armoured power cable of 1.1KVgrade Polycab	KEI/ HAVELLS/ GRANDLEY
10	LT JointingKit/Termination	Raychem MSeal
11	Cable Glands Double Compression with Earthing Links	Comet, Cosmos
12	Bimetallic/ Copper/ AluminiumCable Lug	Comet/ Dowell's (Biller India Pvt. Ltd.)/ Hax Brass (Copper Alloy India Ltd.)
13	PVC insulated copper conductor stranded flexible Finoles FRLS wire (Pretwisted) KEI	Polycab
14	Polycarbonate Junction Boxes	Hensel/ Clipsal/ Sintex
15	Selector Switch, Toggle Switch	Salzer (L & T)/ Siemens/ Kaycee
16	Timer	Siemens/ L & T/ Schneider Electric-TE
17	Material for Structure	TATA/JINDAL/SAIL
MISCELLANEOUS		
1	Irrigation Equipment	JAIN IRRIGATION, KISAN, FINOLEX, PLASSON
2	PVC water tank	SINTEX / POLYCON

3.2 Only material bearing ISI/BIS certifications ECBC/BEE mark shall be used in the work. Where articles of different designs/ makes bearing ISI/BIS certifications are available.

3.3 Where material bearing ISI/BIS certifications marks are not available, material conforming to relevant BIS/ISI shall be used with prior approval of Authority's Engineer. The decision of Authority's Engineer about the design/ make to be used in the work shall be final & binding on the contractor.

3.4 If the specifications of any item are not available, then the decision of the Authority's Engineer regarding quality shall be final & binding on the contractor.

3.5 All materials to be used at site shall be got approved from Authority‘s Engineer before using at site.

Annexure -II

(Schedule-D)

Particular Specification and Condition for E&M Works

1 Scope

The equipment and work shall be confirmed to

(i) ECBC-2017;

(ii) IS: 732-2019

(iii) BIS 15884;

(iv) IS: 374 - 2019;

(v) Central Electricity Authority regulations 2010;

(vi) IS 14665: 2000; Electric Traction Lifts

(vii) IS 4289 Specification for Flexible Cables for Lifts and Other Flexible Connection;

(viii) Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System Code of Practice- IS 2189-2008;

(ix) All amended up to last date of submission of tender, relevant IE rules, relevant IS and as per directions of Authority's Engineer.

(x) All the materials used in the work as far as applicable shall comply with the relevant Indian Standard Specifications with all upto date amendments.

(xi) The contractor shall produce test certificates for their conforming to relevant I.S. specifications.

(xii) The materials having I.S.I. mark shall have precedence over the ones conforming to I.S. specifications.

2 Climatic Conditions

The equipment supplied shall be suitable for satisfactory performance on its rated capacity at all weather conditions i.e. summer, monsoon and winter.

3 Sub Work - Internal & External Electrical Installation of E&M Works

The work shall be carried out in accordance with tender specifications and the following

specifications / rules:

(i) ECBC - 2017.

(ii) IS 4289 Specification for Flexible Cables for Lifts and Other Flexible Connections Part 1: 1984 Elastomer Insulation Cables

Part 2: 2000 PVC insulated Circular Cables

(iii) The Indian Electricity Act, 2003.

(iv) National Electrical Code.

(v) Indian Electricity Rules 1956 amended up to date.

3.1 General

The specifications given below pertain to the internal and external electrical installation work to be carried.

3.2 Wiring

(i) The wires used for the point wiring and power wiring shall be of 650 / 1100 Volts grade FRLS PVC insulated multi stranded copper conductor single core confirming to IS:694:1990.

(ii) All mounting boxes for plate type accessories shall be of metallic construction and of the same make as that of the plate type switches and accessories.

(iii) The connections, inter-connections, earthing and inter earthing shall be done by the contractor wherever required for energizing of the installation and nothing extra shall be paid on this account.

(iv) The rupturing capacity of the MCB"s shall be 10 KA. The MCB"s shall be ISI marked.

(v) The make of MCB, RCCB etc. shall be the same as that of MCB DB.

(vi) Three phase MCB DBs shall be provided with three independent neutral bars for per phase isolation in addition to main neutral link if provided in schedule of quantity.

(vii) Number of inspection boxes for conduit should be barest minimum, rather these

should be avoided.

(viii) Cutting of brick walls shall be with chase cutting machine only. All repairs and patch works shall be neatly carried out to match the original finish and to the entire satisfaction of the Engineer in Charge.

(ix) All the sub main and circuit wiring includes loose wire for connections inside switch boxes and MCB DB s. No payment for these loose wires shall be made.

(x) The connection between incoming switch / isolator shall be made with suitable size of thimble and cable at no extra cost.

(xi) Copper conductor of insulated cables of size 1.5 Sq.mm and above shall be stranded and terminals provided with crimped lugs.

(xii) All hardware items such as screws, thimbles, GI wire etc. which are essentially required for completing an item as per specifications will be deemed to be included inthe item even when the same have not been specifically mentioned.

(xiii) All hardware items such as nuts/ bolts/ screws/ washers etc. to be used in work shall be aluminum alloy / cadmium plated iron.

(xiv) Any conduit which is not be wired by the contractor shall be provided with GI fish wire for wiring by some other agency subsequently. Nothing extra shall be paid for the same.

(xv) The make of the materials have been indicated in the list of acceptable makes. Alternate makes are not acceptable. The materials to be used in the work shall be got approved by the Engineer in Charge / his representative before its use at site. The E- in-C shall reserve the right to instruct the contractor to remove the material which, in his opinion, is not acceptable.

(xvi) Modular boxes, switches, sockets, regulators etc. shall be of only one make.

(xvii) Wherever light fittings are proposed to be provided on the false ceiling, the respective light / fan point wiring will have to be brought up to the terminal of the light fittings / fans by the contractor. Flexible conduits shall be used for drawing wires from MS conduits on ceiling to fittings on false ceiling and nothing extra shall be paid to the contractor for the same.

(xviii) G.I. pipes shall be medium class as per ISI specification and shall be of single piece without any joints.

(xix) All the light and fans points should be properly earthed with 1.5 sq mm, FRLS PVC insulated copper wire.

(xx) Termination of wiring inside the DB's and main board should be done by crimped Copper lugs connections, for which no extra payment will be made.

(xxi) All metallic parts must be properly bonded to the earth. Earthing lugs shall beprovided to all copper earth wires and shall be fixed whenever required by means of anodized bolts and nuts.

4 Sub Work – Data Networking and Telephone, IP Based Video Surveillance/CCTV System, Fire Detection, Alarm and Control System, Firefighting System, HVAC, Building Management System

4.1 Sub Work – Data Networking and Telephone

(i) Passive cabling infrastructure - UTPCAT6 cables & components, fiber optics cable & components

(a) Complete installation shall be done in accordance with installation practices for a well-structured cabling system, using components from a single vendor to ensure consistent and assured performance. The structured cabling distribution network shall serve as a vehicle for transport of data, video and voice telephony signals over a common network throughout the network

(b) Installation, termination and identification of wiring between station outlets and networking rack shall be considered part of the contractor's work.

(c) Wiring utilized for data and voice communications shall originate at networking racks and terminate at IOs terminated at wall.

(d) All cables and terminations shall be identified at all locations.

(e) All balanced twisted pair cable terminations shall comply with, and be tested to TIA/EIA568-C.2 standards for Category 3, Category 5e & Category 6 installations.

(f) Standards Compliance: - Unshielded twisted pair cabling system, conforming to ANSI/TIA/EIA 568-C.2 Category 6 cabling system, ISO/IEC 11801 2nd edition, EN-50173-1.

(g) The contractor carrying out the SITC shall make the system entirely operational for its intended use, by addition of components specific to its make/model even if not specifically mentioned in the BOQ.

(h) It shall be the responsibility of the installer and OEM manufacturer to ensure that the Passive Components of structured cabling distribution network will be free from manufacturing defects in material and workmanship under normal and proper use;

(i) The site will be duly certified by OEM for a period of 20 years from the date of issuance of the registration certificate or installation, whichever is earlier.

(j) 20-year systems performance guarantee by the OEM / manufacturer along with actual test results conducted at site such as attenuation, return loss, NEXT & ACR. Permanent link shall be tested for minimum guaranteedperformance as per standards at 500 MHZ operation minimum.

(k) The Supplying, installation, testing and commissioning of UTP CAT6 data

cables shall include supply and laying of cables in existing conduit on ceiling / wall / slab etc. shall be measured and paid on running length basis.

(ii) UTP CAT6 CABLINGSYSTEM

SN	Description	Specification
	Specifications of UTP Cabling System	
1	Following common specifications shall apply to all UTP CAT6 standards based structured cabling components, i.e., Cable, Patch Panel, IOs & Patch Cords. All components of the Structured Cabling System shall be from the same OEM Manufacturer.	
i	Standards Compliance	1. Unshielded twisted pair cabling system, conforming to ANSI/TIA/EIA568-C. 2. Category 6 Cabling system, ISO/IEC 11801 2nd edition, EN-50173-1.
ii	Warranty	20-year systems performance guaranty by the OEM/manufacturer along with actual test results conducted at site such as Attenuation, return Loss, NEXT & ACR. The cable shall be tested for minimum guaranteed performance as per standards at 500MHz operation minimum
iii	OEM Requirement	All passive cabling must be from same OEM(UTP and Fiber)
2	**CAT-6 UTP Cable**	
i	Standards Compliance	As per 1.i) above
ii	Conductors	23 or 24 AWG solid bare copper
iii	Insulation	PVC jacket or flame retardant LSZH
3	**I/O Jack**	
i	Standards Compliance	As per 1.i) above
4	**Patch Panel**	
i	Standards Compliance	As per 1.i) above
ii	Ports	24 Ports loaded with keystone Jacks
iii	Port arrangement	Individual keystone type or 6 port modular. Blank inserts for unused ports
vii	Height	1 U (1.75 inches)
xiv	Panel	Fully powder coated pencil grey
xv	Approvals	UL listed
xvi	Termination Pattern	TIA / EIA 568 A and B;
xvii	Performance Characteristics	Attenuation, NEXT, PS NEXT, FEXT and Return Loss
5	**Face Plates**	
i	Standard	Conforms to CAT6 Work Area Data I/O Outlet (RJ45) adhering to ANSI / TIA 568-C.2, ISO/IEC 11801(2002) and CENELEC EN50173-1 (2002)specifications
ii	Type	1-port, 2 -port or 4-port, White Face plate
iii	Material	ABS / UL 94 V-0
iv	No. of ports	One/ Two / Four

6	UTP CAT6 PATCH CORD (3 ft or 7 ft)	
i	Standards Compliance	As per 1.i) above
ii	Conductor Size	24-26 AWG, multi -stranded copper
iii	Lengths	3ft or 7ft or 10ft as required in a variety of colours

(iii) FIBER OPTIC CABLE ANDCOMPONENTS

i	Type	Single mode OS2 fiber cabling system from one OEM (Cables + Components)
ii	Networks Supported	1/10G. All passive components must be from same OEM (Copper + Fiber)
iii	Standard Compliance	ITU-T G.652 (A,B,C and D), IEC - 60793-2-50,TIA/EIA492CAAB
iv	Performance Testing	Must be UL listed or ETL certified and fiber Channel compliance to ANSI/TIA568 -C.0 forOS2
v	Warranty	20-year systems warranty; Warranty to cover Bandwidth of the specified and installed cabling system

(iv) Specifications for Optical Fiber Cable

1	Cable Type	6 core Single Mode, Armored, Loose-tube, Gel filled (Uni-tube construction) - Minimum 6 Tubes Cable)
2	Fiber Type	Single Mode, 9 / 125, 250-micron primary coated buffers. UL Listed fiber
3	Fiber core must be	As per Telecordia GR20, ITU-T G652D, IEC-60793-2-50,TIA / EIA 492-CAAB
4	No of cores	6 core – Raw fiber core make can be Corning/Fujikura - ISO 11801 - OS2
5	Armor	Corrugated Steel Tape Armor
6	Cable Construction Type	BELLCORE GR 20 / IEC 794-1 - Loose tube Corrugated steel tape (0.155mm Min) CSTA provided with FRP Rod as strengthening members
7	Outer Jacket Construction	High density polyethylene, anti - termite, anti –rodent suitable for direct burial application. Jacket must be UV Stabilized.
8	Losses @ 1310nm frequency	< = 0.35 dB/Km
9	Losses @1500nm frequency	< = 0.22 dB/Km
10	Max Tensile Load	1500N or higher
11	Maximum Crush (Impact) Resistance	2000N or higher
12	Operating Temperature	-40 deg C to +60 deg C
13	Test Parameters	IEC794-1-E1, IEC794-1-E2, IEC794-1-E3, IEC794-1-E4, EIA-455-104, IEC794-1-E7, IEC794-1-E10, IEC794-1-E11, IEC794-1-F5

14	Marking:	The cable shall have identification marking at regular intervals of 1 meter which will be of permanent nature. The accuracy of the sequential marking will be within +/- 0.5%.
15	Multi-Channel requirement	The fiber cable must have been designed to provide optimum performance from 1265nm to 1625nm making it suitable for 16 – channel Course Wavelength Division Multiplexing (CWDM) applications.

(v) Specifications for Fiber Optic Pigtails

1	Connector Type	LC-Style, Simplex - 1 meter - Compliance to ITU-G657.B-Bend Insensitive fiber
2	Operating temperature	-40 Degree C to +60 Degree C
3	Standard	Fully in compliance with JIS C5973 F04Type.
4	Durability	(500 Matting's): < 0.2 dB Max
5	Ferrules	Pre-radius Ceramic Zirconia Ferrule. Bayonet Coupling: 2.5 mm Zirconia Ferrule
6	Attenuation	Not more than 0.75 dB per mated pair
7	Parameters / standard	Meets or exceeds ITU specifications, UL listed

(vi) Specifications for Fiber Optic Patch Cords (1 or 3mtr)

1	Cable type	LC-LC type SM. Available in either 1.6mm or 3mm simplex or Duplex Zipcord. - Compliance to ITU-G657.B –Bend In sensitive fiber
2	Fiber type	Single mode 9/125 250 micron primary coated buffers
3	No of cores	2 for duplex and 1 for simplex
4	Outside Diameter	1.6mm x 3.0mm (Simplex) or 1.6mm x3.3mm(Duplex)
5	Operating Temperature	-40 Degree to + 60 Degree

(vii) ACTIVE COMPONENTS – NETWORKING SWITCH SPECIFICATIONS

(a) It is a high-performance networking design keeping in mind real time applications and reliability.

(b) Key considerations for network are - gigabit connectivity to each user from the server room to various users/departments/devices in a topology consistingof a central switch followed by the distribution and edge/access switches.

(c) The network shall have a mix of components for supporting PoE+ as well as non-PoE devices.

(d) A robust fiber optics-based backbone is being provided. It shall be based on ring topology using single mode fiber optics cable. The vendor shall ensure that the networking switches shall be populated with the necessarytransceivers

for achieving this design objective.

(e) Several applications are proposed to run on this network – IP-based voice communications supporting voice-data-video, network-based cameras and storage, integrated audio-video, video conferencing, interactive learning, integrated building management systems and important services integration such as fire detection.

(f) All Switches and Wireless Access Points be from same OEM.

(g) All Wireless Access Points asked in tender document should be fully compatible to existing Wireless LAN Controllers.

(h) All Switches asked in tender document should be fully compatible withexisting switches.

(i) All Switches, Wireless Access Points and Existing Wireless LAN Controllers should have capability to manage, configure and troubleshoot from existing Network management system with a single pane of glass.

(j) All SFP and SFP+ should be from same OEM as of switches.

(k) OEM for equipment like Switches and Wireless Access Points should be listed in the leader‟s quadrant of the Gartner Magic Quadrant.

(viii) WIRELESS LAN INFRASTRUCTURE (CONTROLLER AND ACCESS POINT)

(a) Wireless deployment shall be on centralized controller-based architecture in High Availability mode providing seamless scalability

(b) The architecture should be scalable to 1500 APs in the campus

(c) Redundancy should be built in the architecture, i.e., 1+1configuration

(d) IEEE 802.1x with multiple EAP types (TLS or EAP/MSCHAP or TTLS or equivalent)

(e) Wireless system should support IPv6 from Day1

(f) Radio assurance for radio self-test and healing

(g) Increase available 2.4 and 5GHz wireless device density through management of spurious association traffic

(h) IEEE 802.1q – VLAN Tagging

(i) IEEE 802.1d – Spanning Tree

(j) IEEE 802.1p – Layer 2 Traffic Prioritization

(k) IPv6 Control – Increase wireless device density through control of unnecessary IPv6traffic on IPv4-only networks

4.2 Sub Work-IP Based Video Surveillance/CCTV System

(i) GENERAL

(a) The Surveillance System Components must be TCP/IP based components working on the same backbone network as the Data Network (LAN).

(b) Must have mix of IP Cameras as specified in this document.

(c) Must have the Video Analytics and monitoring software capable of meeting the requirements mentioned in this document. The video analytics has to be server based system with capability to interact with third party VMS systems.

(d) Must have the network based storage for the specified time and quality as

specified.

(e) Must be scalable in terms of equipment (no. of cameras) as well as features (Analytics).

(f) True open platform functionality is an essential aspect of this specification; cameras from different OEMs must be able to integrate seamlessly with the specified 3rd party VMS platforms without any loss of features" functionality. Similarly, specified VMS platforms must also be able to integrate with a variety of cameras from different manufacturers.

(g) Camera vendors shall be direct original equipment manufacturers.

(h) All cameras must be with wide dynamic range and True D/N capability with removable IR cut filter.

(i) For better saving on storage and bandwidth the compression used shall be H.264 high profile for all types of cameras and devices. H.264 high profile shall be a common requirement for all cameras and devices irrespective of whether mentioned in individual sub-sections or not or if mentioned otherwise.

(j) All cameras shall be vandal resistant as per IK10rating.

(k) All cameras shall be ONVIF Profile S compliant

(l) Cameras shall have a wide dynamic range of between 90 to 100dB forensuring good image performance in varying light conditions.

(ii) Full High Definition (HD), True Day/Night, Network PTZ Rapid Outdoor PTZ Camera

(a) The camera shall be FHD Rapid Dome PTZ camera supporting triple streaming code simultaneouslygeneratingandtransmittingJPEGandtwoindependentH.264 (preferably High Profile) video streams which are different in resolutions and frame rates.

(b) The camera shall utilize a 1/3-type CMOS/CCD/MOS sensor of approx. 2.0 Megapixel and have a True day/night capability.

(c) The camera shall be capable of 360-degree pan rotation and a minimum tilt range of 0° to 180°, designed for pole / wall /ceiling mount operation.

(d) The camera shall incorporate a built-in 30X optical, auto-focus zoom lens, and shall have 12X digital zoom capability.

(e) The camera shall be able to automatically sequence through the preset positions in programmable sequence, i.e., preset tours.

(f) The camera shall produce a high-quality picture with a minimum illumination of 0.6 lux in colour mode or 0.07 lux in B/W mode at F1.6 or better. It shall offer IR cut filter that switches on/off to enhance low-light sensitivity during B/W mode.

(g) The camera shall be equipped with an intelligent Auto Backlight Compensation feature, mask settings and level adjustment capabilities to compensate for backlight by masking brighter areas.

(h) The camera shall have feature to transform shadows and dark areas into natural and crisp images in real time.

(i) The camera shall support automatic tracing white Balance Adjustment feature.

(j) The Camera shall be capable of Advanced Auto Tracking function which will track and follow single moving indoor target 10 feet from the camera and

occupies approximately 10% of the field-of view, in indoor lighting conditions greater than 2 lux. The Advanced Auto Tracking function shall notrequire an external video processor to control the network Camera. TheAdvanced Auto Tracking mode shall be able to be interrupted by manual operator control and automatically resume to its previous tracking mode after operator releases control.

(k) The camera shall have the light control mode to select the environment, i.e., indoor or outdoor, in which it is to be used.

(l) The camera shall have a 2D and 3D noise reduction capability which reduces AGC noise to provide clear images without motion blur.

(m) The network interface shall be via an 8-pin RJ-45 connector, 10Base-T/100Base-TX Ethernet. Both IPv6 and IPv4 shall be supported.

(n) The camera shall utilize JPEG and H.264 high profile compression. The maximum resolution for each codec shall be 1920 x1080.

(o) The camera shall be capable of generating HTML code for the video image, allowing for easy web page integration.

(p) The camera shall be capable of supporting up to twelve (12) users simultaneously over the network.

(q) The camera shall have the capability to stream JPEG and H.264 high profile video in TCP protocol H.264 in UDP (unicast/multicast) protocol.

(r) The camera shall incorporate a built-in algorithm for intelligent motion detection capability. The Camera shall offer this feature with four configurable areas per scene and fifteen sensitivity levels adjustment capabilities.

(s) The camera shall have 2-way audio feature where the Camera shall have built-in Audio input and output jacks and be capable of transmitting and receiving full duplex audio stream through the same Ethernet connection as the video. The audio shall be encoded using the G.726 or equivalent ADPCMstandard.

(t) The camera shall support the following network protocols: TCP/IP, UDP/IP, HTTP, HTTPS, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP, SNMP, UPnP.

(u) The camera shall support HTTPS client authentication.

(v) The camera shall be compliant with the industry standard ONVIF (Open Network Video Interface Forum) specification with Profile S support.

(w) The camera shall have user configurable port settings.

(x) The camera shall have an email (SMTP) notification capability and in addition the Network Camera shall support the scheduled transfer of image data via FTP to an FTP server.

(y) The camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.

(z) The camera software should include the IP Setup (including group camera management) program, Firmware Upgrade Tool, Privacy Masking Tool. If required, the software shall be supplied with the camera as a standard accessory.

(aa) The minimum electronic shutter setting shall be 1/30 second, and a maximumof 1/10,000sec.

(bb) The camera shall have 3 external I/O Terminals which can support alarm inputs/outputs or external Day/Night controls.

(cc) The camera shall can limit the bandwidth from 64 kbps to 8 Mbps in H.264 mode

and also to operate without bandwidth limitation in JPEG format.

(dd) The Camera shall be capable of being configured to automatically transmit alarm images transfer via FTP file transfer and/or e-mail. In addition the Network Camera shall support the scheduled transfer of image data via FTPto an FTP server.

(ee) inputs, VMD alarms, and alarm commands shall be able to trigger actions such as memory recording, FTP file transfer, e-mail notification,alarm indications on web browser, alarm terminal output, and alarm command.

(ff) The camera shall also have a storage capability at device itself; it shall provide a memory card slot which can support up to a maximum of 64GB memory card that can cache images in the event of a network failure. The camera shall also support manual/alarm recording to the optional memory card. The camera shall provide notification of the remaining capacity of the memory card.

MECHANICALREQUIREMENTS

(a) The camera shall have 360° endless pan rotation and -14° to 180° tilt range. The unit shall be designed for pole / wall / ceiling mount operation.

(b) The camera shall have maximum pan/tilt speeds of 300° per second in presets and minimum pan/tilt speeds of 0.07° per second. The camera shall have two hundred and fifty six (256) user defined presets.

(c) The camera shall be vandal resistant. With IEC 62262compliance.

(d) The camera shall have inbuilt dehumidification feature to remove moisture from the camera.

(e) The camera shall be outdoor rated for ingress protection of IP66 rating and mechanical impact protection ratingIK-10.

(iii) Full High Definition (FHD), True Day/Night, Veri-Focal dome Network Camera

(a) The camera shall be a Full HD dome network camera supporting three codecs, JPEG and 2 nos. H.264 high profile, any two of which can be used simultaneously. The camera shall utilize a 1/3-type, CCD/MOS/CMOS sensor of approx. 2 Megapixels and have a true day/night capability.

(b) The camera shall be ONVIF Profile S compliant.

(c) The camera shall have a vandal-proof housing as standard and shall comply with IEC 62262, IEC 60068-2-75 test standard for impact resistance up to75J.

(d) The network interface shall be via an 8-pin RJ-45 connector, 10Base-T /100Base-TX Ethernet. Both IPv6 and IPv4 shall be supported.

(e) The camera shall utilize JPEG and H.264 high profile compression. The camera shall also be able to support full HD mode of 1920X1080 in H.264 compression mode with 30 fps.

(f) The camera shall incorporate a built-in web server, such that a standard web browser such as Microsoft Internet Explorer can be used to access the camera without need for special viewer software.

(g) The camera shall have an advanced function which allows the camera image to be viewed in JPEG format without using any plug-ins. This allows HTML code for the video image to be generated, allowing for easy web page integration.

(h) The camera shall can support up to ten (10) users simultaneously over the

network.

(i) The camera shall have the light control mode to select the environment, i.e., indoor or outdoor, in which it is to be used.

(j) The camera shall have a 2D and 3D noise reduction capability which reduces AGC noise to provide clear images without motion blur.

(k) The administrator shall have complete access/control of the cameras.

(l) The camera shall have built-in motion detection capability.

(m) The camera shall support the following Network protocols: TCP/IP, UDP/IP, HTTP, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP, and SNMP.

(n) The camera shall support HTTPS client authentication.

(o) The camera shall have user configurable port settings.

(p) The camera shall have an integral 3 to 8 mm auto-iris type vari-focal lens.

(q) The camera shall be Power over Ethernet (PoE) capable, compliant to the IEEE 802.3a/f standard.

(r) The camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.

(s) The software provided with camera shall include the IP Setup (including group camera management) program, Firmware Upgrade Tool etc.

(t) The minimum electronic shutter setting shall be 1/30 second, and a maximum of 1/10,000sec.

(u) The camera shall be capable of limiting the bandwidth from 64 kbps to 8 Mbps in MPEG-4 or H.264 high profile, and from 0.5 Mbps to an unlimited bandwidth in JPEG.

(v) The camera shall be capable of being configured to automatically transmit alarm images transfer via FTP file transfer and/or e-mail. In addition the camera shall support the scheduled transfer of image data via FTP to an FTP server.

(w) The camera shall feature a body-based automatic back focus mechanism for automatic and remote back focus adjustment by way of hardware button or software based control.

(x) The camera shall support feature to transform shadows and dark areas into natural and crisp images in real time. The camera shall also feature intelligent digital back light compensation, digital wide dynamic range circuit, digital noise reduction and electronic sensitivity-up for real surveillance purposes under severe conditions. For better picture quality, the camera shall feature digital 2H enhancer, digital aperture correction, knee circuit and digital white detective ATW. The camera shall also offer a user-configurable AWC setting for white balance at a manual setting.

(y) The camera temperature rating shall be -10 to + 50 deg C.

(z) The camera shall feature cropping function which enable to provide whole image (1920x1080) and the part of image (640x360) simultaneously. Up to 4-images capture areas can be specified, and it is also possible to control the sequence.

(aa) The camera shall also have a storage capability at device itself; it shall provide a memory card slot which can support up to a maximum of 64GB memory card that can cache images in the event of a network failure. The camera shall also support manual/alarm recording to the optional memory

card. The camera shall provide notification of the remaining capacity of the memory card.

MECHANICAL REQUIREMENTS

(a) The Camera shall be IP66 rated and shall adhere to IEC 60529 standard. Also, it shall be vandal resistant body for high reliability for 75Jimpact.
(b) The camera shall have feature to remove the humidity that manages to enter in its body.

(iv) FULL HD, OUTDOOR FIXED CS-MOUNT/BOX OR BULLET CAMERA SPECIFICATIONS

(a) The camera shall be a Full HD fixed-type CS-mount network camera supporting three codecs, JPEG and H.264 high profile (2 Nos), any two of which can be used
(b) Simultaneously. Camera shall utilize a 1/3" type CMOS/MOS sensor and have a resolution of approx. 2.0 MP and have a True day/night capability.
(c) The camera shall feature a Day & Night mode that may be automatically engaged on low light level and permit the use of an external infrared illuminator or manually selected.
(d) The camera shall incorporate independent automatic Colour-to-Black & White switching modes for switchover on light threshold and sensitivity to IR illumination in the 850 nm wavelength. Each Colour-to-Black & White switching mode shall incorporate two switching threshold light levels, high and low. Each Colour-to-Black & White switching mode shall incorporate three duration settings for automated switchover.
(e) The camera shall be ONVIF Profile S compliant.
(f) The camera shall utilize JPEG and H.264 high profile compression. The camera shall also be able to support full HD mode of 1920X1080 in H.264 compression mode with 30fps.
(g) Network interface shall be via an 8-pin RJ-45 connector, 10Base-T /100Base-TX Ethernet.
(h) The camera shall incorporate a built-in web server, such that a standard web browser such as Microsoft® Internet Explorer can be used to access the camera without need for special viewer software.
(i) The camera shall can support up to Ten (10) users simultaneously over the network.
(j) The camera shall incorporate a built-in motion detection capability with 4 areas, and 10 step detection size and sensitivity levels.
(k) The camera shall feature cropping function which enable to provide whole image (1920x1080) and the part of image (640x360) simultaneously. Up to 4-images capture areas can be specified, and the possibility to control the sequence.
(l) The camera shall support the following Network protocols: TCP/IP, UDP/IP, HTTP, HTTPS, RTSP, RTP, RTP/RTCP, FTP, SMTP, DHCP, DNS, DDNS, NTP, SNMP, UPnP, IGMP, ICMP,ARP
(m) The camera shall have both FTP client and server capabilities.

(n) The camera shall have user configurable port settings.
(o) The camera shall have a CS-mount 2MP IR corrected type vari-focal lens (3-8 mm/5- 50mm) as standard accessory.
(p) The camera shall be Power over Ethernet capable, compliant to the 802.3afstandard.
(q) The camera shall have privacy zone masking which blocks out unwanted or prohibited area within the video image to protect privacy.
(r) The camera shall have the capability for Camera ID as well as Date/Time data to be superimposed on the video image.
(s) The camera shall have the light control mode to select the environment, i.e., indoor or outdoor, in which it is to be used.
(t) The camera shall have a 2D and 3D noise reduction capability which reduces AGC noise to provide clear images without motion blur.
(u) The administrator shall have complete access/control of the cameras.
(v) The camera shall be capable of being configured to automatically transmit alarm images transfer via FTP file transfer and/or e-mail. In addition the camera shall support the scheduled transfer of image data via FTP to an FTP server.
(w) The minimum electronic shutter setting shall be 1/30 second, and a maximum of 1/10,000sec.
(x) Thecamerashallbecapablelimitingthebandwidthfrom64kbpsto8192kbpsin
(y) H.264 high profile and unlimited in JPEG.
(z) The camera shall support multi-casting and unicasting.

MECHANICALREQUIREMENTS

(a) The camera shall have a CS type camera lens mount in case Box type or inbuilt in case of Bullet type camera
(b) The camera lens supplied with the camera shall be IR corrected lens supplied by the camera OEM or other reputed makes of lens such as Tamaron or Fujinon or equivalent and having f 3-8mm, F1.2 to F1.9, DC auto-iris type vari-focal lens.
(c) The camera shall be installed in a vandal resistant IK10 rated housing.

(v) VIDEO SURVEILLANCE STORAGE

Configuration & Specification for Storage System for Video Surveillance & Recordings on a 24 Hrs x 30Days Basis

High Availability

(a) The Proposed Solution should be a Storage System configured with dual, redundant controllers.
(b) Each Controller must have Intel Sandy Bridge Quad core CPU per controller or equivalent.
(c) The Proposed Solution should be based on real time optimized operating system. (It should not be a general purpose OS)
(d) The Proposed Solution should support Online Microcode / OS Upgrades.

(e) Must provide five 9s availability (99.999%)

Investment Protection

(a) The proposed Storage should be non-disruptively upgraded to 10G Ethernet, FC and FCoE protocols in future and managed by the same Unified Storage Management Software.
(b) Storage System quoted by the OEM should be in the Leaders Quadrant in the latest Gartner Magic Quadrant for Midrange and High-End Modular Storage Arrays Report.

RAM, Scalability and HDD Support

(a) The controllers should have a minimum 30GB cache spread across dual controllers.
(b) The Proposed Solution should be scalable to more than 110 Drives in the same Storage Array without upgrading the controllers.

Host Connectivity and Storage Backend Disk Connectivity

(a) The offered storage shall be supplied with at least 8nos x 1G iSCSI Ports across dual Controllers for Host Connectivity.
(b) The array proposed should have a minimum of 4nos x 6Gbps 2.0 SAS backend architecture.

Total Aggregate Bandwidth

(a) The Proposed storage disk should ensure a minimum total aggregate bandwidth of 2500Mbps on a 90% write &10% read application environment.

RAID Support

(a) All RAID types should be industry standard RAID and solution to be configured with **RAID5 protection**
(b) For every 30 disks, 1 no disk should be configured as Global hot spare.

Management

(a) The Proposed Solution should support a browser based built in management. It should have SNMP support. (Traps, e-mail, MIBII)

Current Required Protocols

(a) The Proposed Solution must support and be configured for FC & iSCSI protocols.

Storage Capacity Requirements

(a) The Proposed Storage Array should be configured with Minimum 114TB Usable Capacity using SATA/NL-SAS Drives. The usable capacity is defined as the Net storage capacity available for the application stack, after deducting the penalties imposed by storage infrastructure requirements, disk and array formatting, RAID penalties, host OS and file system formatting including overheads or any other penalties which eat away usable disk space. Drives offered for the above capacity shall be of the Highest Capacity offered by the Vendor.

(b) The same Storage System should support 50% extra growth in terms of performance and capacity for future expansion without any controller upgrade.

Regulatory Model

(a) The device should have the following certifications - FCC Class A or CE Mark for immunity against electromagnetic emissions.

Safety and Quality Standards

(a) The device should have the following quality and safety standard certifications- CAN/ CSAC22.2-60950/UL60950.

LED DISPLAY

The LED Display shall have the following minimum specifications:

(a) Screen Size: 55”
(b) Resolution: 1920 x1080
(c) Input Interfaces: VGA (D-Sub), DVI-D, Component (CVBS common), HDMI, Stereo Mini Jack
(d) Contrast Ratio (Typical): 5000:11.5.6.
(e) Power Supply: AC 100 - 240 V~ (+/- 10 %), 50/60 Hz
(f) Power Consumption: 86W
(g) Operating Temperature: 0º C ~ 40º C
(h) Emission Standard:EMC
(i) Compliance: ENERGY STAR5.0

4.3 Fire Detection, Alarm and Control System (FAS)

The technical specification, installation, testing and commissioning of **Fire Detection, Alarm And Control System (FAS) shall confirm to CPWD General Specifications for Electrical Works Part VI Fire Detection and Alarm System – 2018 and** Selection, Installation and Maintenance of Automatic Fire Detection and Alarm System Code of Practice- IS 2189-2008; all amended up to last date

Annexure -III

(Schedule-D)

List of Applicable Codes

1.1 The Contractor shall use the latest edition of relevant Standards & Specifications for Design and Execution of this project/work. The list of Standards & Specifications provided hereunder is not exhaustive and any other Standard & Specification which are not mentioned in this section are also applicable if required for the completion of work as per the Scope of Work shall be used in consultation with Authority.

1.2 Some of the relevant codes and standards are compiled below:

(i) FOR STRUCTURAL WORKS

S. No.	CODE	NAME
1	IS: 1893 – 2002	Criteria for Earthquake resistant deign of Structures
2	IS: 13920	Ductile detailing of Reinforced Concrete Structures Subjected to Seismic forces.
3	IS: 4326 – 1993	Earthquake resistant Design and construction of Buildings
4	IS: 875 – 1987 (Part I to III & Part V)	Code and Practice for Design Loads (Other than earthquake) for Building and Structures like Dead, Imposed, Wind and other Loads
5	IS: 456 – 2000	Plain and Reinforced Concrete (Code of practice)
6	SP: 16	Design aids for Reinforced Concrete Structure.
7	SP: 34	Handbook on Concrete Reinforcement and Detailing
8	IS: 3370 Part I, Part II and Part IV	Code of practice for Concrete structures for the storage of liquids.
9	IS: 1786	Specification for High Strength Deformed Steel bars and wires for concrete reinforcement
10	IS: 1904	Code and Practice for design and Construction of Foundations in Soils
11	IS: 2950	Code and Practice for Design and Construction of Raft Foundations
12	IS: 800-1980	Code of Practice for general Construction in Steel.
13	IS: 1343-1980	Code of Practice for Pre stressed Concrete.
14	BS 8081:2015 & BSEN-1537-2013 & IS 10270-1982 & IS 14268 class11/ASTM-416	Code of Diaphragm.
15	BS 8110: 1997 class-2 for gravity load. BS 8110: 1997 class-3 for gravity load and lateral load.	Code of PT slab

(ii) FOR PLUMBING WORKS

SN	I.S. Code	Description / Title
1.	IS: 1729	Specification for sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
2.	IS:1536	Specification for centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
3.	I.S: 1538 (Part-I to XXIII)	Specification for cast iron fittings for pressure for water, gas and sewage.
4.	I.S:3714	Code of practices for laying C.I pipes
5.	I.S:782	Specification for caulking lead
6.	I.S:1239 (Part-II)	Specification for mild steel tubes, tubular and other wrought steel filling.
7.	I.S:1879	Specification for malleable cast iron pipe fittings.
8.	I.S:4984	High-density polythene pipe for potable water supplies, sewage and Industrial effluents.
9.	I.S:783	Width and depth of trench for R.C.C pipes.
10.	I.S:4127	Width and depth of trench for S.W pipes.
11.	I.S: 780	Specification for sluice valve for water works purposes.
12.	I.S:651	Specification for salt glazed stoneware pipe and fittings
13.	I.S:7558	Code of practice for domestic hot water installation.
14.	I.S: 1742	Code of practice for building drainage
15.	I.S: 2064	Code of practice for selection, installation and Maintenance of Sanitary appliances
16.	I.S:2065	Code of practices for water supply in building
17.	I.S: 2183 (Part-I)	Code of practice for Plumbing in multistoried buildings.
18.	I.S:1239	Specifications for mild steel tubes 104ubular and other wrought steel fittings. (Fifth Revision)
19.	I.S:778	Specifications for copper alloy gate, globe and check valves for water works purposes.
20.	I.S:5312 (Part-I)	Specifications for swing check type reflux (Non-return) valve
21.	I.S : 3114	Code of Practice for laying of C.I. pipes (2nd Rev.)
22.	I.S. : 456	Code of practice for plain and reinforced concrete (3rd Rev.) (Amendment 2)
23.	I.S. : 12820	Code of practice for dimensional requirements of rubber gaskets for mechanical joints and push on joints for use with cast iron pipes and fittings for carrying water, gas & sewage.
24.	I.S. : 1172	Code of basic requirements for water supply, drainage & sanitation (4th Rev.)

SN	I.S. Code	Description / Title
25.	I.S. : 1200 (Part-16)	Code of practice for methods or measurements of building and Civil Engineering works: Part 16 Laying of water and sewer lines including appurtenant items (3rd Rev.)
26.	I.S. : 1200(Part-19)	Code of practice for methods or measurements of building and Civil Engineering works: Part 19 Water supply, plumbing and drains (3rd Rev.)
27.	I.S : 3989	Centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories (2nd rev.) (Amendment2)
28.	I.S : 13095	Butterfly valves for general purposes
29.	I.S : 458	Precast Concrete pipes (with or without reinforcement) (3rd rev.) (Amendment2)
30.	I.S : 1726	C.I. Manhole covers & frames (3rd rev.)
31.	I.S : 1916	Steel cylinder pipe with concrete lining and coating (1st rev.).
32.	I.S : 12592(part1)	Pre-cast concrete manhole covers and frames: Part 1 Covers (Amendment 3)
33.	I.S : 12592(part2)	Pre-cast concrete manhole covers and frames: Part 2 Frames
34.	I.S : 6392	Steel pipe flanges (Amendment 1)
35.	I.S : 6418	C.I and malleable C.I. flanges for general engineering purposes.
36.	I.S : 4985	Un plasticized PVC pipes for potable water supplies (2nd Rev) (Amendment 2)
37.	I.S : 7181	Horizontally cast double flanged pipes for water, gas and sewage.(1st Rev.) (Amendment 1)
38.	I.S : 210	Grey iron casting. (4th Rev.)
39.	BS EN 1057	Copper pipes
40.	BS EN 1254	Copper Fittings
41.	I.S : 4985	UPVC pipes
42.	I.S : 15778	CPVC pipes
43.	I.S : 8329	Ductile iron

List Codes and References mentioned below is not exhaustive and for reference purpose only. Contractor shall follow all the standards and codes mentioned in this schedule or adhere to relevant codes as per site requirement.

S. No.	CODE	NAME
1.	IS: 1893 – 2016	Criteria for Earthquake resistant deign of Structures
2.	IS: 13920-2016	Ductile detailing of Reinforced Concrete Structures subjected to Seismic forces.
3.	IS: 4326 – 1993	Earthquake resistant Design and construction of Buildings
4.	IS: 875 – 2015 (Part I to III & P a r t V)	Code and Practice for Design Loads (Other than earthquake) for Building and Structures like Dead, Imposed, Wind and other Loads
5.	IS: 456 – 2000	Plain and Reinforced Concrete (Code of practice)
6.	SP: 16	Design aids for Reinforced concrete Structure.
7.	SP: 34	Handbook on Concrete Reinforcement and Detailing
8.	IS: 3370 Part I, Part II and Part IV	Code of practice for Concrete structures for the storage of liquids.
9.	IS: 1786	Specification for High Strength Deformed Steel bars and wires for concrete reinforcement
10.	IS: 1904	Code and Practice for design and Construction of Foundations in Soils
11.	IS: 2950	Code and Practice for Design and Construction of Raft Foundations
12.	IS: 800-2007	Code of Practice for general Construction in Steel.
13.	IS: 1343-1980	Code of Practice for Pre stressed Concrete.
14.	IRC 5 : 1998	Standard specifications and code of practice for road bridges.
15.	IRC 6 : 2014	Standard specifications and code of practice for road bridges.
16.	IRC 24-2010	Standard specifications and code of practice for road bridges.

(iii) FOR FIRE FIGHTING WORKS

SN	I.S. Code	Description / Title
1.	I.S:1239	Specifications for mild steel tubes 106 tubular and other wroughtsteel fittings. (Fifth Revision)
2.	I.S:778	Specifications for copper alloy gate, globe and check valves forwater works purposes.
3.	I.S:5312 (Part-I)	Specifications for swing check type reflux (Non-return) valve
4.	I.S:908	Specifications for fire hydrant (2nd Revision)
5.	I.S:5290	Specifications for landing valve
6.	I.S:901	Specifications for coupling double male and female instantaneous pattern for firefighting (3rd revision)
7.	I.S:884	Specifications for first aid hose reel for firefighting (1st Revision)
8.	I.S:903	Specifications for fire hose delivery couplings branch pipe, nozzles and nozzles spanner (3rd revisions)
9.	I.S:933	Specifications for portable chemical from fire extinguisher
10.	I.S:15683	Specifications for fire extinguisher carbon dioxide type.

SN	I.S. Code	Description / Title
11.	I.S:2878	Specifications for fire extinguisher carbon dioxide type.
12.	I.S:9972	Specification for sprinkler
13.	I.S:3844	Code of practice for installation and Maintenance of internal fire hydrants and hose reels on promises.
14	I.S : 3114	Code of Practice for laying of C.I. pipes (2nd Rev.)
15.	I.S. : 456	Code of practice for plain and reinforced concrete (3rd Rev.) (Amendment 2)

(iv) (A) FOR HVAC WORKS

SN	I. S. Code	Description / Title
1.	I.S.3615	Glossary of Terms Used in Refrigeration & Air Conditioning.
2.	I.S.325	Three phase Induction Motors
3.	I.S. 1822	Motor Starters of voltage Not Exceeding 1000 volts
4.	I.S.3624	Bourden Tube Pressure and Vacuum Gauges
5.	I.S.2372	Timber for cooling towers
6.	I.S.7403	code of practice for selection of standard worm and helical gear boxes
7.	I.S.1620	Horizontal centrifugal pumps for clear, cold, fresh water
8.	I.S.996	Single phase small A.C. and Universal motors
9.	I.S.1239	Mild steel tubes, tubulars and other wrought steel fittings
10.	I.S.3589	Electrically welded steel pipes for water, gas and sewage
11.	I.S.6392	Steel pipe flanges
12.	I.S.778	Gun metal gate. globe and check valves for general purpose
13.	I.S.2592	Recommendation for methods of measurement of fluid flow by means plates and nozzles
14.	I.S. 277	Galvanised steel sheets
15.	I.S.737	Wrought aluminium and aluminium alloy sheet and strip for general purposes.
16.	I.S.655	Metal air ducts
17.	I.S. 732	Code of practice for electrical wiring and fittings for building.
18.	I.S.2516	A.C. circuit breakers
19.	I.S.900	Code of practice for installation and Maintenance of induction motors
20.	I.S. 1248	Direct acting electrical indicating installments
21.	I.S. 2516	A.C. circuit breakers for voltages not exceeding 1000 volts
22.	I.S.4047	Heavy duty air break switches and composite units of air break switches for voltage not exceeding 1000 volts.
23.	I.S.2208	HRC cartridge fuse links up to 650 volts
24.	I.S. 1554	PVC insulated (heavy duty) electric cables for working voltage up to and including (PART I) 1100 volts
25.	I.S.8183	Specification for bonded glass wool/ mineral wool
26.	I.S.4671	Specification for expanded polystyrene for thermal insulation purposes
27.	I.S.11561	Code of practice for testing of cooling towers
28.	I.S. 7896	Data for outside design conditions for air conditioning for summer months.
29.	I.S.8148	Packages air conditioners
30.	I.S.2370	Sectional cold rooms (walk-in type)

SN	I. S. Code	Description / Title
31.	I.S.5111	Testing of refrigerant compressors
32.	I.S.10594	Thermostatic Expansion Valve
33.	ASHRAE 62.1.2010	Ventilation for Acceptable Indoor Air Quality
34.	ECBC	Energy conservation Building Code
35.	NBC	National Bulging Code
36.	AHRI 550/590	Air-conditioning Heating and Refrigeration Institute
37.	ASME	American Society of Mechanical Engineers
38.	AMCA	Air Movement and Control Association
39.	UL	Underwriters Laboratories

(B) FOR I.S. SAFETY CODES

1.	I.S.660	Safety Code for Mechanical Refrigeration
2.	I.S.659	Safety Code for air conditioning
3.	I.S.3016	Code of Practice for precautions in welding and cutting operations
4.	I.S.818	Code of practice for safety and health requirements in electrical and gas welding and cutting operations
5.	I.S.5216	Code for safety procedure and practice in electrical works
6.	I.S.3696	Safety code for scaffolds and ladders

List of Main Bureau of Indian Standards Codes and Publications with latest revisions and amendments thereto be followed for analysis & Design.

SN	Code	Description
LOADS		
1.	IS-875 (Part-1)-1987	Code of practice for design loads (other than earthquake) for buildings and structures – Unit weights of buildings materials and stored materials.
2.	IS-875 (Part 2)- 1987	Code of practice for design loads (other than earthquake) for buildings and structures – imposed loads.
3	IS- 875 (part 3) -1987	Code of practice for design loads (other than earthquake)for buildings and structures – wind loads)
4.	IS-875 (Part5)–1987	Code of practice for design loads (other than earthquake) for buildings and structures – special loads and load combinations.
5.	IS:1893-2002	Criteria for design earthquake resistant design of structures (general provision and buildings).
CONCRETE		
1.	IS:456 – 2000	Code of practice for plain and reinforced concrete.
2.	IS:1786 – 2008	Specification of high strength deformed bars and wires for concrete reinforcement.
3.	IS: 432 (Part-2) –1982	Specification of high strength deformed bars and wires for concrete reinforcement.
4.	IS:13920 – 1993	Ductile detailing of reinforced concrete structures subjected to seismic forces – code of practice.
5.	IS : 269 – 1989	Specification for ordinary, rapid hardening and low heat Portland cement.
6.	IS: 1489 – 1991	Specification for Portland pozzolana cement
7.	IS: 383 – 1970	Specification for coarse and find aggregates from natural sources for concrete.

SN	Code	Description
8.	IS : 516 – 1959	Method of test for strength of concrete.
9.	IS: 2645 – 1975	Specification for integral cement water proofing compounds.
10.	IS:3370-2009 Part 1& 2	Liquid retaining structures.
STEEL		
1.	IS:2062 – 1999	Steel for general structural purposes, specification.
2.	IS: 1161 – 1998	Specification of steel tubes for structural purpose.
3.	IS: 800 – 2007	Code of practice for general construction in steel.
4.	IS 4923	Hollow steel section for structural purpose.
5.	IS 1367	Technical specification for Thread bolts
6.	IS 816 - 1969	Code of practice for use of metal ARC welding for general construction in mild steel

(v) List of Reference Standards for Construction Activities

SN	Standard Number	Title
1	SP : 6 (1)	Structural Steel Sections
2	IS : 27	Pig Lead
3	IS : 325	Three Phase Induction Motors
4	IS : 554	Dimensions for pipe threads where pressure tight joints are required on the threads.
5	IS : 694	PVC insulated cables for working voltages up to & including 1100V.
6	IS : 779	Specification for water meters (domestic type).
7	IS : 782	Specification for caulking load
8	IS : 800	Code of practice for general construction in steel
9	IS : 1068	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium.
10	IS : 1172	Code of Basic requirements for water supply drainage and sanitation.
11	IS : 1367 (Part 1)	Technical supply conditions for threaded steel fasteners: Part 1introduction and general information.
12	IS : 1367 (Part 2)	Technical supply conditions for threaded steel fasteners: Part 2product grades and tolerances.
13	IS : 1554 (Part 1)	PVC insulated (heavy duty) electric cables: Part 1 for working voltages up to and including 1100 V.
14	IS : 1554 (Part 2)	PVC insulated (heavy duty) electric cables: Part 2 for working voltages from 33 KV up to and including 11 KV.
15	IS : 1726	Specification for cast iron manhole covers and frames.
16	IS : 1742	Code of practice for building drainage.
17	IS : 2064	Selection, installation and Maintenance of sanitary appliance code of practice.
18	IS : 2065	Code of practice for water supply in buildings.
19	IS : 2104	Specification for water meter for boxes (domestic type)
20	IS : 2373	Specification for eater meter (bulk type)
21	IS:2379	Colour code for identification for pipe lines
22	IS:2629	Recommended practice for hot dip galvanizing on iron and steel

SN	Standard Number	Title
23	IS : 3114	Code of practice for laying of cast iron pipes
24	IS : 4111 (Part 1)	Code of practice for ancillary structures in sewerage system: Part 1 manholes.
25	IS : 4127	Code of practice for laying glazed stoneware pipes.
26	IS : 4853	Recommended practice for radiographic inspection of fusion welded butt joints in steel pipes.
27	IS : 5329	Code of practice for sanitary pipe work above *ground for* buildings
28	IS : 5455	Cast iron *steps* for manholes.
29	IS : 6159	Recommended practice for design and fabrication of material, prior to galvanizing.
30	IS : 7558	Code of practice for domestic hot water installations.
31	IS : 8321	Glossary of terms applicable to plumbing work.
32	IS : 8419 (Part 1)	Requirements for water filtration equipment: Part 1 Filtration medium sand and gravel.
33	IS : 8419 (Part 2)	Requirements for water filtration equipment: Part 2 under drainage system.
34	IS : 9668	Code of practice for provision and Maintenance of water supplies and firefighting.
35	IS : 9842	Preformed fibrous pipe insulation.
36	IS : 9912	Coal tar-based coating materials and suitable primers for protecting iron and steel pipe lines.
37	IS : 10221	Code of practice for coating and wrapping of underground mild steel pipelines.
38	IS : 10446	Glossary of terms relating to water supply and sanitation.
39	IS: 11149	Rubber Gaskets
40	IS : 11790	Code of practice for preparation of butt-welding ends for pipes, valves, flanges and fittings.
41	IS : 12183 (Part 1)	Code of practice for plumbing in multistoried buildings: Part I water supply.
42	IS : 12251	Code of practice for drainage of building basements.
43	IS : 5572	Code of practice for sanitary pipe work.
44	BS : 6700	Specification for design, installation, testing and Maintenance of services supplying water for domestic use within buildings and their cartilages.
45	BS : 8301	Code of practice for building drainage
46	BSEN : 274	Sanitary tapware, waste fitting for basins, bidets and baths. General technical specification.
Pipes and Fittings		
47	IS : 458	Specification for precast concrete pipes (with and without reinforcement)
48	IS : 651	Salat *glazed* stone ware pipes and fittings.
49	IS : 1239 (Part 1)	Mild steel, tubes, tubulars and other wrought steel fittings: Part I Mild Steel tubes.

SN	Standard Number	Title
50	IS : 1239 (Part 2)	Mild Steel tubes, tubulars and other wrought steel fittings: Part 2 Mild Steel tubulars and other wrought steel pipe fittings.
51	IS : 1536	Centrifugally cast (spun) iron pressure pipes for water, gas and sewage.
52	IS : 1537	Vertically cast iron pressure pipes for water, gas and sewage.
53	IS : 1538	Cast Iron fittings for pressure pipes for water, gas and sewage.
54	IS : 1729	Sand Cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
55	IS : 1879	Malleable cast iron pipe fittings.
56	IS : 1978	Line pipe
57	IS : 1979	High test line pipe.
58	IS : 2501	Copper tubes for general engineering purposes
59	IS : 2643 (Part 1)	Dimensions for pipe threads for fastening purposes: Part 1 Basic profile and dimensions.
60	IS : 2643 (Part 2)	Dimensions for pipe threads for fastening purposes: Part 2 Tolerances.
61	IS : 2643 (Part 3)	Dimensions for pipe threads for fastening purposes: Part 3 Limits of sizes.
62	IS : 3468	Pipe nuts.
63	IS : 3589	Seamless or electrically welded steel pipes for water, gas and sewage (168.3 mm to 2032 mm outside diameter).
64	IS : 3989	Centrifugally cast (sun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories.
65	IS : 4346	Specifications for washers for use with fittings for water services.
66	IS : 4711	Methods for sampling steel pipes, tubes and fittings.
67	IS : 6392	Steel pipe flanges
68	IS : 6418	Cast iron and malleable cast iron flanges for general engineering purposes.
69	IS : 7181	Specification for horizontally cast iron double flanged pipe for water, gas and sewage.
Valves		
70	IS : 778	Specification for copper alloy float gage globe and check valves for water works purposes.
71	IS: 7181	Specification for sluice valves for water works purposes (50 mm to 300 mm size)
72	IS: 1703	Specification copper alloy float valves (horizontal plunger type) for water supply fittings.
73	IS : 2906	Specification for sluice valves for water works purposes (350 mm to 1200 mm size)
74	IS : 3950	Specification for surface boxes for sluice valves.
75	IS : 5312 (Part 1)	Specification for swing check type reflux (non return) valves: part Multi door pattern.
76	IS : 5312 (Part 2)	Specification for swing check type reflux (non return) valves: part Multi door pattern.
77	IS : 12992 (Part 1)	Safety relief valves, spring loaded : Design
Sanitary Fittings		

SN	Standard Number	Title
78	IS : 13095	Butterfly valves for general purposes
79	IS : 771 (Part 1 to 3)	Specification for glazed fire clay sanitary appliances.
80	IS : 774	Specification for flushing cistern for water closets and mina's (other than plastic cistern)
81	IS : 775	Specification for cast iron brackets and supports for wash basins and sinks
82	IS: 781	Specification for cast copper alloy screw down bib taps and stop valves for water services.
83	IS : 1700	Specification for drinking fountains.
84	IS : 2548 (Part 2)	Specification for plastic seats and covers for water closets: Part-1 thermoset seats and covers.
85	IS : 2556 (Part 1)	Specification for vitreous sanitary appliances (Vitreous china):part 1 general requirement.
86	IS: 2556 (Part 2)	Specification for vitreous sanitary appliances (vitreous china) part 2 specific requirements of wash down water closets.
87	IS: 2556 (Part 3)	Specification for vitreous sanitary appliances (vitreous china) part 3 specific requirements of squatting pans.
88	IS: 2556 (Part 4)	Specification for vitreous sanitary appliances (vitreous china) part 4 specific requirements of wash basins.
89	IS: 2556 (Part 6 sec 2))	Specification for vitreous sanitary appliances (vitreous china) part 6 specific requirements of urinals, section 2 half stall urinals.
90	IS: 2556 (Part 6 sec 4)	Specification for vitreous sanitary appliances (vitreous china) part 6 specific requirements of urinals, section 4 partition slabs.
91	IS: 2556 (Part 6 sec 5)	Specification for vitreous sanitary appliances (vitreous china) part 6 specific requirements of urinals, section 5 waste fittings.
92	IS:2556(part 6 Sec 6)	Specification for vitreous sanitary appliances (vitreous china) part 6 specific requirements of urinals, section 6 water spreaders for half stall urinals.
93	IS:2557 (part 7)	Specification for vitreous sanitary appliances (vitreous china) part 7 specific requirements of half round channels.
94	IS 2556 (Part 8)	Specification for vitreous sanitary appliances (vitreous china): Part 8 Specific requirements of siphoning wash down water closets.
95	IS : 2556 (Part 11)	Specification for vitreous sanitary appliances (vitreous china): Part 11 Specific requirements for shower rose.
96	IS : 2556 (Part 12)	Specification for vitreous sanitary appliances (vitreous china): Part 12 Specific requirements of floor traps.
97	IS : 2556 (Part 15)	Specification for vitreous sanitary appliances (vitreous china): Part 15 Specific requirements of universal water closets.
98	IS:2692	Specification for ferrule for water services
99	*IS :* 2717	Glossary of terms relating to vitreous enamelware and ceramic metal systems
100	IS : 2963	Specifications for waste plug and its accessories for sinks and wash basins.
101	IS : 3311	Specifications for waste plug and its accessories for sinks and wash basins.

SN	Standard Number	Title
102	IS : 5961	Specification for cast iron gratings for drainage purposes.
103	IS : 6249	Specification for gel-coated *glass* fibre reinforced polyester resin bath tubs.
104	IS : 6411	Specification for gel-coated glass fibre reinforced polyester resin bath tubes.
105	IS : 8931	Specification for copper alloy fancy single taps, combination tap assembly and stop valves for water services.
106	IS : 9758	Specification for flush valves and fitting for water closets and urinals.
Pumps & Vessels		
107	IS: 1520	Specification for horizontal centrifugal pumps for clear cold fresh water.
108	IS : 2002	Steel plates for pressure vessels for intermediate and high temperature service including boilers
109	IS : 2825	Code for unfired pressure vessels.
110	IS : 4648 (Part 1)	Code of practice for lining of vessels and equipment for chemical processes v Part 1 : Rubber lining
111	IS : 5600	Specification for sewage and drainage pumps
112	IS : 8034	Specification for submersible pump sets for clear, cold, fresh water
113	IS : 8418	Specification for horizontal centrifugal self-priming pumps.
114	IS : 374	Ceiling fans and regulators (3rd revision)
115	IS : 694	PVC insulated Electric cable for working voltage upto and including 1100 volts.
116	IS : 732	Code of practice for electrical wiring and installation
117	IS : 1255	Code of Practice for installation and Maintenance of Power Cables upto and including 33 KV rating (Second Revision).
118	IS : 1258	Bayonet tamp holders (Third revision)
119	IS : 1293	Three pin plugs and sockets outlets rated voltage upto and including 250 volts and rated current upto and including 160 amps.
120	IS : 1554 (Part - I)	PVC insulated (Heavy Duty) electric cables for working voltages upto and including 1100 volts.
121	IS : 1646	Electrical installation fire safety of buildings (general) Code of practice.
122	IS : 1885	Glossary of items for electrical cables and conductors
123	IS : 1913	General and safety requirements for fluorescent lamps luminaries Tubular
124	IS : 2071	Methods of high voltage testing
125	IS : 2309	Protection of building and allied structures against lightning
126	IS : 2551-	Danger notice plate.
127	IS : 3043	Code of practice for earthing.
128	IS : 3427	AC Metal enclosed switch gear and control gear for rated voltages above 1 KV and up to and including 52 KV.
129	IS : 3480	Flexible steel conduits for electrical wiring.
130	IS : 3837	Accessories for rigid steel conduit for electrical wiring.
131	IS : 4146	Application guide for voltage transformers
132	IS: 4615	Switch socket outlets.

SN	Standard Number	Title
133	IS : 5133 (Part -I)	Boxes for the enclosure of electrical accessories.
134	IS : 5216 (Part-1)	Guide for safety procedures and practices in electrical work.
135	IS : 5424	Rubber mats for electrical purposes.
136	IS : 5578 & 11353	Marking and arrangement of bus bar
137	IS : 7098 - (Part - II)	Cross linked polyethylene insulated PVC sheathed cables. Voltages from 3.3 KV up to and including 33 KV
138	IS : 8130	Conductors for insulated electric cables and flexible cords
139	IS : 8623 - (Part -D	Factory built assemblies of switchgear and control gear for voltages up to and including 1000 V AC and 1200 V D C.
140	IS : 8828	Miniature Circuit Breakers
141	IS : 9537	Rigid Steel Conduits for electrical wiring (Second Revisions)
142	15:10810	Methods of test for cables.
143	IS : 12640	Earth Leakage Circuit Breakers
144	IS : 13947	Degree of protection provided by enclosures for LV switchgear and control gear.
145	IS : 13947	General requirement for switchgear and control gear for voltage not exceeding 1000 Volts.
146	IS : 15652	Insulating mats for electrical purposes.
147	IS : 1651 & 1652	Stationary cells and batteries lead acid type.
148	IS : 2551-1982	Danger notice plate.
149	IS : 3043 - 1987	Code of practice for earthing.
150	IS : 4146 - 1983	Application guide for voltage transformers
151	1S : 5216 1982 (Part- I)	Guide for safety procedures and practices in electrical work.
152	IS 5:1994	Colours for ready mixed paint and enamels
153	IS 2705 (Part-1) : 1992 (second revision)	Current transformers - Specification General requirements
154	IS 2705 (Part-2) : 1992 (Second Revision)	Current transformers – Specification Measuring Current Transformers
155	IS 2705 (Part-3) : (Second revision)	Current transformers – Specification Protective Current Transformers
156	IS:2705 (part 4) Second revision1992	Current transformers – Specification Protective Current Transformers for Special Purpose Applications
157	IS 3043 :1987	Code of practice for earthing
158	IE Rules, with amendments upto 1995 :1956	Indian Electricity Rules
159	IS : 2071 - 1974 - 76	Methods of high voltage testing
160	IS : 3427 :1997 IEC:60298,60694	AC Metal enclosed switchgear and control gear for rated voltage above lkv and upto and including 52kv.
161	IS : 12729 :1998	General requirement for switchgear and control gear for voltage exceeding 1000V

SN	Standard Number	Title
162	IS : 13118 :1991	Specification for high voltage alternating current circuit breaker
163	IS: 5578 & 11353-1985	Marking and arrangement of bus bars
164	IS: 3156	Potential transformer
165	IS: 9385	HV HRC Control Fuse
166	IS: 1248	For measuring instruments
167	IS : 2026 - 1977 to 81 (Part Ito IV)	Power Transformers
168	IS : 2551-1982	Danger notice plate.
169	IS : 3043 — 1987	Code of practice for earthing.
170	IS : 4146 — 1983	Application guide for voltage transformers
171	IS : 5216 — 1982 (Part-I)	Guide for safety procedures and practices in electrical work.
172	IS 5:1994	Colours for ready mixed paint and enamels
173	IS 2705 (Part-1) : 1992 (Second Revision)	Current transformers - Specification General requirements
174	IS 2705 (Part-2) 1992 (Second Revision)	Current transformers – Specification Measuring Current Transformers
175	IS 2705 (Part-3) : (Second Revision) 1992	Current transformers – Specification Protective Current Transformers
176	IS 2705 (Part-4) : (Second Revision)1992	Current transformers – Specification Protective Current Transformers for Special Purpose Applications
177	IS 3043 :1987	Code of practice for earthing
178	IE Rules, with amendments upto 1995 :1956	Indian Electricity Rules
179	1EC 44 -1 :1996	Instrument Transformer -P1 : Current Transformer
181	IS:10561 :1977	Power Transformers: General
182	IS 4146: 1983	Application guide for voltage transformers
183	1S:8478: 1978	Application guide for on-load tap changers
184	IS:10028 Part-1: 1985	Code of practice for selection, installation and Maintenance of power transformers: Selection
185	IS:10028 Part-2 1981	Code of practice for selection, installation and Maintenance of power transformers: Installation
186	IS:3639 : 1966	Fittings and accessories for power transformers
187	IS:4201: 1983	Application guide for current transformers
188	IS:4257 Partl : 1981	Dimensions for clamping arrangement for bushings 12kV to 36Kv
189	IS:8603 Parts lto3 : 1977	Dimensions of porcelain transformer bushings for use in heavily polluted atmosphere

SN	Standard Number	Title
190	IS: 554-1985 (Reaffirmed 1996)	Dimensions for pipe threads where pressure tight joints are required on the threads
191	IS: 665 – 1963 (Reaffirmed 1991)	Metal air ducts
192	IS: 659 - 1964	Air conditioning (Safety code)
193	IS: 660 - 1963	Mechanical Refrigeration (Safety code)
194	IS: 694 – 1990 (Reaffirmed 1994)	PVC insulated (HD) electric cables for working voltage upto and including 1100 volts
195	IS: 732-1989	Code of Practice for electrical wiring
196	IS: 780-1984	Sluice valves for water works purposes
197	IS: 822-1970 (Reaffirmed 1991)	Code of procedure for inspection of welds
198	IS: 1239 (Part-I) 1990	Mils steel tube
199	IS: 1239 (Part-II) 1992	Mild steel tubulars and other wrought steel pipe fittings
200	IS: 1255 - 1983	Code of practice for installation and Maintenance of Power Cables upto and including 33 KV rating (Second Revision)
201	IS: 1554 - 1988	PVC insulated (Heavy Duty) electric cables (part-I) for working voltages upto and including 1100 volts
202	IS: 1897 – 1983	Copper bus bar
203	IS: 2379 – 1990	Colour code for the identification of pipelines
204	IS: 2551 – 1982	Danger notice plate
205	IS: 3043 – 1987	Code of practice for earthing
206	IS: 3103 – 1975	Code of practice for Industrial Ventilation
207	IS: 3837 – 1976	Accessories for rigid steel conduit for electrical wiring
208	IS: 4736 – 1986	Hot-dip zinc coating on steel tubes
209	IS: 4894 – 1987	Centrifugal Fan
210	IS: 5133 – 1969	Boxes for the enclosure of electrical accessories
211	IS: 5216 – 1982 (Part-I)	Guide for safety procedure and practices in electrical work
212	IS: 5312 (Part-II) 1984 (Reaffirmed 1990)	Swing – check type reflux Non-return valves for water works
213	IS: 5421 – 1969	Rubber mats for electrical purposes
214	IS: 5578& 11353– 1985	Marking and arrangement of bus bars
215	IS: 6392 – 1971 Reaffirmed 1988)	Steel pipe flanges
216	IS: 8623 – 1977 (Part-I)	Factory bill assemblies of switchgear and control gear for voltages upto an including 1000 VAC and 1200 VDC
217	IS: 8623 – 1980 (Part-II)	Bus Bar trunking system
218	IS: 8828 – 1996 IEC 898 - 1995	Miniature Circuit Breakers

SN	Standard Number	Title
219	IS: 9537 – 1981	Rigid steel conduits for electrical wiring (Second Revisions)
220	IS: 10810 – 1988	Methods of test for cables
221	IS:13947(Part-II)– 1993	Air circuit breakers
222	IS:13947IEC 947 – 2–1989	Molded case circuit breakers
223	IS: 13947 – 1993	Degree of protection provided by enclosures for LV switchgear and control gear
224	IS: 13947 – 1993	General requirement for switchgear and control gear for voltage not exceeding 1000 volts
225	**ASHREA**	American society of Heating Refrigeration & Air-conditioning books HVAC Systems and Equipment 2008
		HVAC Application 2007
		Refrigeration 2006
		Fundamental 2005
		Indoor air quality 90.1.2007
226	IEC	Relevant Sections
227	ASME, Section VIII	Boiler and Pressure Vessel Code
National Fire Protection Association (NFPA) – USA		
228	No. 70 – 90 or 70 - 93	National Electric Code
229	No. 72 – 1993	National Fire Alarm Code
230	No. 101 – 91	Life Safety Code
231	No. 90A	Practice for Smoke Control System
232	No. 76	Telecommunication Facilities
233	No. 318	Clear Room Applications
Underwriters Laboratories Inc. (UL) – USA		
234	UL 50	Cabinets & Boxes
235	UL 268	Smoke detectors for Fire Protective Signaling Systems
236	UL 864	Control units for Fire Protective Signaling Systems
237	UL 268A	Smoke detectors for Duct Application
238	UL 521	Thermal detectors for Fire Protective Signaling Systems
239	UL 228	Door Closers – holders for Fire Protective Signaling Systems
240	UL 464	Audible signaling appliances
241	UL 38	Manually activated Signaling Boxes
242	UL 346	Water floor indicators for Fire Protective Signaling Systems
243	UL 1481	Power supplied for Fire Protective Signaling Systems
244	UL 1076	Proprietary burglar alarm units & systems
245	UL 1791	Visual notifications appliances

Road Works	
IRC 5	Standard Specifications and Code of Practice for Road Bridges,
	Section I – General Features of Design
IRC 6	Standard Specifications and Code of Practice for Road Bridges,
	Section II – Loads and Stresses
IRC 11	Recommended Practices for the Design of Layout of Cycle Tracks

IRC 19	Standard Specifications and Code of Practice for Water Bound Macadam
IRC 112	Standard Specifications and Code of Practice for Road Bridges
	Section III–Cement Concrete (Plain and Reinforced)
IRC 22	Standard Specifications and Code of Practice for Road Bridges,
	Section VI – Composite Construction
IRC 37	Guidelines for the Design of Flexible Pavement
IRC 48	Tentative Specifications for Bituminous Surface Dressing Using Pre-coated Aggregates
IRC:SP 11	Handbook of Quality Control for Construction of Roads and Runways
IRC:SP 11	Handbook of Quality Control for Construction of Roads and Runways
IRC:44-2017	Guidelines for Cement Concrete Mix Design for Pavements (Third Revision)

(vi) CONDUIT AND WIRE

Conduit	Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
Wire	All system wiring shall be new. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. a. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meet the requirements of NFPA72. b. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA90A.

(vii) Lighting Protection

IEC 60598-1	Luminaires – Part 1: General requirements and tests
IEC 60598-2	Luminaires – Part 2: Particular requirements
IEC 60400	Lamp holders for tubular fluorescent lamps and starter- holder
NFPA	National Fire Protection Association

Annexure -IV

(Schedule-D)

Specifications for Solar Works

1 Solar Photovoltaic Modules

1.1 The total Solar PV minimum array capacity should not be less than 250kWp and should comprise of modules with latest technological features to provide minimum of 16% module efficiency with minimum 320 Wp and above wattage of module. Module capacity less than 240 Wp should not be supplied. The module type must be qualified as per IEC 61215. SPV module conversion efficiency should be equal to or greater than 16.0% under STC of 1000w/m2 and cell operating temp of 250 C and AM 1.5 radiations. Modules must qualify to IEC 61730 Part I and II for safety qualification testing. Certificate for module qualification from IEC or equivalent to be submitted as part of the bid offer.

1.2 The PV module shall perform satisfactorily in humidity up to 100% with temperature between 0^0C to + 50^0C. Since the modules would be used in a high voltage circuit, the high voltage insulation test shall be carried out on each module and a test certificate to that effect provided.

1.3 Manufacturers / Contractors should confirm whether they are supplying PV module using a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module laminate, but must be able to withstand harsh environmental conditions.

(i) Name of the manufacturer of PV Module

(ii) Name of the Manufacturer of Solar cells

(iii) Month and year of the manufacture (separately for solar cells and module)

(iv) Country of origin (separately for solar cells and module)

(v) I-V curve for the module

(vi) Peak Wattage, Im, Vm and FF for the module Unique Serial No and Model No of the module

(vii) Date and year of obtaining IEC PV module qualification certificate

(viii) Name of the test lab issuing IEC certificate

(ix) Other relevant information on traceability of solar cells and module asper ISO 9000series.

1.4 Other general requirement for the PV modules and subsystems shall be the following

(i) The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-

pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP65rated.

(ii) Necessary I-V curves at 25^0c, 45^0c, 60^0c and at NOCT are required to be furnished. Offers to provide PV module warranty of 10 years with no more than 10% degradation in performance/output.

2 Technical Specifications for High Efficiency PV Modules

2.1 The PV modules to be positioned to take maximum advantage of available sunlight within string constraints. Bidder will position the PV modules in such a manner that the maximum power is obtained with the sun's movements during the day.

2.2 The supplier / manufacturer of the PV Module shall be in existence for atleast 15 years for international supplier and 3 years for Indian supplier in the Solar PV manufacturing field with proven track record.

2.3 The Photovoltaic modules must be qualified as per IEC 61215 and in addition, the modules must conform to IEC 61730□1 and IEC 61730□2 requirements for construction & Part□2 requirements for testing, for safety qualification. The modules shall be RoHS compliant. The test certificates can be from any of the International Accredited Testing Calibration Laboratories

2.4 The PV Modules shall be "PID Free" and the certification of the same shall be submitted along with the modules by the supplier from an Internationally Recognized certification agency for PID testing.

2.5 The PV Modules shall be "LID Free" and there shall not any effect of LID on the modules in the first year of installation.

2.6 Minimum proven cell efficiency shall be greater than or equal to 22% on commercial scale and on lab scale the minimum proven cell efficiency shall be greater than or equal to25%.

2.7 The efficiency of the module should be greater than or equal to 19.0%. Supplier shall follow the latest engineering practice; ensure long term compatibility requirements and continuity of equipment supply and the safety of the operating staff.

2.8 The PV Modules shall be Salt Mist Corrosion Tested Panels of min severity level 5 or above, since the modules may be installed very close to seashore or factories emitting pollutant gases or harsh environmental conditions.

2.9 The optimum generation of electricity of PV capacity installed vis-à-vis available solar radiation at the site may be obtained through use of either a seasonal tilt structural arrangement or single axis solar tracking system, lower cable losses, maximization of power transfer from PV modules to electronics, maximization of power generation by enhancing incident radiation by optional methods like seasonally changing tilt angles etc.

2.10 The manufacturer of the modules shall provide certification on qualification of PV modules.

2.11 The PV module shall perform satisfactorily in humidity upto 100% with temperature between +20 deg. C to +40 deg C and with stand wind dust up to 150 km/h from back side of the panel. Photo / electrical conversion efficiency of the modules of SPV module shall be greater than or equal to 19.0 %. Since the modules would be used in a low/medium voltage circuit,the insulation test shall be carried out on each module and a test certificate to that effect provided. The bidder shall indicate minimum efficiency. PV modules used in solar power plants/ systems must be warranted for minimum 90% output of Pmin capacity for the first ten years and 80% output of Pmin capacity at the end of 25 years. The product workmanship shallbe guaranteed for 10 years.

2.12 The panel should have positive tolerance of Maximum output power and the maximum voltage shall not exceed 1000V. The negative temperature coefficient of power max shall be equal to or less than □0.3% per deg C temperature.

2.13 PV module shall be provided with frame of Anodized Aluminum (either Black or Other) channels for size and simplicity in installation offered as a single module or series parallel combination of modules. The module frame, if any, shall be made of a corrosion resistant material which shall be electrolytic ally compatible with the structural material used for mounting the modules.

2.14 The PV modules shall be made of light weight cells, resistant to abrasion, hail impact, rain, water and environmental pollution. The PV modules shall be provided with Anti Reflection coating and the Glass shall be AR Coated tempered glass.

2.15 The PV module shall use lead wire with weatherproof connector for output terminal.

2.16 The power output of the PV system under Standard Test Conditions (STC) should be sufficient to meet the requirement and the required power made of suitable module size depending upon manufacturer prudent practice with required output voltage. The number of modules to be supplied shall be worked out accordingly. Module less than 240Wp capacity should not be supplied or installed.

2.17 In order to optimize the overall structural cost, each of the PV Modules shall be less than or equal to 15 Kg weight in order to reduce the overall civil cost of the project.

3 Technical Specification for Inverter

3.1 Central / String inverters shall be used. The inverter should convert DC power produced by SPV modules, in to AC power and adjust the voltage & frequency levels to suit the local grid conditions. Inverter shall interconnect and feed power to the LT panel and wherever required export surplus power to the grid at 11KV. Mandatory Technical Specification is as below:

3.2

Specification of Inverter

a.	**AC side**	**As per Tender design**
i	Nominal AC Power	25 kW

ii	Output AC Voltage	415 V, 415V+/- 10%
iii	Frequency	50 Hz
iv	Total harmonic distortion	< 3% at nominal power.
v	AC over / under voltage, under frequency protection.	Yes
vi	Phase SIFT (COS Phi)	1
b.	**DC Side**	
i	PV Power	23 kWp
ii	Maximum DC Voltage	1000 V
iii	MPPT Voltage range	1000 V
iv	Maximum DC Current *	Design to be submitted
v	DC voltage ripple	<3%
vi	DC over voltage protection	Yes
c.	**Other Parameters**	
i	Minimum efficiency (CE)	>98%
ii	Ambient temperature	0-50º C
iii	Humidity (Non Condensing)	95%
iv	Degree of protection for enclosure	IP 54 (Outdoor type)
v	Dimension / Weight	As per Manufacturer
vi	Noise level	< 65 dBA
vii	Cooling	Forced Air

3.3 Other important Features/Protections required in the Inverter

(i) Automatic morning wake-up and nightly shutdown

(ii) Inverter must have the feature to work in tandem with other similar inverters and be able to be successively switched ON and OFF automatically based on solar radiation variations during the day.

(iii) Mains (Grid) over-under voltage and frequency protection

(iv) Fool proof protection against ISLANDING.

(v) Included authentic tracking of the solar arrays maximum power operation voltage (MPPT).

(vi) Array ground fault detection.

(vii) LCD and piezoelectric keypad operator interface Menu driven Automatic fault conditions reset for all parameters like voltage, frequency and/or blackout.

(viii) MOV type surge arresters on AC and DC terminals for over voltage protection from lightning-induced surges or else suitable arrangement shall be provided externally.

(ix) The inverter shall have AC /DC side dis-connector of appropriate rating or else suitable arrangement shall be provided externally.

(x) Inverter should be rated to operate at 0 –55 deg centigrade unless provision for air conditioning is included in Inverter

(xi) Shall be provided with an isolating transformer.

(xii) Allparametersshouldbeaccessiblethroughanindustrystandardcommunicationlink.

4 Parallel Operation with Grid

4.1 The Inverter shall be capable of operating in parallel with the grid utility service and shall be capable of interrupting line-to-line fault currents and line-to-ground fault currents.

4.2 The Inverter shall include appropriate self-protective and self-diagnostic features to protect itself and the PV array from damage in the event of Inverter component failure or from parameters beyond the Inverter‘s safe operating range due to internal or external causes. The self-protective features shall not allow signals from the Inverter front panel to cause the Inverter to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the Inverter, including commutation failure, shall be cleared by the Inverterprotectivedevicesandnotbytheexistingsiteutilitygridservicecircuitbreaker.

4.3 The Inverter shall go to shutdown/standby mode, with its contacts open, under the following conditions before attempting an automatic start after an appropriate time delay; insufficient solar power output.

4.4 Insufficient Solar Power Input.

4.5 When the power available from the PV array is insufficient to supply the losses of the Inverter, the Inverter shall go to a standby/shutdown mode. The Inverter control shall prevent excessive cycling during rightly shutdown or extended periods of insufficient solar radiation.

4.6 Utility-Grid Over or Under Voltage

4.7 The Inverter shall restart after an over or under voltage shutdown when the utility grid voltage has returned to within limits for a minimum of two minutes.

4.8 Utility-Grid Over or Under Frequency

4.9 The Inverter shall restart after an over or under frequency shutdown when the utility grid voltage has returned to the within limits for minimum of two minutes.

4.10 The Inverter Powerfactoratthepointofutilityserviceconnectionshallbe>0.99laggingor leading when operating at above 25 percent of the rated output, but may be less than 0.99 laggingbelow25percentoftheratedoutput.

4.11 The high voltage and power circuits of the Inverter shall be separated from the low-voltage and control circuits. The internal copper wiring of the Inverter shall have flame resistant insulation. Use of PVC is not acceptable. All conductors shall be made of standard copper.

4.12 The Inverter shall withstand a high voltage test of 2000Vrms, between either the input or the output terminals and the cabinet (chassis).

4.13 Full protection against accidental open circuit and reverse polarity at the input shall be provided.

4.14 The Inverter shall not produce Electromagnetic Interference (EMI) which may cause malfunctioning of electronic and electrical instruments including communication equipment, which are located within the facility in which the Inverter is housed.

4.15 The Inverter shall have an appropriate display on the front panel to display the instantaneous AC power output and the DC voltage, current and power input. Each of these measurement displays shall have an accuracy of 1 percent of full scale or better. The display shall be visible from outside the Inverter enclosure. Operational status of the Inverter, alarms, trouble indicators and ac and the dc disconnect switch positions shall also be communicated by appropriate messages or indicator lights on the front cover of the Inverter enclosure.

4.16 Communication Modbus protocol with LAN/WAN options along with remote access facility and SCADA package with latest monitoring systems including individual string monitoring with Web/IP data monitoring shall be provided.

5 Electrical Safety, Earthing and Protection

5.1 Internal Faults: In built protection for internal faults including excess temperature, commutation failure, overload and cooling fan failure (if fitted) is obligatory.

5.2 Galvanic Isolation: Galvanic Isolation is required to avoid any DC component being injected into the grid and the potential for AC components appearing at the array (required inc central inverters).

5.3 Over Voltage Protection: Over Voltage Protection against atmospheric lightning discharge to the PV array is required. Protection is to be provided against voltage fluctuations in the grid itself and internal faults in the power conditioner, operational errors and switching transients.

5.4 Earth fault supervision: An integrated earth fault device shall have to be provided to detect eventualearthfaultonDCsideandshallsendmessagetothesupervisorysystem.

5.5 Cabling practice: Cable connections must be made using PVCC u cables, as per BIS standards. All cable connections must be made using suitable terminations for effectivecontact. The XLPODC Grade Cu cables of 1.1kV grade must be run in GI trays with covers for protection.

5.6 Fast acting semiconductor type current limiting fuses at the main bus-bar to protect from the grid short circuit contribution. The Inverter shall include an easily accessible emergency OFF button located at an appropriate position on the unit.

5.7 All exposed surfaces of ferrous parts shall be thoroughly cleaned, primed, and painted or otherwise

6 General Features of Inverter:

6.1 The Inverter enclosure shall be weatherproof and capable of surviving climatic changes and should keep the Inverter intact under all conditions in the room where it will be housed. The Inverter shall be located outdoor with suitable protection and should be either wall/padmounted. Moisture condensation and entry of rodents and insects shall be prevented in the Inverter enclosure. The enclosure for housing the inverter shall be minimum IP54 protection level..

6.2 Components and circuit boards mounted inside the enclosures shall be which shall also serve to identify the items on the supplied drawings.

6.3 All doors, covers, panels and cable exists shall be gasket or otherwise designed to limit the entry of dust and moisture. All doors shall be equipped with locks. All openings shall be provided with grills or screens with openings no larger than 0.95cm.(about3x8inch).

7 Operating Modes

7.1 The following operating modes are to be made available: Night or Sleep mode: Where the inverter is almost completely turned off, with just the timer and control system still inoperation, losses should not exceed1watts per 5 kilowatt.

(i) Standby mode: Where the control system continuously monitors the output of the solar generator until pre-set value is exceeded (typically10watts)

(ii) Operational or MPPT tracking mode: The control system continuously adjust the voltage of the generator to optimize the power available. The power conditioner must automatically re-enter stand-by mode when input power reduces below the standby mode threshold. Front Panel display should prove the status of the Inverter, including AC Voltage, Current, Power output & DC Current, Voltage and Power input, pf and fault Indication (ifany).

8 Technical Specifications for Array Structure

8.1 Wherever required, suitable number of PV panel structures shall be provided.

8.2 Structural material shall be corrosion resistant and electrolytically compatible with the Materials used in the module frame, its fasteners, nuts and bolts. Galvanizing should meet ASTMA-123 hot dipped galvanizing or equivalent which provides atleast spraying thickness of 80 microns on steel as per ISi5905, if steel frame is used. Aluminum frame structures with adequate strength and in accordance with relevant BIS/international standards can also be used.

(i) Structures shall be supplied complete with all members to be compatible for allowing easy installation.

(ii) Each structure shall have a provision to adjust its angle of inclination to the horizontal as per the site conditions by way of motorized operation i.e. single axis and dual axis tracking for maximization of the power generated.

(iii) The structure should be capable of withstanding a wind load of 150 km/hr after grouting & installation. Grouting material for SPV structure shall be as per M15 (1:2:4) concrete specification.

(iv) The structures shall be designed for simple mechanical and electrical installation. There shall be no requirement of welding or complex machinery at the installation site. If prior civil work or support platform is absolutely essential to install the structures, the Contractor shall clearly and unambiguously communicate such requirements alongwith their specifications in the bid. Detailed engineering drawings and instructions for such prior civil work shall be carried out prior to the supply of Goods.

(v) The Contractor shall specify installation details of the PV modules and the support structures with appropriate diagrams and drawings. Such details shall include, but not limited to, the following;

(a) Determination of true south at the site;
(b) Array tilt angle to the horizontal, with permitted tolerance;
(c) Details with drawings for fixing the modules;
(d) Details with drawings of fixing the junction/terminal boxes;
(e) Inter connection details inside the junction/terminal boxes;
(f) Structure installation details and drawings;
(g) electrical grounding(earthing);
(h) Inter-panel/Inter-row distances with allowed tolerances; and
(i) Safety precautions to be taken.

The array structure shall support SPV modules at a given orientation and absorb and transfer the mechanical loads to the terrace columns and beams properly. All nuts and bolts shall be of very good quality stainless steel. Detailed design and Drawing shall have to submitted to the consultant engaged by client or the Engineer-in-charge for acceptance and approval before execution of work.

9 Technical Specifications for Cables & Wires

9.1 Cabling: Cabling shall be carried out as per IE Rules. All other cabling above ground should be suitably mounted on cable trays with proper covers. Only LSHZXLPO cables must be usedfor DC side, DC grade cables shall be used. For AC power shall be XLPE insulated PVC sheathed aluminium/ copper conductor cables.

9.2 Wires: Only FRL Scopper wires of appropriate size and of reputed make shall have to be used.

9.3 Cables Ends: All connections are to be made through suitable cable/lug/terminals/MC-4connectors; crimped properly & with use of Cable Glands.

9.4 Cable Marking: All cable/wires are to be marked in proper manner by good quality ferule or by other means so that the cable can be easily identified.

9.5 Multi Strand, Annealed high conductivity copper conductor

(i) Overall PVC insulation for UV protection and confirm to IEC69947

(ii) All cables shall conform to BIS standards (IS694)and (IS1554)28

(iii) The size of each type of cable selected shall be based on minimum voltage drop, however, the maximum drop shall be limited to 2%

(iv) Allelectricalcontrol/powercables/wiresinsidethebuildingtobefixedinaccordance withCPWDspecificationsforelectricalworksPart-IinternalonlyRigidSteelConduit should be used for wiring inside the building

(v) Proper laying of cables have to be ensured in appropriate cable trays, pipes/trenches as per site requirement.

10 Technical Specifications for Surge Arrestor

10.1 SURGE PROTECTOR CATEGORYII

(i) The surge Protection manufacturer shall offer a complete line of surge Protection product to support the requirements for the Distribution. The surge protector at this stage shall be provided to protect the downstream electrical and electronics against any induced switching surges that may be passed on to the downstream electrical & electronic system.

(ii) The Protection unit shall be based on Single High Capacity Metal Oxide Varistors (MOV), capable of handling 8/20µs surges and shall be able to give an indication in the event module failure and be pluggable to facilitate the in-service replacement without distributing the lines.

10.2 PLANT METERING/DATA LOGGING

(i) PV array energy production: Digital Meters to log the actual value of AC Voltage, Current One way HT energy meter (Export metering) Class 0.2 SABT Compliantshall be incorporated in the system on the main 11KV AC Grid supply complete with CTs/PTs in the main plant ODY.

(ii) Solar Irradiance: An integrating Pyranometer (Class I) should be provided, with the sensor mounted in the plane of the array. Read out should be integrated with data logging system.

(iii) Wind Speed: An integrated wind speed measurement unit be provided.

(iv) Temperature Sensor: Integrated temp. sensors for measuring the module surface temp., inverter inside enclosure temp. and ambient temp to be provided complete withread outs integrated with the data logging system.

(v) A data logging system (Hardware and software) for plant control and monitoring shall be provided with the following features: 2no‘s suitable Computers (HP/DELL): 3GHz Pentium i7 latest with 1.0T BHDD, 3GB RDRAM, 2 Parallel & 2 Serial Port, Wi-Fi Lan Card, DVDRW Drive, 20 ǁLED display, USB Scroll Mouse, alongwith two All in one (HP) professional series 600dpi/20ppm Desktop Laser Jet printers along with one 2KVA on-lineups with 1 hour battery backup.

(vi) Remote Supervisory Control and data acquisition through SCADA software at the Departments location through Handheld device/GSMcellular device with latest

software/hardware configuration and service connectivity for online/real time data monitoring/control complete to be supplied and operation and maintenance/control to be ensured by the contractor.

(vii) All major parameters should be available on the digital bus and logging facility for energy auditing through the internal microprocessor and can be read on the digital front panel at any time the current values, previous values for upto a month and the average values. The following parameters should be accessible via the operating interface display.

(a) AC Voltage
(b) AC Output current & Output Power
(c) DC Input Voltage DC Input Current
(d) Active Time disabled
(e) Time Idle Temperatures Inverter Status
(f) Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage, Over voltage delay, Under voltage delay over frequency, Ground fault delay, PV starting delay, PV stopping delay)

10.3 Inverter/ARRAYSIZERATIO

The Inverter continuous power rating shall be not below 90% of array power. Calculations must be submitted.

10.4 Maximum Power Point Tracker(MPPT)

Maximum power point tracker shall be integrated in the Inverter to maximize energy drawn from the array. The MPPT should be microprocessor based to minimize power losses. The details of working mechanism of MPPT shall be mentioned. The MPPT must have provision (manual setting) for constant voltage operation.

10.5 Plant Control, data logger & plant monitoring unit

Basically, this unit should perform the following:

(i) Individual Array monitoring via string monitoring system

(ii) Measurement and/or recording of energy parameters.

(iii) Simple data logger or energy meter to record the energy data on a pre-determined interval basis.

(iv) Measurement & continuous acquisition of ambient air temperature, wind speed, solar radiation, PV module temperature, individual string current, inverter output

(v) Voltage and current, output frequency

(vi) Operating state monitoring and failure indication.

(vii) Representation of monitored datas in graphics mode or in tabulation mode.

(viii) Controlling&monitoringtheentirepowersystemthroughremoteterminalatdepartmentoffi

ce as well as from a local terminal

(ix) Remote control/Instrumentation: The microprocessor control unit should have the provision for installation of RS – 232/485 communication link, should remote control and monitoring capability (by personal computer) be desired. All parameters, status and indicators and targets accessible through the local operator interface may be accessed remotely through these ports. Optional analog outputs (0-5VDC) for AC powers, DC current, DC Voltage can be supplied to interface with external data acquisition systems. Optional contacts inputs from an external SCAD/RTU or other remote control device can be provided within the inverter enclosure for remotely disabling or resetting setting the unit.

10.6 AC DISTRIBUTION PANEL BOARD

(i) AC Distribution Panel Board (DPB) shall control the AC power from inverter and Inter connection from ACDB to transformer and then to HT bus (if required to export power) be carried out and complete equipment along with metering (if required to export power) to be installed in the ACDB. Requirement/specifications of DCDB and ACDB may be changed as per site conditions. The AC panel shall be provided with adequate safety features to prevent transmission of fault.

(ii) The existing LT panel shall be upgraded to receive the solar power.

10.7 FIRE EXTINGUISHERS:

The firefighting system for the proposed power plant for fire protection shall be consisting of Portable fire extinguishers in the control room for fire caused by electrical short circuits. Sand buckets in the control room the installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing the batteries and Inverters.

10.8 LIGHTNING AND OVER VOLTAGE PROTECTION

There shall be the required number of suitable lightning arrestors installed in the array field. Suitableearthingsuchthatinducedtransientsfindanalternateroutetoearth.Protectionshall meet the safety rules as per Indian Electricity Act. All building earth conductors shall beinterconnected through the concept of earth mats for interconnection with separate earth pits. For each earth pits necessary test points shall have to be provided.

10.9 EARTHING PROTECTION

Each array structure should be grounded properly. Provision should be kept for shorting and groundingofthePVarrayatthetimeofmaintenancework.Allmetalcasing/shieldingoftheplantsho uldbethoroughlygroundedinaccordancewithIndianelectricityAct/IERules.EarthResistancesho uldbetestedinpresenceoftherepresentativeofCPWDafterearthingbycalibrated earth tester. Inverter S, ACDB and DCDB should also be earthed properly. The 11KV side equipment and parts shall be earthed in compliance to Indian Electricity Rules‘1956, all non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode.

10.10 TOOLS & TACKLES AND SPARES:

After completion of installation & commissioning of the power plant, necessary tools &

tackles are to be provided free of cost by the contractor for maintenance purpose. List of tools and tackles to be supplied by the contractor for approval of specifications and make from CPWD. A list of requisite spares in case of Inverter comprising of asset of control logiccards, IGBT driver cards etc., Junction Boxes, Fuses, MCCBs etc. alongwith spare set of PV modules and batteries be indicated, which shall be supplied along with the equipment (at extra cost if required by the department). A minimum set of spares shall be maintained in theplant itself for the entire period of warranty and Operation & Maintenance which upon itsuse shall be replenished.

10.11 DANGER BOARDS

Danger boards should be provided as and where necessary as per IE Act./IE rules as amended upto date.

11 List of Standards

(i) FM (Factory Mutual) USA for application in NEC Class1, Division 2, Group C&D

(ii) UL (Under writers laboratory) for electrical and fire safety (Class C fire rating)

(iii) IEC 61215

(iv) IEC 61646

(v) IEC 61730

(vi) UL 1703

(vii) CE Mark

(viii) Electrical Safety Tester (EST)Series

(ix) CE certified.

(x) TUV Rhine land.

(xi) RDSO approved.

(xii) BBIS approved

(a) BIS:694 PVC insulated Electric cable for working voltage upto and including 1100 volts.
(b) BIS:732 Code of practice for electrical wiring and installation
(c) BIS:1651&1652 Stationary cell & batteries, lead acid type.
(d) BIS:1885 Glossary of items for electrical cables and conductors
(e) BIS:2551 Danger noticeplates.
(f) BIS:3043 Code of practice for earthing.
(g) BIS:5216 Guide for safety procedures and practices in electrical work.
(h) BIS:5578 Guide for marking of insulated conductors
(i) BIS:8130 Conductors for insulated electric cables and flexible cords
(j) BIS:8623 Factory built assemblies of switch gear and control gear for voltages upto and including 1000V AC and 1200V DC.
(k) BIS:8828 Miniature Circuit Breakers
(l) BIS:9537 Rigid Steel Conduits for electrical wiring (Second RevBISions)

(m) BIS:10810 Methods of test for cables.
(n) BIS:11353 Guide for uniform system of marking and identification of conductors and apparatus terminals.
(o) BIS:12640 Earth Leakage Circuit Breakers
(p) BIS:13947 Molded Case Circuit Breakers
(q) BIS:13947 Degree of protection provided by enclosures for LV switchgear and control gear.
(r) BIS:13947 General requirement for switchgear and control gear for voltage not exceeding 1000 Volts. SP:6(1) Structural Steel Sections
(s) BIS:325 Three Phase Induction Motors
(t) BIS:554 Dimensions for pipe threads where pressure tight joints are required on the threads.
(u) BIS:800Codeofpracticeforgeneralconstructioninsteel
(v) BIS:1367(Part1) Technical supply conditions for threaded steel fasteners
(w) Part1 Introduction and general information.
(x) BIS:1367 (Part2) Technical supply conditions for threaded steel fasteners: Part2 product grades and tolerances.
(y) BIS:2026 (Part I-IV) Power Transformer
(z) BIS:111 71 Dry type Transformer
(aa) BIS:1554 (Part1) PVC insulated (heavy duty) electric cables: Part1 for working voltages upto and including 1100V.
(bb) BIS:1554 (Part2) PVC insulated (heavy duty) electric cables: Part2 for working voltages from 3.3KV upto and including 11KV.

12 Acceptable Makes of Equipment

(i) Modules: Waaree/Nevitor/Goldigrain
(ii) Inverter: ABB/Bergen/Delta
(iii) Cables (XLPO/XLPE):C.C.I/Havells/Universal cable/Finolex/Polycab
(iv) String Combiner Box: Hensel/Onexis
(v) DC Connector: Elmax/Staubli
(vi) AC Junction Box: Rittal/SuRe

Annexure -V

(Schedule-D)

Landscaping and Horticulture Works

1. The work shall be carried out as per "Schedule of Rates, Analysis of Rates and Specifications (Horticulture & Landscaping)-2018**",** with upto date correction slips and as per CPWD Yard stick, **NBC 2016,** in absence of detail specification the standard horticulture practices for healthy growth of plants beautification should be followed as approved by engineer in charge.

2. The Scope of work include preparation of landscaping plan including parks, planters and other details etc. for the horticulture works and execution of same including providing unfiltered/recycled water supply lines from the existing WTP/STP and installation of additional pumps if required, providing drip irrigation system for trees, shrubs and hedges, sprinkler system for lawns etc. complete will be responsibility of agency. Development of parks, construction of its boundary wall, providing MS railings (including painting), wicket gates, water hydrants, etc. shall be completed as per the specification and drawing approvedby the Authority Engineer. Contractor has to do horticulture works as per approved landscaping plan including grassing, grass turfs, plantation of shrubs, plants, trees etc.

3. Grassing will be done with selection No.1 grass including supplying good earth if needed including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for mowing.

4. Grass turf will be provided with selection No.1 grass turf with earth 50mm to 60mm thickness of existing ground prepared with proper level and ramming with required tools wooden (Dhurmos) and then rolling the surface with light roller making the surface smooth.

5. Plantation of tress at site will be done with healthy, well developed trees established at the site of following varieties including watering, removal of unserviceable materials etc. in quantity as per approved Landscaping drawings.

6. Preparation of garden area: Trenching in ordinary soil upto a depth of 60cm includingremoval & Stacking of serviceable materials and then disposing of surplus soil by spreading and neatly levelling within all lead of 50m and making up the trenched area to proper levelsby filling with earth or earth mixed with sludge or/and manure before & after flooding trench with water (excluding cost of imported earth sludge or manure. 2.6.1 All kinds of soil.

7. Complete maintenance of entire garden features :- Complete maintenance of the entire garden features having as per yard stick in the garden area i.e. lawn trees, shrubs, hedge, potted palnt, cement pot, flower beds, foliages, creepers etc. including hoeing, weeding pruning replacement of plants, gap filling, watering, mowing of lawn, grass cutting by lawn moverand brush cutter, removal of garden waste, applying insecticide, pesticide & fertilizers(whenever required) top dressing of lawn with good earth and manure and maintenance of other garden related works as directed by office-in-charge (Cost of Good Earth, Manure, Fertilizer, Insecticide, Pesticide will be provided by the Department & lawn

mover and brush cutter with fuel , other T & P material/articles shall be provided by the contractor.)

8. Grassing will be done with Selection No. 1 grass including supplying good earth if needed including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for mowing.

9. Grass turf will be provided with Selection No. 1 grass turf with earth 50 mm to 60 mm thickness of existing ground prepared with proper level and ramming with required tools wooden (Dhurmos) and then rolling the surface with light roller making the surface smooth.

10. Plantation for landscaping and ornamental plant for beautification plants at site will be done with healthy, well developed plants established at the site. Suiting to the environment at the Military Infrastructure site in Consultation with Forest Department & Authority's Engineer.

11. Displayed of Indoor / Outdoor decorative plants in good looking ornamental attractive planters in consultation with Authority's Engineer.

12. Plantation of trees at site will be done along the boundary wall with healthy, well developed trees established at the site of the varieties suiting to the environment of Military Infrastructure site in Consultation with Forest Department and Authority's Engineer.

13. Plantation of shrubs at site will be done with healthy, well developed shrubs established at the site with varieties suiting to the environment of Military Infrastructure site in Consultation with Forest Department and Authority's Engineer.

14. Soil testing for texture, nutrient level, water retaining capacity, PH value and other essential test for healthy growth of plants shall be conducted near every building where horticulture/ Landscapings works are to be done, from approved laboratory and at least 25% from ICAR/Krishi Vigyan Kendra. Necessary recommendation for fertilizer requirement and water consumption requirement shall be made available from the laboratories.

15. In general the quality of soil in construction area is not very conducive for growth of plants and grasses. Top good soil from the construction site shall be preserved for horticulture purposes. The soil not suitable for grasses and growth of trees shall be removed and good quality soil either from the preserved top soil or brought from outside the campus shall beused for horticulture purpose. No extra payment shall be made for same. The agency will be responsible for healthy growth of plants, trees, shrubs and grasses during construction stage and maintenance upto one year.

16. Manure and Fertilizers: Cattle manure/ compost shall be well decayed (should be at least 6 months covered in dump), free from grits and any other unwanted materials. The Contractor shall also provide and spread manure (cow dung manure/compost) for healthy growth the plants & trees under his maintenance. Depending upon requirement to maintained the nutrients level of the soil necessary application of chemical fertilizers (NPK) and other micro nutrients should be done.

17. Watering should be done in such any way that optimum level of moisture content for healthy growth of plants and trees is maintained, at no time moisture content should fall below the wilting point. Inadequate or excessive watering is to be avoided. During the dry season watering should be carried out at least daily in summer & twice a week in winter or as per requirement of the tree plant, shrub, water should be sourced from STP (Sewerage Treatment Plants) in case of emergency the source other than STP and be used provided that prior approval of Authority Engineer has been obtained.

18. Weeding and Hoeing: The work includes maintaining areas close to the base of the trees and shrubs free from weeds within 300mm radius from the stem of the trees / 150mm radius from the stem of the plants. Weeding has to be carried out once in a month. All weeds are to be disposed off from the site with all leads and lifts.

19. Pruning and Trimming: All dead or injured twigs, water shoots, unwanted branches are to be removed. Trees, shrubs and ground cover should be pruned to maintain natural shape. The hedges and shrubs shall be given special shapes and sizes to give aesthetic appearance of the greenery at regular intervals.

20. Pest and Disease control: All trees/plants are to be inspected once in a month to determine any disease or pest infections. Once the infection is identified adequate control measures are to be taken.

21. The trees and shrubs having height less than 3 metre in the median and planters shall be washed by sprinkler attached with water tankers on monthly basis. The contractor shall take utmost care of the trees and shrubs so that the casualty is brought to a minimum. The deadand fallen tree should be removed immediately from the site of work for smooth traffic movement and it should be brought to the notice of Department so that further survey and auction of the same can be done

22. Authority shall not be responsible for any injury partial or permanent or death of any workers at site due to accident or mal functioning of the equipment or by negligence of the staff.

23. The Contractor shall be responsible for removal of garden waste from the site and disposed off at designated dumping area or any other composting yard as approved by Authority's Engineer.

24. The Agency should ensure adequate deployed of mali having experience of Horticulture work, In case of any deficiency the Authority's Engineer can issue the necessary direction to increase the staff and Agency should abide by order of Authority's Engineer

25. The Contractor shall maintain the plants, hedges, trees, shrubs and lawns in good and healthy condition during construction period and maintenance period. This will include Complete maintenance of the entire garden features of the garden area i.e. lawn, trees, shrubs, hedge, potted plants, flowers beds, creepers etc. and other garden feature including watering hoeing, making of plants basic manuring, trimming and cleaning of hedges / plants, Beds, spraying of insecticides, fungicides, weeding, mowing, and top dressing of lawn with good earth and

manure and hedge clipping and removal of the garden waste, composting of green waste from plants, trees, lawn mowing, etc as per direction and satisfaction of the Authority Engineer.

26. The following activities are covered under this contract.

SN	Item of work	Nos./Qty./Frequency Required
(i)	Pruning & trimming of trees/shrubs creepers etc.	Quarter Yearly / need based
(ii)	Hedges Cutting	Monthly
(iii)	Any other item (Horticulture, Civil, Elect, U/F water supply) required for proper maintenance	On need basis
(iv)	Irrigation	Daily in summer season and twice a week during winter and need based
(v)	(i) Manuring (ii) Fertilization	a) Trees/palms - once in every three months b) shrubs/grounds covers –monthly c) Grass -once every three months.
(vi)	Lawn Mowing & trimming of shrubs	Monthly or as and when required.
(vii)	Plant Protection	Pest-Fortnightly Disease control-Fortnightly during rainy season and monthly in other seasons
(viii)	Cultivation & Weeding	Monthly or earlier as per the requirement.
(ix)	Seasonal Flowers	Wherever feasible
(x)	Top dressing with soil &/or manure	Yearly
(xi)	Repair & replacement of plants, levelling etc.	As and when required

Annexure -VII

(Schedule-D)

Signage

1 General

The Contractor shall develop shop drawings for all types of required signage's for the Project as per the intent suggested by the Architect and shall submit to the Authority's Engineer for approvals before executing the works. Contractor will arrange samples and required mockups as instructed by Authority's Engineer for some important areas.

The scope in this section shall be engineering, procurement and execution of all types of Signage like informative cautionary and mandatory.

2 External Signage's

The Contractor shall provide following signage as required and necessary. Sizes mentioned are indicative for intent purpose.

2.1 Main Building Signage

Main Building Signage in brushed finished SS cut letters in both English and Hindi alphabets, stuck on dry stone wall, back lit with approved shade and color of LED. SS to be of 316 L grade, letters to be fixed on the wall with inbuilt nails

(i) At GF Location-I size having size not lets than 50mm deep and height 450mm.

(ii) At GF Location-II size to be 50mm deep and height 450mm

(iii) At Roof Level Location-I size to be 100mm deep and height 900mm.

(iv) At Roof Level Location-II size to be 100mm deep and height 900mm

2.2 Legal Entity with Signage

Legal Entity with Signage in brushed finished 3mm thick Stainless Steel plate, laser engraved text (English and Hindi Language) in approved colour laser fused pigment, fixed on wall by means of SS screws / Studs. SS to be of 316 L grade

(i) At GF Compound Wall at Entry and Exit gates size to be 600mm x 900mm

(ii) At Building Entrance size to be 600mm x 600mm

2.3 External Way finding Signage

External Way finding Signage in brushed finished stainless steel 3mm brush finished Plate with

3mm grooves slits, laser engraved text (English and Hindi Language) in approved colour laser fused pigment. Some signage may be fixed on wall or some shall be individual pole structure. SS to be of 316 L grade Size: 450mm x 900mm

Reference Image

2.4 External Parking / General Signage

External Parking / General Signage in brushed finished stainless steel 3mm brush finished Plate with 3mm grooves slits, laser engraved text (English and Hindi Language) in approved colour laser fused pigment. Some signage may be fixed on wall or some shall be individual pole structure. SS to be of 316 L grade Size 400mm x 400mm

Reference Images



3 Internal Signage's

The Contractor shall provide following signage as required and necessary. The Sizes, shapes mentioned are indicative for intent purpose.

3.1 Reception Logo

Reception Logo in brushed finished SS cut letters in both English, stuck on dry stone wall. SS to be of 316 grade letters to be fixed on the wall with inbuilt nails. Size to be 50mm deep and height 450mm

3.2 Building Directory at GF Entry

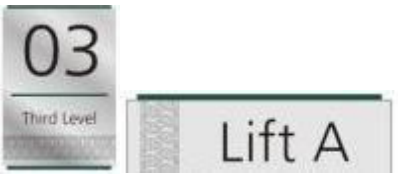
Building Directory at GF Entry in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment, fixed with double side tapes with silicon paste on doors. with silicon paste. SS to be of 316 grade, size may be 900mm x 1800mm or as decided by Engineer-in-charge.

3.3 Floor Directory at All Floor Lift Lobby

Floor Directory at All Floor Lift Lobby in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment, fixed with double side tapes with silicon paste on doors. with silicon paste. SS to be of 316 grade, size may be 600mm x 1200mm or as required and decided by Engineer-in-charge.

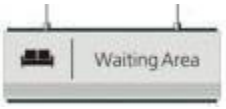
3.4 Floor and Lift Identification at All Floor Lift Lobby, Staircases Service lift

Floor and Lift Identification at All Floor Lift Lobby, Staircases Service lift in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment, fixed with double side tapes with silicon paste on doors. with silicon paste. SS to be of 316 grade, size may be 150mm x 200mm or as required.



3.5 Location Signage's

Location Signage's in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment. SS to be of 316 grade, size to be 600mm x 200mm. Signage to be cantilevered or Hanging.



3.6 Individual Room Signage's

Individual Room Signage's for all rooms in entire building excluding the toilet / rest rooms in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment, fixed with double side tapes with silicon paste on doors. with silicon paste. SS to be of 316 grade, size to be 300mm x 75mm

3.7 Workstation / Cubicle Signage's

Workstation / Cubicle Signage's for all consisting of Vinyl Stickers.Size 200mm x 50mm or as required as decided by Engineer-in-charge.

3.8 Rest Room Signage's

Rest Room Signage's for all Toilets in entire building in brushed finished 3mm thick Stainless Steel plate, laser engraved text in approved colour laser fused pigment, fixed with double side tapes with silicon paste on doors. with silicon paste. SS to be of 316 grade, size to be 75mm x 75mm

3.9 Fire Exit, Emergency, Informatory Signage's

Fire Exit, Emergency, Informatory Signage's to be in 4mm thick Acrylic Base + Photoluminescent sheet / Auto Glow sheet with 2hrs glowing effect+ Content in vinyl printing, some signage to be fixing with double sided tape with silicon paste on walls and some shall be double sides painted and hanging from ceiling with SS rods., size as per standard

3.10 Fire Evacuation Plan Signages

Fire Evacuation Plan Signages to be in 4mm thick Acrylic Base + Photo luminiscent sheet / Auto Glow sheet with 2hrs glowing effect+ Content in vinyl printing, signage to be fixing with double sided tape with silicon paste on walls, size as per standard

SCHEDULE-E: Specifications and Standards

1 General

1.1 Maintenance for Project shall be 48 months from the date of successful handing over and issue of virtual completion certificate with requisite staff deployed at site in terms of the plan finalised with the Authority.

1.2 The contractor shall be responsible for minimum 5-year warranty on all the Equipmentinstalled and 10 years on water proofing for the smooth operation of the project.

2 Maintenance Requirements

2.1 The Contractor shall, at all times maintain the Project in accordance with the provisions of this Agreement, Applicable Laws and Applicable Permits.

2.2 The Contractor shall repair or rectify any Defect or deficiency set forth in Paragraph 2 of this Schedule-E within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in Clause 14.6 of this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.

2.3 All Materials, works and construction operations shall conform to the MORTH/ CPWD/ Uttarakhand PWD Specifications for Building & Infrastructure Works, and the relevant IRC publications. Where the specifications for a work are not given, Good Industry Practice shall be adopted.

3 Repair/rectification of Defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Annexure-I of this Schedule-E within the time limit set forth therein.

4 Other Defects and deficiencies

In respect of any Defect or deficiency not specified in Annex - I of this Schedule-E, the Authority's Engineer may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Authority's Engineer.

5 Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule-E, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time

specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority's Engineer and conveyed to the Contractor and the Authority with reasons thereof.

6 Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Schedule-E, if any Defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

7 Daily inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Military Infrastructure and maintain a record thereof in a register to be kept in such form and manner as theAuthority's Engineer may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Authority's Engineer at any time during office hours.

8 Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all the Military Infrastructure before [1stJune] every year. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the [10th June] every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Authority's Engineer a compliance report. Post monsoon inspection shall be done by the [30th September] and the inspection report together with detailsof any damages observed and proposed action to remedy the same shall be sent to theAuthority's Engineer.

9 Repairs on account of natural calamities

All damages occurring to the Project on account of a Force Majeure Event or default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties.

Annexure -I

(Schedule-E)

Repair/rectification of Defects and Deficiencies

The Contractor shall repair and rectify the Defects and deficiencies specified in this Annex-I of Schedule-E within the time limit set forth in the table below.

SN	Nature of Defect or Deficiency	Time limit for Repair/ Rectification
1	Gates	24hours
2	Security Block utilities	24 hours
3	Sign Boards	48 hours
4	RCC /masonry wall	7 days
5	Soil Sink	7 days
6	Plaster & Paints	7 days
7	Glazing & ACP	7 days
8	Door, Window & Gates	48 hours
9	Flooring	7 days
10	Any cracks in internal road surface	48 hours
11	All Utilities Works	48 hours
12	Cleaning of toilets	Every 4 hours
13	Defects in electrical, water and sanitary installations in the Terminal Block	24 hours
14	Obstruction by plants in a minimum head- room of 5 m above carriageway or obstruction in visibility of road signs	24 hours
15	Removal of fallen trees	4 hours
16	Deterioration in health of trees and Bushes	Timely watering and treatment
17	Trees and bushes requiring replacement	15 days
18	Removal of vegetation affecting sight line and road structures	15 days
19	Maintenance of Major Equipment	24 hours
20	Major faults / Breakdown	24 hours

Note:

- Where necessary, the Authority may modify the time limit for repair/rectification, or add to the nature of Defect or deficiency before issuing the bidding document, with the approval of the Authority Engineer.
- The Contractor shall submit a warranty for all equipment, material and accessories supplied by him against manufacturing defects, malfunctioning or under capacity functioning.
- The form of warranty shall be as approved by Authority Engineer.
- The warranty shall expressly include replacement of all defective or under capacity equipment/material. Authority Engineer may allow repair of certain equipment if the same is found to meet the requirement for efficient functioning of the system.

- The warranty includes replacement of any equipment found to have capacity lesser that the rated capacity as accepted in the contract. The replacement equipment shall be approved bythe Authority Engineer.

SCHEDULE-F: Applicable Permits

1 Applicable Permits

1.1 The Contractor shall obtain, as required under the Applicable Laws, the following Applicable Permits:

Building Construction Permission	Local Authority / Municipal Corporation of Jammu
Environment Clearance	Ministry Of Environment And Forests
Heritage Clearance	Permission from ASI/ relevant Authority
Water & Sewerage Connection	Concerned Authority
Shifting of Services and utilities	Directorate of State Transport Concerned Authority, Local Authority, PWD (B&R) Department
Traffic Management during operation	Traffic Police
Application for PAN, sales tax and other tax registrations etc.	Concerned departments of Government of J&K and Government of India (GoI)
Electricity connection	Respective Electricity Board in J&K
Clearance for employing labor-Primary Employer	Labour Commissioner
Clearance for blasting and use of explosives	Commissioner of Explosives and Police Department, Go UK
Employment of migrant labour	Labour Commissioner
Storage of sludge/silt	J&K State Pollution Control Board
License for commercial activities	Concerned Authority
Realignment and channelization of Nallas	Concerned Authority, J&K PWD (B&R)
Installation of Lifts	Concerned Authority
Fire safety equipment	Concerned Authority /Police Department
Drains and Sewers	Concerned Authority, J&K PWD (B&R)
Diesel Generator	J&K State Pollution Control Board
Labour Camps	District Health Officer
Working in Night Shifts	Concerned Authority, Police Department
Re-routing of vehicular traffic	Concerned Authority, Traffic Police
Completion Cum Occupancy Certificate Stage	
Completion certificate from local authority Approval from the Lift Inspector- Required for installing lift in the building Consent to operate from State Pollution Control Board NOC from Weight and measurement Department as per Legal Metrology Laws NOC from explosive department NOC from Industry department NOC from labour department	

1.2 The above list is indicative and not necessarily complete or accurate. The Contractor shall make his / her own assessment of the statutory clearances required and shall be responsible for obtaining all such clearances. The Contractor shall at all times, obtain and maintain all Applicable Permits which are required by Applicable Law to undertake the Project. Charges for all permits etc. shall be borne by the Contractor.

1.3 Applicable Permits, as required, relating to environmental protection and conservation shall have been procured by the Authority in accordance with the provisions of this Agreement.

SCHEDULE-G: Form of Bank Guarantee

Annexure -I

(Schedule-G)

Performance Security

The ……
……..
……..
……

WHEREAS:

(A) _____[name and address of contractor] (hereinafter called the "**Contractor**") and [name and address of the authority], (hereinafter called the **"Authority"**) have entered into an agreement (hereinafter called the "**Agreement**") for the Development of Military Infrastructure at Jammu in the State of J&K on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the {Construction Period/ Defects Liability Period and Maintenance Period} (as defined in the Agreement) in a sum of Rs….. cr. (Rupees ……..….. crore) (the "**Guarantee Amount**").

(C) We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (*hereinafter called the* **"Guarantee**") by wayof Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the {Construction Period/ Defects Liability Period and Maintenance Period} under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show groundsor reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of Chief Engineer in Raipur, Chhattisgarh that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that

the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Agreementor to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Agreement or to postponefor any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any ofthe terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect on ****$. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shallbe discharged from its liabilities hereunder.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorised to receive such notice and to effect payment thereof forthwith, and if

sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

13. This guarantee shall also be operatable at our..... Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment there under claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation. 14. Bank Guarantee has been sent to authority's bank through SFMS gateway as per the details below:-

Sl. No	**Particulars**	**Details**
1	Name of the Beneficiary	National Highways and Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank, Transport Bhawan, 1st Parliament street, New Delhi-110001

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

Annexure -II

(Schedule-G)

Form of Guarantee for Withdrawal of Retention Money

……..
…….
……..
……

WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "Agreement") with the [name and address of the authority], (hereinafter called the "**Authority**") for the Development of Military Infrastructure at Ramnagar in the State of Uttarakhand on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement.

(B) In accordance with Clause 7.5.3 of the Agreement, the Contractor may withdraw the retention money (hereinafter called the "**Retention Money**") after furnishing to the Authority a bank guarantee for an amount equal to the proposed withdrawal.

(C) We, …….. through our branch at ……. (the "**Bank**") have agreed to furnish this bank guarantee (hereinafter called the "**Guarantee**") for the amount of Rs. --------- cr. (Rs---------- crore) (the "**Guarantee Amount**").

NOW, THEREFORE, the Bank hereby unconditionally and irrevocably guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of Chief Engineer in Raipur, Chhattisgarh, that the Contractor has committed default in the due and faithful performance of all or any of its obligations for under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in defaultin due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Retention Money and any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Retention Money.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect 90 (ninety) days after the date of the Completion Certificate specified in Clause 12.4 of the Agreement.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) ishereby excluded.

13. This guarantee shall also be operatable at our…….. Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall

be made available on demand. In the contingency of this guarantee being invoked and payment there under claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation. 14. Bank Guarantee has beensent to authority's bank through SFMS gateway as per the details below:-

Sl. No	Particulars	Details
1	Name of the Beneficiary	National Highways and Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank, Transport Bhawan, 1st Parliament street, New Delhi-110001

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

Annexure -III

(Schedule-G)

Form of Guarantee for Advance Payment

……..
……..
……..
……..

WHEREAS:

(A) [name and address of contractor] (hereinafter called the "**Contractor**") has executed an agreement (hereinafter called the "**Agreement**") with the [name and address of the authority], (hereinafter called the "**Authority**") for Development of Military Infrastructure at Ramnagar in the State of Uttarakhand on Engineering, Procurement and Construction (the "**EPC**") basis, subject to and in accordance with the provisions of the Agreement

(B) In accordance with Clause 19.2 of the Agreement, the Authority shall make to the Contractor an interest free advance payment (herein after called "**Advance Payment**") equal to 10% (ten per cent) of the Contract Price; and that the Advance Payment shall be made in three installments subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equivalent to 110% (one hundred and ten percent) of such installment to remain effective till the complete and full repayment of the installment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement. The amount of {first/second/third} installment of the Advance Payment is Rs. ------ cr. (Rupees crore) and the amount of this Guarantee is Rs. ------- cr. (Rupees crore) (the **"Guarantee Amount")**[$]

(C) We, …….. through our branch at ……. (the "**Bank"**) have agreed to furnish this bank guarantee (*hereinafter called the* **"Guarantee"**) for the Guarantee Amount.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the Authority, uponits mere first written demand, and

2. A letter from the Authority, under the hand of an officer not below the rank of Chief Engineer in Raipur, Chhattisgarh, that the Contractor has committed default in the dueand faithful performance of all or any of its obligations for the repayment of the

[$]The Guarantee Amount should be equivalent to 110% of the value of the applicable instalment. without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

instalment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Agreement and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any suchlaw.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Advance Payment.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect on ****.[$] Unless a demand or claim under this Guarantee is made in writing on or before the aforesaid date, the Bank shall be discharged from its liabilities hereunder.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and ifsent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Agreement.

12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) ishereby excluded.

13. This guarantee shall also be operatable at our…….. Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment there under claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation. 14. Bank Guarantee has beensent to authority's bank through SFMS gateway as per the details below:-

Sl. No	**Particulars**	**Details**
1	Name of the Beneficiary	National Highways and Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Syndicate Bank, Transport Bhawan, 1st Parliament street, New Delhi-110001

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

SCHEDULE-H: Contract Price Weightages

1.1 The Contract Price for this Agreement is Rs ----------

1.2 Proportions of the Contract Price for different stages of Construction of the Military Infrastructure shall be asspecified below:

SN	Facilities	Percentage as per total price
1	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District	3.73%
2	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District	4.67%
3	Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District	4.78%
4	Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K	4.76%
5	6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu	19.65%
6	02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K	32.32%
7	Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K	4.38%
8	Ancillary Work in Akhnoor village, Chak Singh Jammu District	25.71%
	Total	100%

Distribution of items into sub weightage and payment schedule

Item	Weightage in percentageto the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
A. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District			

Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%
		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.75%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4) Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Ground Floor)	31.25%	**A- Completion of Civil Works**	
		(1) Foundation work upto plinth level	15.75%
		(2) Column/Shear Wall/ Slab/beams/Staircase	18.19%
		(3) Construction of walls	18.98%
		(4) Construction of Flooring	15.00%
		(5) Supply and fixing of Door/windows including wood work, painting, etc	7.08%

		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	2.50%
		(2) Painting work	2.50%
		C- External Finishing	5.00%
		D- Internal Electric Installation	5.00%
		E- Internal Plumbing Installation	5.00%
Residential Block(First Floor)	38.90%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	28.37%
		(2) Completion of walls	22.90%
		(3) Completion of Flooring	11.07%
		(4) Completion of Door, windows including wood work, painting, etc	18.32%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	5.00%
		(2) Painting work	2.63%
		C- External Finishing	5.00%
		D- Internal Electric Installation	2.70%
		E- Internal Plumbing Installation	4.00%
Roof Top area	4.50%	(1) Construction of parapet across terrace	20.00%
		(2) Aesthetic work at roof top	20%
		(3) PVC Water storage tanks	55%
		(4) Coverage over Verandah at first floor	5.0%
Completion of E&M works	10.35%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	

		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Solar water heaters at roof top	22.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%
		(5) Complete Installation of DG set	20.00%
		(6) Completion of HVAC and BMS Work	20.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority's Engineer	10.00%
Completion of Plumbing & fire fighting works	5.75%	(1) Complete Installation of Fire Fighting system	30.00%
		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti Termite proofing, Horticulture and Landscaping Works	2.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%
		(2) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	3.00%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	2	3	4
B. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Captain Rank in Jammu District			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%
		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.00%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Ground Floor)	38.50%	**A- Completion of Civil Works**	

		(1) Foundation work upto plinth level	18.18%
		(2) Column/Shear Wall/ Slab/beams	36.05%
		(3) Construction of walls	10.30%
		(4) Construction of Flooring	10.20%
		(5) Supply and fixing of Door/windows including wood work, painting, etc	5.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	2.61%
		(2) Painting work	2.66%
		C- External Finishing	5.00%
		D- Internal Electric Installation	5.00%
		E- Internal Plumbing Installation	5.00%
Residential Block(First Floor)	31.50%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	38.09%
		(2) Completion of walls	26.98%
		(3) Completion of Flooring	9.52%
		(4) Completion of Door, windows including wood work, painting, etc	5.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	5.00%
		(2) Painting work	5.00%
		C- External Finishing	5.41%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	2.00%

Roof Top area	4.00%	(1) Construction of parapet across terrace	20.00%
		(2) Aesthetic work at roof top	20.00%
		(3) PVC Water storage tanks	55.00%
		(4) Coverage over Verandah at first floor	5.00%
Completion of E&M works	11.80%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Solar water heaters at roof top	22.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%
		(5) Complete Installation of DG set	20.00%
		(6) Completion of HVAC and BMS Work	20.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority‘s Engineer	10.00%
Completion of Plumbing & fire fighting works	4.75%	(1) Complete Installation of Fire Fighting system	30.00%
		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%

Anti Termite treatment Horticulture and Landscaping Works	2.45%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30%
		(3) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40%
Handing over of the complete project with commissioning of all E&M works	2.00%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentageto the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
C. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Uri Lines in Jammu District			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%
		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall &	1.50%	**A-<u>Boundary Wall & Gate</u>**	

Gate		(1) Foundation works	20.75%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Ground Floor)	31.25%	**A- Completion of Civil Works**	
		(1) Foundation work upto plinth level	15.75%
		(2) Column/Shear Wall/ Slab/beams	18.19%
		(3) Construction of walls	18.98%
		(4) Construction of Flooring	15.00%
		(5) Supply and fixing of Door/windows including wood work, painting, etc	7.08%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	2.50%
		(2) Painting work	2.50%
		C- External Finishing	5.00%
		D- Internal Electric Installation	5.00%
		E- Internal Plumbing Installation	5.00%
Residential Block(First Floor)	38.90%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	28.37%
		(2) Completion of walls	22.90%
		(3) Completion of Flooring	11.07%
		(4) Completion of Door, windows including wood work, painting, etc	18.32%
		B - Internal Finishing and painting	

		(1) Surface finishing with synthetic mortar	5.00%
		(2) Painting work	2.63%
		C- External Finishing	5.00%
		D- Internal Electric Installation	2.70%
		E- Internal Plumbing Installation	4.00%
Roof Top area	4.50%	(1) Construction of parapet across terrace	20.00%
		(2) Aesthetic work at roof top	20%
		(3) PVC Water storage tanks	55%
		(4) Coverage over Verandah at first floor	5.0%
Completion of E&M works	10.35%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Solar water heaters at roof top	22.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%
		(5) Complete Installation of DG set	20.00%
		(6) Completion of HVAC and BMS Work	20.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority‘s Engineer	10.00%
Completion of Plumbing & fire	5.75%	(1) Complete Installation of Fire Fighting system	30.00%

fighting works		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti Termite Proofing, Horticulture and Landscaping Works	2.00%	(2) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%
		(2) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	3.25%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentageto the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
D. Two Storey Family Accomodation Block (4 houses) for JCO's at district Jammu, UT of J&K			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%

		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.00%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Ground Floor)	39.85%	**A- Completion of Civil Works**	
		(1) Foundation work upto plinth level	17.57%
		(2) Column/Shear Wall/ Slab/beams	36.93%
		(3) Construction of walls	10.41%
		(4) Construction of Flooring	8.78%
		(5) Supply and fixing of Door/windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	2.50%
		(2) Painting work	2.52%
		C- External Finishing	5.29%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(First Floor)	29.75	**A- Completion of Civil Works**	

		(1) Column/Shear Wall/ Slab/beams	37.31%
		(2) Completion of walls	27.39%
		(3) Completion of Flooring	8.41%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	4.89%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Roof Top area	5.90%	(1) Construction of parapet across terrace	15.00%
		(2) Aesthetic work at roof top	20%
		(3) PVC Water storage tanks	55%
		(4) Coverage over Verandah at first floor	10.00%
Completion of E&M works	9.40%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Solar water heaters at roof top	22.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom	5.00%

		Barriers on campus gates etc.,	
		(5) Complete Installation of DG set	20.00%
		(6) Completion of HVAC and BMS Work	20.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority's Engineer	10.00%
Completion of Plumbing & fire fighting works	5.40%	(1) Complete Installation of Fire Fighting system	30.00%
		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti Termite Treatment, Horticulture and Landscaping Works	2.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30%
		(2) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	3.70%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentageto the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
E. 6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	

		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%
		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.00%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Stilt Floor)	15.05%	**A-** Foundation work upto plinth level	52.46%
		B- Construction of walls and beams	19.67%
		C- Construction of Staircases & flooring	24.59%
		D- Construction of Elevator duct	3.28%
Residential Block (Ground Floor)	10.4%	**A- Completion of Civil Works**	
		(1 Column/Shear Wall/ Slab/beams	60.19%
		(2) Construction of walls	9.53%
		(3) Construction of Flooring	9.52%

		(4) Supply and fixing of Door/windows including wood work, painting, etc	4.76%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	4.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(First Floor)	6.60%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	53.95%
		(2) Completion of walls	13.16%
		(3) Completion of Flooring	13.16%
		(4) Completion of Door, windows including wood work, painting, etc	4.74%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	3.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block (Second Floor)	7.6%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	53.95%
		(2) Completion of walls	13.16%
		(3) Completion of Flooring	13.16%

		(4) Completion of Door, windows including wood work, painting, etc	4.74%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	3.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block (Third Floor)	7.60%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	53.95%
		(2) Completion of walls	13.16%
		(3) Completion of Flooring	13.16%
		(4) Completion of Door, windows including wood work, painting, etc	4.74%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	3.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(Fourth Floor)	7.60%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	53.95%
		(2) Completion of walls	13.16%
		(3) Completion of Flooring	13.16%

		(4) Completion of Door, windows including wood work, painting, etc	4.74%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	3.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(Fifth Floor)	7.60%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	53.95%
		(2) Completion of walls	13.16%
		(3) Completion of Flooring	13.16%
		(4) Completion of Door, windows including wood work, painting, etc	4.74%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	3.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(Sixth Floor)	5.55%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	36.93%
		(2) Completion of walls	18.02%
		(3) Completion of Flooring	18.02%

		(4) Completion of Door, windows including wood work, painting, etc	10.0%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	4.00%
		C- External Finishing	4.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.03%
Roof Top area	8.7%	(1) Construction of parapet across terrace	32.18%
		(2) Machine room and Finishing work	54.02%
		(3) PVC Water storage tanks	8.05%
		(4) Coverage over Verandah at first floor	5.75%
Completion of E&M works	12.50%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Installation of Elevators	45.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%
		(5) Complete Installation of DG set	10.00%
		(6) Completion of HVAC and BMS Work	15.00%

		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority's Engineer	5.00%
Completion of Plumbing & fire fighting works	3.30%	(1) Complete Installation of Fire Fighting system	30.00%
		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti Termite Proofing Horticulture and Landscaping Works	1.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	60%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30%
		(2) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	2.5%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentageto the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
F. 02 Nos of 6 Storey Family Accommodation Block of 24 No's for OR's at district Jammu, UT of J&K			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%

		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%
		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.00%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Stilt Floor)	10.70%	**A-** Foundation work upto plinth level	61.42%
		B- Construction of Electrical room	11.81%
		C- Construction of Staircases	18.90%
		D- Construction of Elevator duct	7.87%
Residential Block (Ground Floor)	10.8%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	50.79 %
		(2) Construction of walls	8.47%
		(3) Construction of Flooring	11.01%
		(4) Supply and fixing of Door/windows including wood work, painting, etc	12.71%
		B - Internal Finishing and painting	

		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Residential Block(First Floor)	7.5%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	45.33%
		(2) Completion of walls	13.33%
		(3) Completion of Flooring	13.34%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	4.00%
Residential Block (Second Floor)	7.5%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	45.33%
		(2) Completion of walls	13.33%
		(3) Completion of Flooring	13.34%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	

		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	4.00%
Residential Block (Third Floor)	7.5%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	45.33%
		(2) Completion of walls	13.33%
		(3) Completion of Flooring	13.34%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	4.00%
Residential Block(Fourth Floor)	7.5%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	45.33%
		(2) Completion of walls	13.33%
		(3) Completion of Flooring	13.34%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	

		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	4.00%
Residential Block(Fifth Floor)	7.5%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	45.33%
		(2) Completion of walls	13.33%
		(3) Completion of Flooring	13.34%
		(4) Completion of Door, windows including wood work, painting, etc	10.00%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	4.00%
Residential Block(Sixth Floor)	8.85%	**A- Completion of Civil Works**	
		(1) Column/Shear Wall/ Slab/beams	22.60%
		(2) Completion of walls	22.60%
		(3) Completion of Flooring	22.55%
		(4) Completion of Door, windows including wood work, painting, etc	15.25%
		B - Internal Finishing and painting	

		(1) Surface finishing with synthetic mortar	3.00%
		(2) Painting work	3.00%
		C- External Finishing	5.00%
		D- Internal Electric Installation	3.00%
		E- Internal Plumbing Installation	3.00%
Roof Top area	6.00%	(1) Construction of parapet across terrace	18.18%
		(2) Machine room and finishing work	60.77%
		(3) PVC Water storage tanks	11.36%
		(4) Coverage over Verandah at first floor	4.00%
Completion of E&M works	14.00%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	10.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Installation of Elevators	60.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom Barriers on campus gates etc.,	4.00%
		(5) Complete Installation of DG set	10.00%
		(6) Completion of HVAC and BMS Work	5.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority‘s Engineer	5.00%
Completion of Plumbing & fire	4.70%	(1) Complete Installation of Fire Fighting system	30.00%

fighting works		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti Termite Proofing Horticulture and Landscaping Works	1.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%
		(3) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	2.45%	Handing over of the complete project with commissioning of all E&M works	100.00%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
G. Two Storied (02 Storeyed) family accomodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Children Park in Jammu District, UT of J&K			
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing for entire scope of work and opening of office for Authority**	
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%
		(2) On approval of final drawings Architectural Drawings	13.00%
		(3) On approval of structure design by Authority Engineer	15.00%
		(4) On obtaining required approvals from Various government bodies	12.00%
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%

		(7) Establishing office for Authority as per Schedule-B	18.00%
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%
Boundary wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**	
		(1) Foundation works	20.00%
		(2) Civil works of boundary wall	50.00%
		(3) Construction/erection of two gate cabin	15.00%
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%
Residential Block (Ground Floor)	31.25%	**A- Completion of Civil Works**	
		(1) Foundation work upto plinth level	15.75%
		(2) Column/Shear Wall/ Slab/beams	18.19%
		(3) Construction of walls	18.98%
		(4) Construction of Flooring	15.00%
		(5) Supply and fixing of Door/windows including wood work, painting, etc	7.08%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	2.50%
		(2) Painting work	2.50%
		C- External Finishing	5.00%
		D- Internal Electric Installation	5.00%
		E- Internal Plumbing Installation	5.00%
Residential Block(First Floor)	38.90%	**A- Completion of Civil Works**	

		(1) Column/Shear Wall/ Slab/beams	28.37%
		(2) Completion of walls	22.90%
		(3) Completion of Flooring	11.07%
		(4) Completion of Door, windows including wood work, painting, etc	18.32%
		B - Internal Finishing and painting	
		(1) Surface finishing with synthetic mortar	5.00%
		(2) Painting work	2.63%
		C- External Finishing	5.00%
		D- Internal Electric Installation	2.70%
		E- Internal Plumbing Installation	4.00%
Roof Top area	4.50%	(1) Construction of parapet across terrace	20.00%
		(2) Aesthetic work at roof top	20%
		(3) PVC Water storage tanks	55%
		(4) Coverage over Verandah at first floor	5.0%
Completion of E&M works	10.35%	**(1) All Electrical Works including DG Sets etc. complete as per the scope of work complete.**	
		(i) Supply of Equipments / parts	17.00%
		(ii) Installation, Testing & Commissioning	3.00%
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%
		(3) Solar water heaters at roof top	22.00%
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required data cabling etc. complete. Installations of Boom	5.00%

		Barriers on campus gates etc.,	
		(5) Complete Installation of DG set	20.00%
		(6) Completion of HVAC and BMS Work	20.00%
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority's Engineer	10.00%
Completion of Plumbing & fire fighting works	5.75%	(1) Complete Installation of Fire Fighting system	30.00%
		(2) Complete external water-supply system / grid including supply and Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%
		(3) Completion of sewerage system/grid.	10.00%
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%
Anti termite proofing, completion of all Horticulture and Landscaping Works	2.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%
		(3) Development of Horticulture work as per the approved plan mentioned in the tender document and drawings.	40.00%
Handing over of the complete project with commissioning of all E&M works	3.25%	Handing over of the complete project with commissioning of all E&M works	100%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage
1	**2**	**3**	**4**
H. Ancillary works in Uri, Rajouri Lines and Chak singh			
Ancillary work Site Levelling, Grading and Demolition of existing structures Boundary wall &	100%	**Part A- In Uri Lines and Rajouri Lines**	
		Building No.P-20 (Toilet Block)	0.10%

Gate Residential Block (Ground Floor) Residential Block(First Floor) Roof Top area Completion of E&M works Completion of Plumbing & fire fighting works		Septic Tank Near P-86, P-09	0.20%
		Drainage Near T-95 &T-97 Block	0.30%
		Building No.T-54, T-55	1.80%
		Building No. T99C, T-99D (Toilet Block)	0.40%
		Building No.t-14, t-17	8.40%
		TAPPS Bio Toilet (Four Seater with Two Bio digester)	0.00%
		Septic Tank	0.10%
		Providing and laying Optical Fiber (OFC) along with the all accessories connectors, switches etc.	0.20%
		PLB-HDPE (Permently Lubricated High Density Poly Ethylene) pipe 40mm, dia pipe for laying optical Fiber Cable	0.10%
		Cable RCC Route Marker and Straight Joint maker	0.00%
		Providing and laying JFC (10 Pair 5 mm) along with the all accessories connectors, switches etc.	0.10%
		Providing and laying JFC (20 Pair 10 min) along with the all accessories connectors, switches etc.	0.10%
		Boundary Wall near new APS Ht=4 M above finish road level with fencing	3.20%
		Internal road of 3.75 m width of 375 m length	5.00%
		Part B- In Chak Singha Village	0.00%
		LT Overhead Feeder including Pole, Cross Arms, Insulators, Stay etc.	0.20%
		LT Undergound Cable of size 10 SqmmX 4 Core including Poles Street Lights and Junction Boxes etc with Earthing.	1.40%
		HT Underground Cable of size 95 Sqmm x 3 Core including End Joints, PCC Covers, Sand etc including Cable Protection pipe under Road.	2.00%
		Two Pole Structure complete with Earthing GOD ETC	0.30%
		CI/DI Pipe line of size 150 mm Dia.	0.50%
		GI Pipe lines of of size 50/40/25/20 mm including Gate valves.	0.20%

		Shifting Transformer including Connected Accessories, LT Panel, Cable, Fencing	0.40%
		CI/DI Pipe line of size 100 mm Dia.	3.30%
		HT 11 KV Feeder including Pole, Cross Arms, insulators, stay, Earthing etc.	1.50%
		Armoured jelly Filled Cable 20 Pair.	0.50%
		Armoured jelly Filled Cable 50 Pair.	1.30%
		Armoured jelly Filled Cable 100 Pair.	0.30%
		Armoured Opticab Fibre Cable 12 Core Single Mode.	0.70%
		Boundary wall Road, 4m High RCC wall with 7' view Cutters above finished road level.	2.10%
		Road along the newly constructed wall Width 5M, GSB 150mm, WMM=150mm, DBM-50mm & BC=40mm	1.40%
		Sentry Post with Guard Room	1.20%
		Regimental Buildings	20.10%
		Vocational Training Buildings	**8.2%**
		Vocational Training Buildings (open sheds)	
		Vocational Training Buildings (Basket Ball Court)	
		(i) Foundation work upto plinth level	**20%**
		(ii) Construction of Wall, Shear wall, Beams and Column	**30%**
		(iii) Construction of Roof and flooring	**20%**
		(iv) Jointary, finishes, E&M work, water supply etc	**30%**
		Boundary Wall (Reconstruction site)	0.10%
		Jafri Compound Wall 1.5M High with RCC Columns	0.00%
		Steel Gate with 3.5m Wide with RCC Columns	0.20%
		Integrated Perimeter Security System	0.20%

		OR'S Institute (s/s)	**1.70%**
		(i) Foundation work upto plinth level	20%
		(ii) Construction of Wall, Shear wall, Beams and Column	30%
		(iii) Construction of Roof and flooring	20%
		(iv) Jointary, finishes, E&M work, water supply etc	30%
		02 Pole Structure	0.10%
		Security Light Pole	0.60%
		Security Light	0.20%
		Part C- In Ambaran Village	0.00%
		Boundary Wall (Reconstruction with Integrated Perimeter Security System)	**13.60%**
		Sentry Post with Guard Room	0.60%
		Steel Gate	0.60%
		Tower Post	0.20%
		Fencing	0.70%
		Security Post	3.00%
		Officer Mes Area	**6.60%**
		(i) Foundation work upto plinth level	20%
		(ii) Construction of Wall, Shear wall, Beams and Column	30%
		(iii) Construction of Roof and flooring	20%
		(iv) Jointary, finishes, E&M work, water supply etc	30%
		Inter connectivity (03 km distance with a min width of 3.5m to 4m)	5.80%
		12 Core optical fibre	0.10%
		Jelly Filled Cable 20 Pair Armoured	0.10%

1.3 Procedure of estimating the value of work done.

1.3.1 Military Infrastructure Works

Procedure for estimating the value of work done shall be as follows:

A. Two Storied (02 Storyed) family accommodation Block (04 houses) for Army Officers of Major Rank at Rajouri Lines near Pre-Primary School in Jammu District

Item	Weightage in percentageto the ContractPrice	Stage for Payment	Percentage weightage	Procedure of Payment
1	2	3	4	
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing forentire scope of work**		
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%	On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings
		(2) On approval of final drawings Architectural Drawings	13.00%	On approval of final drawings Architectural Drawings
		(3) On approval of structure design by Authority Engineer	15.00%	On approval of structure design by Authority Engineer
		(4) On obtaining required approvals from Various government bodies	12.00%	On obtaining required approvals from Various government bodies
		(5) On approval of all drawings for electrical, sanitary work, services, development, landscaping/horticulture and art works	12.00%	On approval of all drawings for electrical, sanitary work, services, development, landscaping and art works
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%	On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc

		(7) Establishing office for Authority as per Schedule-B	18.00%	On completion of establishment of office as per Schedule-B
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%	On completion and submission of digital walk through video of complete Military Infrastructure prospective view of min. 2 minutes.
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area/length.
Boundary Wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**		
		(1) Foundation works	20.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(2) Civil works of boundary wall	50.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length
		(3) Construction/erection of two gate cabin	15.00%	Unit of measurement is complete work as per specification. Payment of each stage shall be made on completion of the one gate cabin on pro rata basis.
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%	Unit of measurement is complete work as per specification. Payment shall be made on the completion of atleast one no. of gates and signages on prorata basis.
Residential Building (Ground Floor)	31.25%	**A- Completion of Civil Works**		
		(1) Foundation work upto plinth level	15.75%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis

				on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(2) Column/Shear Wall/ Slab/beams	18.19%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Construction of walls	18.98%	Unit of measurement is area/length (sqm/m). Payment of each stage shallbe made on pro rata basis on completion of a stage ina area/length of not less than 10 (ten) percent of the total area/length.
		(4) Construction of Flooring	15.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(5) Supply and fixing of Door/windows including wood work, painting, etc	7.08%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting. Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	2.50%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	2.50%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.

		C- External Finishing	5.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		D- Internal Electric Installation	5.00%	
		E- Internal Plumbing Installation	5.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion ofa stage in a area of not less than 10 (ten) percent of the total area.
Residential Building (First Floor)	38.90%	**A- Completion of Civil Works**		
		(1) Column/Shear Wall/ Slab/beams	28.37%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	22.90%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	11.07%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	18.32%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors andwindows.
		B - Internal Finishing and painting		

		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	2.63%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	5.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		D- Internal Electric Installation	2.70%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	4.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Roof Top area	4.50%	(1) Construction of parapet across terrace	20.00%	Unit of measurement is finished top area (sqm). Payment of each stage shall be made on pro rata basison full completion of a stage.
		(2) Aesthetic work at roof top	20%	
		(3) PVC Water storage tanks	55%	
		(4) Coverage over Verandah at first floor	5.0%	
Completion of E&M works	10.35%	**(1) All ElectricalWorks including DG Sets etc. complete as per the scope of work complete.**		
		(i) Supply of Equipments / parts	17.00%	Unit of measurement is Cost of supplied equipments/parts. Payment

				shall be determined pro rate with respect to the total cost of equipments/parts. Payment shall be made on the supply of atleast 20% of the cost of the equipments/parts.
		(ii) Installation, Testing & Commissioning	3.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
		(3) Parking Management System	22.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 20 (twenty) percent of the total area.
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required datacabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%	Cost of completed works shall be determined pro rate with respect to the procurement, installation & commissioning works.Payment shall be made on 40% on procurement and balance on the completionof all works.
		(5) Complete Installation of DG set	20.00%	Cost of completed works shall be determined pro rate with respect to the procurement, installation & commissioning works. Payment shall be made on 70% on procurement and balance 30% on the completion of all works.
		(6) Completion of HVAC and BMS Work	20.00%	Cost of completed works shall be determined pro rate with respect to the

				procurement, installation & commissioning works. Payment shall be made on 40% on procurement and balance 30% on the completion of all works.
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority‘s Engineer	10.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
Completion of Plumbing & firefighting works	5.75%	(1) Complete Installation of Fire Fighting system	30.00%	Cost of completed works shall be determined pro rate with respect to the procurement & installation works. Payment shall be made on 70% on procurement and balance 30% on the completion of all works.
		(2) Complete external water-supply system / grid including supplyand Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%	Cost of completed works shall be determined pro rate with respect to the procurement & installationworks. Payment shall be made on 50% on procurement and balance 50% on the completion ofall works.
		(3) Completion of sewerage system/grid.	10.00%	
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%	
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%	
Anti Termite Treatment, completion of all Horticulture Works	2.00%			
		(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 25 (twenty five) percent of the total area.
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 25 (twenty five)percent of the total area

		(3) Development of Horticulture works as per the approved plan mentioned in the tender document and drawings.	40.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 25 (twenty five) percent of the total area.
Handing over of the complete project with commissioning of all E&M works	3.25%	Handing over of the complete project with commissioning of all E&M works	100%	Unit of measurement is completion of works. Payment shall be made on completion of all work

#Accordingly, the same payment procedure will be followed for all the requisite 2 storey Infrastructure for Major, Captain & JCO

B. 6 Storey Family Accomodation Block of 24 No's for JCO's at district Jammu

Item	Weightage in percentageto the ContractPrice	Stage for Payment	Percentage weightage	Procedure of Payment
1	2	3	4	
Investigation, Planning, Designing,	2.00%	**Investigation, planning, Designing forentire scope of work**		
		(1) On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings	12.00%	On approval of inception report & Site survey, Geo- technical investigation and preparation of preliminary Architectural Drawings
		(2) On approval of final drawings Architectural Drawings	13.00%	On approval of final drawings Architectural Drawings
		(3) On approval of structure design by Authority Engineer	15.00%	On approval of structure design by Authority Engineer
		(4) On obtaining required approvals from Various government bodies	12.00%	On obtaining required approvals from Various government bodies
		(5) On approval of all drawings for electrical, sanitary work, services, development,	12.00%	On approval of all drawings for electrical, sanitary work, services, development, landscaping and art works

		landscaping/horticulture and art works		
		(6) On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc	10.00%	On approval of DG sets, STP & Sub Station, lifts & escalators shop drawings etc
		(7) Establishing office for Authority as per Schedule-B	18.00%	On completion of establishment of office as per Schedule-B
		(8) Digital walk through video of complete Military Infrastructure prospective view of minimum 2 minutes.	8.00%	On completion and submission of digital walk through video of complete Military Infrastructure prospective view of min. 2 minutes.
Site Levelling, Grading and Demolition of existing structures	0.50%	**Site Levelling, Grading and Demolishing of Existing Structures**	100%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area/length.
Boundary Wall & Gate	1.50%	**A-<u>Boundary Wall & Gate</u>**		
		(1) Foundation works	20.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(2) Civil works of boundary wall	50.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length
		(3) Construction/erection of two gate cabin	15.00%	Unit of measurement is complete work as per specification. Payment of each stage shall be made on completion of the one gate cabin on pro rata basis.
		(4)Construction/erection of Gate works (entry and Exit) and signages (at entry and Exit)	15.00%	Unit of measurement is complete work as per specification. Payment shall be made on the completion of atleast one no. of gates and signages on prorata basis.

Residential Block (Stilt Floor)	15.05%	**A- Completion of Parking**	30.00%	Unit of measurement is complete work as per specification. Payment of each stage shall be made on completion of full stage
		B- Construction of Electrical room	20.00%	
		C- Construction of Staircases	30.00%	
		D- Construction of Elevator duct	20.00%	
Residential Building (Ground Floor)	10.4%	**A- Completion of Civil Works**		
		(1) Foundation work upto plinth level	20.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(2) Column/Shear Wall/ Slab/beams	12.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Construction of walls	10.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shallbe made on pro rata basis on completion of a stage ina area/length of not less than 10 (ten) percent of the total area/length.
		(4) Construction of Flooring	20.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(5) Supply and fixing of Door/windows including wood work, painting, etc	10.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting. Payment shall be made on the completion of atleast five no. of doors and windows.

		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	4.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	4.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		C- External Finishing	10.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		D- Internal Electric Installation	5.00%	
		E- Internal Plumbing Installation	5.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion ofa stage in a area of not less than 10 (ten) percent of the total area.
Residential Building (First Floor)	6.60%	**A- Completion of Civil Works**		
		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro

				rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors andwindows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Residential Block(Second Floor)	7.60%	**A- Completion of Civil Works**		

		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area

		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Residential Block(Third Floor)	7.60%	**A- Completion of Civil Works**		
		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of

				a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Residential Block(Fourth Floor)	7.60%	**A- Completion of Civil Works**		
		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the

				total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Residential Block(Fifth Floor)	7.60%	**A- Completion of Civil Works**		

		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area

		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Residential Block(Sixth Floor)	5.55%	**A- Completion of Civil Works**		
		(1) Column/Shear Wall/ Slab/beams	19.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Completion of walls	14.00%	Unit of measurement is area/length (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area/length of not less than 10 (ten) percent of the total area/length.
		(3) Completion of Flooring	21.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		(4) Completion of Door, windows including wood work, painting, etc	12.00%	Cost of completed works shall be determined pro rate with respect to the total number of door/windows works including painting . Payment shall be made on the completion of atleast five no. of doors and windows.
		B - Internal Finishing and painting		
		(1) Surface finishing with synthetic mortar	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of

				a stage in a area of not less than 10 (ten) percent of the total area.
		(2) Painting work	5.00%	Unit of measurement is area (sqm). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		C- External Finishing	12.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area
		D- Internal Electric Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
		E- Internal Plumbing Installation	6.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 10 (ten) percent of the total area.
Roof Top area	8.70%	(1) Construction of parapet across terrace	15%	Unit of measurement is finished top area (sqm). Payment of each stage shall be made on pro rata basison full completion of a stage.
		(2) Aesthetic work at roof top	20%	
		(3) PVC Water storage tanks	50%	
		(4) Coverage over Verandah at first floor	15.00%	
Completion of E&M works	12.50%	**(1) All ElectricalWorks including DG Sets etc. complete as per the scope of work complete.**		
		(i) Supply of Equipments / parts	17.00%	Unit of measurement is Cost of supplied equipments/parts. Payment shall be determined pro rate with respect to the total cost of equipments/parts. Payment shall be made on

				the supply of atleast 20% of the cost of the equipments/parts.
		(ii) Installation, Testing & Commissioning	3.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
		(2) Completion of Cabling, P&F rising main, meter, Panel etc. and connection to the Main Receiving Station including clearance of statutory authorities.	3.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
		(3) Parking Management System	22.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 20 (twenty) percent of the total area.
		(4) Designing & Installing & commissioning of CCTV Cameras covering all, covering entry &exit points of each buildings and main gates with adequate display of cameras on LED screens in control rooms, including control rooms, display system and software support system and required datacabling etc. complete. Installations of Boom Barriers on campus gates etc.,	5.00%	Cost of completed works shall be determined pro rate with respect to the procurement, installation & commissioning works.Payment shall be made on 40% on procurement and balance on the completionof all works.
		(5) Complete Installation of DG set	20.00%	Cost of completed works shall be determined pro rate with respect to the procurement, installation & commissioning works. Payment shall be made on 70% on procurement and balance 30% on the completion of all works.
		(6) Completion of HVAC and BMS Work	20.00%	Cost of completed works shall be determined pro rate with respect to the procurement, installation & commissioning works. Payment shall be made on 40% on procurement and

				balance 30% on the completion of all works.
		(7) All testing of control rooms, displays and system etc. complete as per the direction of Authority‘s Engineer	10.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work.
Completion of Plumbing & firefighting works	3.30%	(1) Complete Installation of Fire Fighting system	30.00%	Cost of completed works shall be determined pro rate with respect to the procurement & installation works. Payment shall be made on 70% on procurement and balance 30% on the completion of all works.
		(2) Complete external water-supply system / grid including supplyand Installation of Pumps., over Head Tanks, Water supply Lines, drainage pipes, Vitreous Chinaware, CP Fittings	40.00%	Cost of completed works shall be determined pro rate with respect to the procurement & installationworks. Payment shall be made on 50% on procurement and balance 50% on the completion ofall works.
		(3) Completion of sewerage system/grid.	10.00%	
		(4) Completion of Drainage system & Rain water Harvesting including recharge well & Tube Wells.	10.00%	
		(5) Completion of STP/ETP, waste water recycling plant, etc	10.00%	
Anti Termite treatment, completion of all Horticulture Works	1.00%	(1) Complete supply, installation, testing of the irrigation system for Horticulture works such as filling of good earth, grassing, tree plantation etc.	30.00%	Unit of measurement is area (sqm/m). Payment of each stage shall be made on pro rata basis on completion of a stage in a area of not less than 25 (twenty five) percent of the total area.
		(2) Anti Termite Proofing at foundation, slab/column/beam, walls, Door/Windows etc on ground and first floor	30.00%	
		(3) Development of Horticulture works as per the approved plan mentioned in the tender document and drawings.	40.00%	

Handing over of the complete project with commissioning of all E&M works	2.50%	Handing over of the complete project with commissioning of all E&M works	100.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work

 # Accordingly, the same payment procedure will be followed for all the requisite 6 storey Infrastructure for ORs

C. Ancillary works in Uri, Rajouri Lines and Chak singh

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage	Procedure of payment
1	**2**	**3**	**4**	
H. Ancillary works in Uri, Rajouri Lines and Chak singh				
Ancillary work Site Levelling ,Grading and Demolition o fexisting structures Boundary wall & Gate Residential Block (Ground Floor) Residential Block(First Floor) Roof Top area Completion of E&M works Completion of Plumbing & fire fighting works	100%	**Part A- In Uri Lines and Rajouri Lines**		
		Building No.P-20 (Toilet Block)	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Septic Tank Near P-86, P-09	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Drainage Near T-95 &T-97 Block	0.30%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Building No.T-54, T-55	1.80%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Building No. T99C, T-99D (Toilet Block)	0.40%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Building No.t-14, t-17	8.40%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		TAPPS Bio Toilet (Four Seater with Two Bio digester)	0.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work

		Septic Tank	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Providing and laying Optical Fiber (OFC) along with the all accessories connectors, switches etc.	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		PLB-HDPE (Permently Lubricated High Density Poly Ethylene) pipe 40mm, dia pipe for laying optical Fiber Cable	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Cable RCC Route Marker and Straight Joint maker	0.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Providing and laying JFC (10 Pair 5 mm) along with the all accessories connectors, switches etc.	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Providing and laying JFC (20 Pair 10 min) along with the all accessories connectors, switches etc.	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Boundary Wall near new APS Ht=4 M above finish road level with fencing	3.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Internal road of 3.75 m width	5.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Part B- In Chak Singha Village	0.00%	
		LT Overhead Feeder including Pole, Cross Arms, Insulators, Stay etc.	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		LT Undergound Cable of size 10 SqmmX 4 Core including Poles Street Lights and Junction Boxes etc with Earthing.	1.40%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		HT Underground Cable of size 95 Sqmm x 3 Core including End Joints, PCC Covers, Sand etc including Cable Protection pipe under Road.	2.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Two Pole Structure complete with Earthing GOD ETC	0.30%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		CI/DI Pipe line of size 150 mm Dia.	0.50%	Unit of measurement is completion of works. Payment shall be made

				on completion of all work
		GI Pipe lines of of size 50/40/25/20 mm including Gate valves.	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Shifting Transformer including Connected Accessories, LT Panel, Cable, Fencing	0.40%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		CI/DI Pipe line of size 100 mm Dia.	3.30%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		HT 11 KV Feeder including Pole, Cross Arms, insulators, stay, Earthing etc.	1.50%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Armoured jelly Filled Cable 20 Pair.	0.50%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Armoured jelly Filled Cable 50 Pair.	1.30%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Armoured jelly Filled Cable 100 Pair.	0.30%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Armoured Opticab Fibre Cable 12 Core Single Mode.	0.70%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Boundary wall Road, 4m High RCC wall with 7' view Cutters above finished road level.	2.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Road along the newly constructed wall Width 5M, GSB 150mm, WMM=150mm, DBM-50mm & BC=40mm	1.40%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Sentry Post with Guard Room	1.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Regimental Buildings	20.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Vocational Training Buildings	**8.2%**	
		Vocational Training Buildings (open sheds)		

		Vocational Training Buildings (Basket Ball Court)		
		(i) Foundation work upto plinth level	**20%**	Unit of measurement is completion of works. Payment shall be made on completion of all work
		(ii) Construction of Wall, Shear wall, Beams and Column	**30%**	
		(iii) Construction of Roof and flooring	**20%**	
		(iv) Jointary, finishes, E&M work, water supply etc	**30%**	
		Boundary Wall (Reconstruction site)	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Jafri Compound Wall 1.5M High with RCC Columns	0.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Steel Gate with 3.5m Wide with RCC Columns	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Integrated Perimeter Security System	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		OR'S Institute (s/s)	**1.70%**	
		(i) Foundation work upto plinth level	20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		(ii) Construction of Wall, Shear wall, Beams and Column	30%	
		(iii) Construction of Roof and flooring	20%	
		(iv) Jointary, finishes, E&M work, water supply etc	30%	
		02 Pole Structure	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Security Light Pole	0.60%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Security Light	0.20%	Unit of measurement is completion of works. Payment shall be made

				on completion of all work
		Part C- In Ambaran Village	0.00%	
		Boundary Wall (Reconstruction with Integrated Perimeter Security System)	13.60%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Sentry Post with Guard Room	0.60%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Steel Gate	0.60%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Tower Post	0.20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Fencing	0.70%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Security Post	3.00%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Officer Mes Area	**6.60%**	
		(i) Foundation work upto plinth level	20%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		(ii) Construction of Wall, Shear wall, Beams and Column	30%	
		(iii) Construction of Roof and flooring	20%	
		(iv) Jointary, finishes, E&M work, water supply etc	30%	
		Inter connectivity (03 km distance with a min width of 3.5m to 4m)	5.80%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		12 Core optical fibre	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work
		Jelly Filled Cable 20 Pair Armoured	0.10%	Unit of measurement is completion of works. Payment shall be made on completion of all work

2. Procedure for payment for Maintenance

2.1 The cost for maintenance shall be as stated in Clause 14.1(v).

2.2 Payment for Maintenance shall be made in quarterly instalments in accordance with theprovisions of Article 14 and Article 19.

SCHEDULE-I: Drawings

1 Drawings

In compliance of the obligations set forth in Clause 10.2 of this Agreement, the Contractor shall furnish to the Authority's Engineer, free of cost, all Drawings listed in Annex-I of this Schedule-I.

2 Additional Drawings

If the Authority's Engineer determines that for discharging its duties and functions under this Agreement, it requires any drawings other than those listed in Annex-I, it may bynotice require the Contractor to prepare and furnish such drawings forthwith. Upon receiving a requisition to this effect, the Contractor shall promptly prepare and furnish such drawings to the Authority's Engineer, as if such drawings formed part of Annex-I of this Schedule-I.

Annexure -I

(Schedule-I)

List of Drawings

Note: The Authority shall describe in this Annex-I, all the Drawings that the Contractor isrequired to furnish under Clause 10.2.

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SCHEDULE-J: Project Completion Schedule

1 Project Completion Schedule

During Construction period, the Contractor shall comply with the requirements set forth in this Schedule-J for each of the Project Milestones and the **Scheduled Completion Date**. Within 15 (fifteen) days of the date of each Project Milestone, the Contractor shall notify the Authority of such compliance along with necessary particulars thereof.

2 Project Milestone-I

2.1 Project Milestone-I shall occur on the date falling on the 256th (Two hundred and fifty sixth) day from the Appointed Date (the "**Project Milestone-I**").

2.2 Prior to the occurrence of Project Milestone-I, the Contractor shall have commenced construction of the Project and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 10% (ten per cent) of the Contract Price.

3 Project Milestone-II

3.1 Project Milestone-II shall occur on the date falling on the 438th (Four hundred and thirty eight) day from the Appointed Date (the "**Project Milestone-II**").

3.2 Prior to the occurrence of Project Milestone-II, the Contractor shall have continued with construction of the Project and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 30% (thirty per cent) of the Contract Price.

4 Project Milestone-III

4.1 Project Milestone-III shall occur on the date falling on the 621st (Six hundred and twenty first) day from the Appointed Date (the "**Project Milestone- III**").

4.2 Prior to the occurrence of Project Milestone-III, the Contractor shall have continued with construction of the Project and submitted to the Authority duly and validly prepared Stage Payment Statements for an amount not less than 60% (sixty per cent) of the Contract Price.

5 Scheduled Completion Date

5.1 The Scheduled Completion Date shall occur on the 730th (Seven Hundred and thirtieth) dayfrom the Appointed Date.

5.2 On or before the Scheduled Completion Date, the Contractor shall have completedconstruction in accordance with this Agreement.

6 Extension of time

Upon extension of any or all of the aforesaid Project Milestones or the Scheduled Completion Date, as the case may be, under and in accordance with the provisions of this Agreement, the Project Completion Schedule shall be deemed to have been amended accordingly.

SCHEDULE-K: Tests on Completion

1 ScheduleforTests

1.1 The Contractor shall, no later than 30 (thirty) days prior to the likely completion of construction, notify the Authority's Engineer and the Authority of its intent to subject the Project to Tests, and no later than 10 (ten) days prior to the actual date of Tests, furnish tothe Authority's Engineer and the Authority detailed inventory and particulars of all works and equipment forming part of Works.

1.2 The Contractor shall notify the Authority's Engineer of its readiness to subject the Project to Tests at any time after 10 (ten) days from the date of such notice, and upon receipt of such notice, the Authority's Engineer shall, in consultation with the Contractor, determine the date and time for each Test and notify the same to the Authority who may designate its representative to witness the Tests. The Authority's Engineer shall thereupon conduct the Tests itself or cause any of the Tests to be conducted in accordance with Article 12 and this Schedule-K.

2 Tests

2.1 Other tests: The Authority's Engineer may require the Contractor to carry out or cause to be carried additional tests, in accordance with Good Industry Practice, for determining the compliance of the Project with Specifications and Standards.

2.2 Environmental audit: The Authority's Engineer shall carry out a check to determine conformity of the Project with the environmental requirements set forth in Applicable Laws and Applicable Permits.

2.3 Safety Audit: The Authority's Engineer shall carry out, or cause to be carried out, a safety audit to determine conformity of the Project with the safety requirements and Good Industry Practice.

3 Agency for conducting Tests

All Tests set forth in this Schedule-K shall be conducted by the Authority's Engineer orsuch other agency or person as it may specify in consultation with the Authority.

4 Completion Certificate

Upon successful completion of Tests, the Authority's Engineer shall issue theCompletion Certificate in accordance with the provisions of Article 12.

SCHEDULE-L: Provisional Certificate

1 I, ……. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated .....(the **"Agreement"**), for Construction of Equal Value Assets viz. married residential accommodation for Army Officers, Junior Commissioned Officers and ORs at Dharmal, Domana and Jandial in Jammu through …… (Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been undertaken to determine compliance of the Project Highway with the provisions of the Agreement.

2 Works that are incomplete on account of Time Extension have been specified in the Punch List appended hereto, and the Contractor has agreed and accepted that it shall complete all such works in the time and manner set forth in the Agreement. In addition, certain minor works are incomplete and these are not likely to cause material inconvenience to the Users of the Project Building & Instructure work or affect their safety. The Contractor has agreed and accepted that as a condition of this Provisional Certificate, it shall complete such minor works within 30 (thirty) days hereof. These minor works have also been specifiedin the aforesaid Punch List.

3 In view of the foregoing, I am satisfied that the Project for Building & Infrastructure work can be safely and reliably placed in service of the Users thereof, and in terms of the Agreement, the Project Building & Instructure work is hereby provisionally declared fit for entry into operation on this the …… day of …….. 20…...

ACCEPTED, SIGNED, SEALED AND DELIVERED	SIGNED, SEALED AND DELIVERED
For and on behalf of	For and on behalf of
CONTRACTOR by:	AUTHORITY's ENGINEER by:
(Signature)	(Signature)

COMPLETION CERTIFICATE

1 I, ……. (Name of the Authority's Engineer), acting as the Authority's Engineer, under and in accordance with the Agreement dated.....(the "**Agreement**"), for Construction of Equal Value Assets viz. married residential accommodation for Army Officers, Junior Commissioned Officers and ORs at Dharmal, Domana and Jandial in Jammu through …….(Name of Contractor), hereby certify that the Tests in accordance with Article 12 of the Agreement have been successfully undertaken to determine compliance of the Project Building & Instructure work with the provisions of the Agreement, and I am satisfied that the Project Building & Instructure work can be safely and reliably placed in service of the Users thereof.

2 It is certified that, in terms of the aforesaid Agreement, all works forming part of Project Highway have been completed, and the Project Highway is hereby declared fit for entry into operation on this the …… day of …… 20…..

SIGNED, SEALED AND DELIVERED

For and on behalf of the Authority's Engineer by:

(Signature)

(Name)

(Designation)

(Address)

SCHEDULE-M: Payment Reduction for Non-Compliance

1 Payment reduction for non-compliance with the Maintenance Requirements

1.1 Monthly lump sum payments for maintenance shall be reduced in the case of non-compliance with the Maintenance Requirements set forth in Schedule-E.

1.2 Any deduction made on account of non-compliance with the Maintenance Requirements shall not be paid even after compliance subsequently. The deductions shall continue to be made every month until compliance is done.

1.3 The Authority's Engineer shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

2 Percentage reductions in lump sum payments

2.1 The following percentages shall govern the payment reduction:

2.2 The amount to be deducted from monthly lump-sum payment for noncompliance of particular itemshall be calculated as under:

R=P/IOO x M x C1

Where
P = Percentage of particular item/ Defect/deficiency for deductionM = Monthly lump-sum payment in accordance with the Bid
C = its % in the Schedule H (of Contract Price)
R = Reduction (the amount to be deducted for non-compliance for a particular item/Defect/ deficiency

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/ deficiency or non-compliance.

SCHEDULE-N: Selection of Authority's Engineer

1 Selection of Authority's Engineer

1.1 The provisions of the Model Request for Proposal for Selection of Technical Consultants, issued by the Ministry of Finance in May 2009, or any substitute thereof shall apply for selection of an experienced firm to discharge the functions and duties of an Authority's Engineer.

1.2 In the event of termination of the Technical Consultants appointed in accordance with the provisions of Paragraph 1.1, the Authority shall appoint another firm of Technical Consultants forthwith and may engage a government-owned entity in accordance with the provisions of Paragraph 3 of this Schedule-N.

2 Terms of Reference

The Terms of Reference for the Authority's Engineer (the "**TOR**") shall substantiallyconform with Annex 1 to this Schedule N.

3 Appointment of Government entity as Authority's Engineer

Notwithstanding anything to the contrary contained in this Schedule, the Authority may in its discretion appoint a government-owned entity as the Authority's Engineer; provided that such entity shall be a body corporate having as one of its primary functions the provision of consulting, advisory and supervisory services for engineering projects; provided further that a government-owned entity which is owned or controlled by the Authority shall not be eligible for appointment as Authority's Engineer.

Annexure -I

(Schedule-N)

Terms of Reference for Authority's Engineer

1 Scope

1.1 These Terms of Reference (the "**TOR**") for the Authority's Engineer are being specified pursuant to the EPC Agreement dated..... (the "**Agreement**), which has been entered into between the [name and address of the Authority] (the "**Authority**") and..... (the "**Contractor**") for Development of multimodal logistic park, package-II on Engineering, Procurement, Construction (EPC) basis, and a copy of which is annexed hereto and marked as Annex-A to form part of this TOR.

1.2 The TOR shall apply to construction and maintenance of the Project.

2 Definitions and interpretation

2.1 The words and expressions beginning with or in capital letters and not defined herein but defined in the Agreement shall have, unless repugnant to the context, the meaning respectively assigned to them in the Agreement.

2.2 References to Articles, Clauses and Schedules in this TOR shall, except where the context otherwise requires, be deemed to be references to the Articles, Clauses and Schedules of the Agreement, and references to Paragraphs shall be deemed to be references to Paragraphs of this TOR.

2.3 The rules of interpretation stated in Clauses 1.2, 1.3 and 1.4 of the Agreement shall apply, *mutatis mutandis*, to this TOR.

3 General

3.1 The Authority's Engineer shall discharge its duties in a fair, impartial and efficient manner, consistent with the highest standards of professional integrity and Good Industry Practice.

3.2 The Authority's Engineer shall perform the duties and exercise the authority in accordance with the provisions of this Agreement, but subject to obtaining prior written approval of the Authority before determining:

(i) any Time Extension;

(ii) any additional cost to be paid by the Authority to the Contractor;

(iii) the Termination Payment; or

(iv) any other matter which is not specified in (a), (b) or (c) above and which creates an obligation or liability on either Party for a sum exceeding Rs. 5,000,000 (Rs. fifty lakh).

3.3 The Authority's Engineer shall submit regular periodic reports, at least once every month, to the Authority in respect of its duties and functions under this Agreement. Such reports shallbe submitted by the Authority's Engineer within 10 (ten) days of the beginning of every month.

3.4 The Authority's Engineer shall inform the Contractor of any delegation of its duties and responsibilities to its suitably qualified and experienced personnel; provided, however, that it shall not delegate the authority to refer any matter for the Authority's prior approval in accordance with the provisions of Clause 18.2.

3.5 The Authority's Engineer shall aid and advise the Authority on any proposal for Change of Scope under Article 13.

3.6 In the event of any disagreement between the Parties regarding the meaning, scope and nature of Good Industry Practice, as set forth in any provision of the Agreement, the Authority's Engineer shall specify such meaning, scope and nature by issuing a reasoned written statement relying on good industry practice and authentic literature.

4 Construction Period

4.1 During the Construction Period, the Authority's Engineer shall review the Drawings furnished by the Contractor along with supporting data, including the geo-technical and hydrological investigations, characteristics of materials from borrow areas and quarry sites, topographical surveys, and the recommendations of the Safety Consultant in accordance with the provisions of Clause 10.1.6. The Authority's Engineer shall complete such review and send its observations to the Authority and the Contractor within 15 (fifteen) days of receiptof such Drawings; provided, however that in case of a Major Structure, the aforesaid periodof 15 (fifteen) days may be extended upto 30 (thirty) days. In particular, such comments shall specify the conformity or otherwise of such Drawings with the Scope of the Project and Specifications and Standards.

4.2 The Authority's Engineer shall review any revised Drawings sent to it by the Contractor and furnish its comments within 10 (ten) days of receiving such Drawings.

4.3 Authority's Engineer shall review the Quality Assurance Plan submitted by the Contractor and shall convey its comments to the Contractor within a period of 21 (twenty-one) days stating the modifications, if any, required thereto.

4.4 The Authority's Engineer shall complete the review of the methodology proposed to be adopted by the Contractor for executing the Works, and convey its comments to the Contractor within a period of 10 (ten) days from the date of receipt of the proposed methodology from the Contractor.

4.5 The Authority's Engineer shall grant written approval to the Contractor, where necessary, for interruption and diversion of the flow of traffic for purposes of maintenance during the Construction Period in accordance with the provisions of Clause 10.4.

4.6 The Authority's Engineer shall review the monthly progress report furnished by the Contractor and send its comments thereon to the Authority and the Contractor within 7

(seven) days of receipt of such report.

4.7 The Authority's Engineer shall inspect the Construction Works and the Project Building & Instructure work and shall submit a monthly Inspection Report bringing out the results of inspections and the remedial action taken by the Contractor in respect of Defects or deficiencies. In particular, the Authority's Engineer shall include in its Inspection Report, the compliance of the recommendations made by the Safety Consultant.

4.8 The Authority's Engineer shall conduct the pre-construction review of manufacturer's test reports and standard samples of manufactured Materials, and such other Materials as the Authority's Engineer may require.

4.9 For determining that the Works conform to Specifications and Standards, the Authority's Engineer shall require the Contractor to carry out, or cause to be carried out, tests at such time and frequency and in such manner as specified in the Agreement and in accordance with Good Industry Practice for quality assurance.

4.10 The Authority's Engineer shall test check at least 20 (twenty) percent of the quantity or number of tests prescribed for each category or type of test for quality control by the Contractor.

4.11 Timing of tests referred to in Paragraph 4.9, and the criteria for acceptance/ rejection of their results shall be determined by the Authority's Engineer in accordance with the QualityControl Manuals. The tests shall be undertaken on a random sample basis and shall be in addition to, and independent of, the tests that may be carried out by the Contractor for its own quality assurance in accordance with Good Industry Practice.

4.12 In the event that results of any tests conducted under Clause 11.10 establish any Defects or deficiencies in the Works, the Authority's Engineer shall require the Contractor to carry out remedial measures.

4.13 The Authority's Engineer may instruct the Contractor to execute any work which is urgently required for the safety of the Project, whether because of an accident, unforeseeable eventor otherwise; provided that in case of any work required on account of a Force Majeure Event, the provisions of Clause 21.6 shall apply.

4.14 In the event that the Contractor fails to achieve any of the Project Milestones, the Authority's Engineer shall undertake a review of the progress of construction and identify potential delays, if any. If the Authority's Engineer shall determine that completion of the Project is not feasible within the time specified in the Agreement, it shall require the Contractor to indicate within 15 (fifteen) days the steps proposed to be taken to expedite progress, and the period within which the Project Completion Date shall be achieved. Upon receipt of a report fromthe Contractor, the Authority's Engineer shall review the same and send its comments to the Authority and the Contractor forthwith.

4.15 The Authority's Engineer shall obtain from the Contractor a copy of all the Contractor's quality control records and documents before the Completion Certificate is issued pursuantto Clause 12.4.

4.16 Authority's Engineer may recommend to the Authority suspension of the whole or part of

the Works if the work threatens the safety of the Users and pedestrians. After the Contractor has carried out remedial measure, the Authority's Engineer shall inspect such remedial measures forthwith and make a report to the Authority recommending whether or not the suspension hereunder may be revoked.

4.17 In the event that the Contractor carries out any remedial measures to secure the safety of suspended works and Users, and requires the Authority's Engineer to inspect such works, the Authority's Engineer shall inspect the suspended works within 3 (three) days of receiving such notice, and make a report to the Authority forthwith, recommending whetheror not such suspension may be revoked by the Authority.

4.18 The Authority's Engineer shall carry out, or cause to be carried out, all the Tests specified in Schedule-K and issue a Completion Certificate or Provisional Certificate, as the case may be. For carrying out its functions under this Paragraph 4.18 and all matters incidental thereto, the Authority's Engineer shall act under and in accordance with the provisions of Article 12 and Schedule-K.

5 Maintenance Period

5.1 The Authority's Engineer shall aid and advise the Contractor in the preparation of its monthly Maintenance Programme and for this purpose carry out a joint monthly inspection with the Contractor.

5.2 The Authority's Engineer shall undertake regular inspections, at least once every month, to evaluate compliance with the Maintenance Requirements and submit a Maintenance Inspection Report to the Authority and the Contractor.

5.3 The Authority's Engineer shall specify the tests, if any, that the Contractor shall carry out, or cause to be carried out, for the purpose of determining that the Project is in conformity with the Maintenance Requirements. It shall monitor and review the results of such tests and the remedial measures, if any, taken by the Contractor in this behalf.

5.4 In respect of any defect or deficiency referred to in Paragraph 3 of Schedule- E, the Authority's Engineer shall, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards and shall also specify the time limit for repair or rectification of any deviation or deterioration beyond the permissible limit.

5.5 The Authority's Engineer shall examine the request of the Contractor for closure of the Project or part thereof for undertaking maintenance/repair thereof, and shall grant permission with such modifications, as it may deem necessary, within 5 (five) days of receiving a request from the Contractor. Upon expiry of the permitted period of closure, the Authority's Engineer shall monitor the reopening of such lane(s), and in case of delay, determine the Damages payable by the Contractor to the Authority under Clause 14.5.

6 Determination of costs and time

6.1 The Authority's Engineer shall determine the costs, and/or their reasonableness, that arerequired to be determined by it under the Agreement.

6.2 The Authority's Engineer shall determine the period of Time Extension that is required to be determined by it under the Agreement.

6.3 The Authority's Engineer shall consult each Party in every case of determination inaccordance with the provisions of Clause 18.5.

7 Payments

7.1 The Authority's Engineer shall withhold payments for the affected works for which the Contractor fails to revise and resubmit the Drawings to the Authority's Engineer in accordance with the provisions of Clause 10.2.4 (d).

7.2 Authority's Engineer shall –

(i) within 10 (ten) days of receipt of the Stage Payment Statement from the Contractor pursuant to Clause 19.4, determine the amount due to the Contractor and recommend the release of 90 (ninety) percent of the amount so determined as part payment, pending issue of the Interim Payment Certificate; and

(ii) within 15 (fifteen) days of the receipt of the Stage Payment Statement referred to in Clause 19.4, deliver to the Authority and the Contractor an Interim Payment Certificate certifying the amount due and payable to the Contractor, after adjustments in accordance with the provisions of Clause 19.10.

7.3 The Authority's Engineer shall, within 15 (fifteen) days of receipt of the Monthly Maintenance Statement from the Contractor pursuant to Clause 19.6, verify the Contractor's monthly statement and certify the amount to be paid to the Contractor in accordance with the provisions of the Agreement.

7.4 The Authority's Engineer shall certify final payment within 30 (thirty) days of the receipt of the final payment statement of Maintenance in accordance with the provisions of Clause 19.16.

8 Other duties and functions

The Authority's Engineer shall perform all other duties and functions as specified inthe Agreement.

9 Miscellaneous

9.1 A copy of all communications, comments, instructions, Drawings or Documents sent by the Authority's Engineer to the Contractor pursuant to this TOR, and a copy of all the test results with comments of the Authority's Engineer thereon, shall be furnished by the Authority's Engineer to the Authority forthwith.

9.2 The Authority's Engineer shall retain at least one copy each of all Drawings and Documents received by it, including 'as-built' Drawings, and keep them in its safe custody.

9.3 Within 90 (ninety) days of the Project Completion Date, the Authority's Engineer shall obtain a complete set of as-built Drawings, in 2 (two) hard copies and in micro film form

or in such other medium as may be acceptable to the Authority, reflecting the Project as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project and setback lines, if any, of the buildings and structures forming part of Project Facilities; and shall hand them over to the Authority against receipt thereof.

9.4 The Authority's Engineer, if called upon by the Authority or the Contractor or both, shall mediate and assist the Parties in arriving at an amicable settlement of any Dispute between the Parties.

9.5 The Authority's Engineer shall inform the Authority and the Contractor of any event of Contractor's Default within one week of its occurrence.

SCHEDULE-O: Forms of Payment Statements

1 Stage Payment Statement for Works

The Stage Payment Statement for Works shall state:

(i) the estimated amount for the Works executed in accordance with Clause 19.3.1 subsequent to the last claim;

(ii) amounts reflecting adjustments in price for the aforesaid claim;

(iii) the estimated amount of each Change of Scope Order executed subsequent tothe last claim;

(iv) amounts reflecting adjustment in price, if any, for (iii) above in accordancewith the provisions of Clause 13.2.3 (a);

(v) total of (i), (ii), (iii) and (iv) above;

(vi) Deductions:

(a) Any amount to be deducted in accordance with the provisions of the Agreement except taxes;
(b) Any amount towards deduction of taxes; and
(c) Total of (a) and (b) above.

(vii) Net claim: (v) – (vi) (c);

(viii) The amounts received by the Contractor upto the last claim:

(a) For the Works executed (excluding Change of Scope orders);
(b) For Change of Scope Orders, and
(c) Taxes deduct

2 Monthly Maintenance Payment Statement

The monthly Statement for Maintenance Payment shall state:

(i) the monthly payment admissible in accordance with the provisions of theAgreement;

(ii) the deductions for maintenance work not done;

(iii) net payment for maintenance due, (i) minus (ii);

(iv) amounts reflecting adjustments in price under Clause 19.12; and

(v) amount towards deduction of taxes

3 Contractor's claim for Damages

Note: The Contractor shall submit its claims in a form acceptable to the Authority.

SCHEDULE-P: Insurance

1 Insurance during Construction Period

1.1 The Contractor shall effect and maintain at its own cost, from the Appointed Date till the date of issue of the Completion Certificate, the following insurances for any loss or damage occurring on account of Non Political Event of Force Majeure, malicious act, accidental damage, explosion, fire and terrorism:

(i) insurance of Works, Plant and Materials and an additional sum of [15 (fifteen)] per cent of such replacement cost to cover any additional costs of and incidental to the rectification of loss or damage including professional fees and the cost of demolishing ansd removing any part of the Works and of removing debris of whatsoever nature; and

(ii) insurance for the Contractor's equipment and Documents brought onto the Site by the Contractor, for a sum sufficient to provide for their replacement at the Site.

1.2 The insurance under paragraph 1.1 (i) and (ii) above shall cover the Authority and the Contractor against all loss or damage from any cause arising under paragraph 1.1 other than risks which are not insurable at commercial terms.

2 Insurance for Contractor's Defects Liability

The Contractor shall effect and maintain insurance cover for the Works from the date of issue of the Completion Certificate until the end of the Defects Liability Period for anyloss or damage for which the Contractor is liable and which arises from a cause occurring prior to the issue of the Completion Certificate. The Contractor shall also maintain other insurances for maximum sums as may be required under the Applicable Laws and in accordance with Good Industry Practice.

3 Insurance against injury to persons and damage to property

3.1 The Contractor shall insure against its liability for any loss, damage, death or bodily injury, or damage to any property (except things insured under Paragraphs 1 and 2 of this Schedule or to any person (except persons insured under Clause 20.9), which may arise out of the Contractor's performance of this Agreement. This insurance shall be for a limit per occurrence of not less than the amount stated below with no limit on the number of occurrences.

The insurance cover shall be not less than: Rs. [*****]

3.2 The insurance shall be extended to cover liability for all loss and damage to the Authority's property arising out of the Contractor’s performance of this Agreement excluding:

(i) the Authority's right to have the construction works executed on, over, under,in or through any land, and to occupy this land for the Works; and

(ii) damage which is an unavoidable result of the Contractor's obligations to execute the

Works.

4 Insurance to be in joint names

The insurance under paragraphs 1 to 3 above shall be in the joint names of the Contractorand the Authority.

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